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NUMBER	SHEET NAME
GENERAL	
G0.00	COVER
G1.00	SHEET INDEX
G1.01	PROJECT INFORMATION
G2.00	SMC - LAND USE - PRE-SUBMITTAL CONFERENCE MINUTES
G2.10	LAND USE SUMMARY 1/2
G2.11	LAND USE SUMMARY 2/2 23.66.334 ADDED + 23.66336 REVISED
G2.20	LAND USE DIAGRAMS
G2.21	COMMON RECREATION AREAS
G2.22	STREET LEVEL STANDARDS
G2.30	SPU SOLID WASTE APPROVAL
G2.40	SMC - BIKE RACK CUT SHEETS
~~G2.50~~	~~SMC - FAR CALCULATION~~
~~G2.51~~	~~SMC - FAR CALCULATION~~
~~G3.00~~	~~SBC - CODE SUMMARY 1/2~~
~~G3.01~~	~~SBC - CODE SUMMARY 2/2~~
~~G3.10~~	~~SBC - USE, SEPARATION & HEIGHT~~
G3.20	SBC - OCCUPANCY AND EGRESS
G3.21	SBC - OCCUPANCY AND EGRESS & FIXTURES
~~G3.30~~	~~SBC - ENERGY CODE SUMMARY~~
~~G3.31~~	~~SBC - ENERGY CODE SUMMARY~~
~~G3.40~~	~~SBC - AIR BARRIER DIAGRAMS~~
~~G4.00~~	~~ACCESSIBILITY REQUIREMENTS~~
~~G4.01~~	~~ACCESSIBILITY REQUIREMENTS~~
~~G4.02~~	~~ACCESSIBILITY REQUIREMENTS~~

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2/2	SURVEY
CIVIL	
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~~C2.00~~	~~TESC PLAN~~
~~C2.10~~	~~TEST DETAILS~~
~~C3.00~~	~~CIVIL SITE PLAN~~
~~C3.10~~	~~CIVIL DETAILS~~
~~C3.11~~	~~ROOF DRAINAGE PLAN~~
SDOT 01	COVER SHEET
SDOT 02	NOTES SHEET
SDOT 03	ALIGNMENT PLAN
SDOT 04	PLAN AND PROFILE 10TH AVE
SDOT 05	PLAN AND PROFILE 10TH AVE
SDOT 06	PLAN AND PROFILE S JACKSON ST
SDOT 07	DETAILS SHEET
LANDSCAPE	
L1.01	SITE PLAN
L1.02	LEVEL 02 COURTYARD AND ROOF
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L3.01	SITE DETAILS
L4.01	PLANTING PLAN
L4.02	PLANTING DETAILS AND PLANTING SCHEDULE
L5.01	IRRIGATION PLAN STREETSCAPE
L5.02	IRRIGATION PLAN LEVEL 02 COURTYARD AND ROOF
L5.03	IRRIGATION DETAILS
L6.01	GREEN FACTOR SITE PLAN
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A3.11	BUILDING SECTIONS
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A5.25	EXTERIOR DETAILS - STOREFRONT
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A5.45	EXTERIOR DETAILS - THIN BRICK
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NUMBER	SHEET NAME
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M0.02	MECHANICAL NOTES & SPECIFICATIONS
M0.03	MECHANICAL NOTES & SPECIFICATIONS
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~~P0.06~~	~~PLUMBING EQUIPMENT SCHEDULES~~
~~P0.07~~	~~PLUMBING EQUIPMENT SCHEDULES~~
~~P0.08~~	~~PLUMBING FIXTURE SCHEDULES~~
~~P0.09~~	~~PLUMBING FIXTURE SCHEDULES~~
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~~P2.04~~	~~LEVEL 04 PLUMBING PLAN~~
~~P2.05~~	~~LEVEL 05 PLUMBING PLAN~~
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~~E2.09~~	~~ROOF P&LV PLAN~~
E3.00	EXTERIOR LIGHTING PLAN
~~E3.01~~	~~LEVEL 01 LIGHTING PLAN~~
~~E3.02~~	~~LEVEL 02 LIGHTING PLAN~~
~~E3.03~~	~~LEVEL 03 LIGHTING PLAN~~
E3.04	LEVEL 04-08 LIGHTING PLAN
~~E3.09~~	~~ROOF LIGHTING PLAN~~
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~~E5.01~~	~~ENLARGED STACKED ELECTRICAL ROOMS~~
~~E6.00~~	~~ENLARGED ELECTRICAL UNIT PLANS~~
~~E6.01~~	~~ENLARGED ELECTRICAL UNIT PLANS~~
~~E6.02~~	~~ENLARGED ELECTRICAL UNIT PLANS~~
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~~E6.04~~	~~ENLARGED ELECTRICAL UNIT PLANS~~
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~~E7.01~~	~~ELECTRICAL PANEL SCHEDULES~~
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1 - COVER SHEET
2 - GENERAL NOTES
3 - ALIGNMENT PLAN
4 - 10TH AVE S PLAN & PROFILE
5 - 10TH AVE S PLAN & PROFILE
6 - S JACKSON ST PLAN & PROFILE
7 - DETAILS SHEET
8 - STREET LIGHTING
9 - LANDSCAPE PLAN
10 - LANDSCAPE DETAILS
11 - STREETSCAPE PLANTING PLAN
12 - LANDSCAPE PLANTING DETAILS
13 - LANDSCAPE PLANTING SCHEDULE
14 - GREEN FACTOR SITE PLAN
15 - GREEN FACTOR SCORE SHEET
16 - SURVEY
17 - SURVEY SITE NOTES

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PROJECT
Little Saigon Landmark

LOCATION
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Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

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ABBREVIATIONS

A	
AB	ANCHOR BOLT
AC	AIR CONDITIONING
ACC	ACCESSIBLE
ACOUS	ACOUSTICAL
AD	AREA DRAIN
ADJ	ADJUSTABLE
AFF	ABOVE FINISH FLOOR
ALT	ALTERNATE
ALUM	ALUMINUM
ANCH	ANCHOR
ANOD	ANODIZED
ACP	ACOUSTICAL CEILING PANEL
APPD	APPROVED
APPROX	APPROXIMATE
ARCH	ARCHITECTURAL
AUTO	AUTOMATIC
AV	AUDIO VISUAL
AVB	AIR VAPOR BARRIER
B	
BD	BOARD
BLDG	BUILDING
BM	BEAM
BOT	BOTTOM
BSMT	BASEMENT
BT	BOLT
C	
CAB	CABINET
CAT	CATEGORY
CB	CATCH BASIN
CBU	CEMENTITIOUS BACKER UNIT
CER	CERAMIC
CG	CORNER GUARD
CFMF	COLD FORMED METAL FRAMING
CH	CHILLER
CHAN	CHANNEL
CI	CAST IRON
CIP	CASTINPLACE
CJ	CONTROL JOINT / CONSTRUCTION JOINT
CL	CENTER LINE
CLG	CEILING
CLR	CLEAR
CNTR	COUNTER
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
COND	CONDITION
CONN	CONNECTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
COORD	COORDINATE
CORR	CORRIDOR
CT	CERAMIC TILE
CTR	CENTER
CTSK	COUNTER SUNK
CW	COLD WATER (PIPING)
D	
D	DEEP, DEPTH
DBL	DOUBLE
DEG	DEGREE
DEMO	DEMOLITION
DEPT	DEPARTMENT
DET	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIFF	DIFFUSER
DIM	DIMENSION
DISP	DISPENSER
DMPF	DAMPPROOFING
DN	DOWN
DO	DOOR OPENING
DR	DOOR
DRN	DRAIN
DW	DISHWASHER
DWG	DRAWING
DWR	DRAWER
E	
(E)	EXISTING
E	EAST
EA	EACH
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMERG	EMERGENCY
EP	ELECTRICAL PANELBOARD
EQ	EQUAL
EQUIP	EQUIPMENT
EXH	EXHAUST
EXP	EXPANSION
EXIST	EXISTING
EXT	EXTERIOR
F	
FA	FIRE ALARM
FCP	FIBER CEMENT PANEL
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FND	FOUNDATION
FE	FIRE EXTINGUISHER
FEC	FIRE EXTINGUISHER CABINET
FF&E	FURNITURE, FINISHES & EQUIPMENT
FFEL	FINISH FLOOR ELEVATION
FIN	FINISH
FIXT	FIXTURE
FL	FLOOR
FLASH	FLASHING
FO	FACE OF
FP	FIRE PROTECTION
FPG	FIREPROOFING
FR	FRAME
FT	FEET
FRT	FIRE RETARDANT TREATED
FTG	FOOTING
FURN	FURNITURE
G	
GA	GAUGE / GAGE
GALV	GALVANIZED
GB	GRAB BAR
GC	GENERAL CONTRACT(OR)
GFRC	GLASS FIBER REINFORCED CONCRETE
GFRG	GLASS FIBER REINFORCED GYPSUM
GL	GLASS
GR	GRADE
GRD	GROUND
GWB	GYPSUM WALLBOARD

H	
H	HIGH / HEIGHT
HB	HOSE BIB
HC	HOLLOW CORE
HDW	HARDWARE
HS	HEAT STRENGTHEND (GLASS)
HM	HOLLOW METAL (STEEL FRAME)
HNDRL	HANDRAIL
HO	HOLDOPEN
HORIZ	HORIZONTAL
HT	HEIGHT
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
HYDR	HYDRAULIC
I	
ID	INSIDE DIAMETER
IN	INCH
INCL	INCLUDED / INCLUDING
INFO	INFORMATION
INSUL	INSULATION
INT	INTERIOR
INV	INVERT
IPS	INTERNATIONAL PIPE STANDARD
J	
JAN	JANITOR
JC	JANITOR'S CLOSET
JST	JOIST
JT	JOINT
K	
KIT	KITCHEN
KO	KNOCKOUT
L	
LDG	LANDING
LAM	LAMINATE / LAMINATION
LAV	LAVATORY
LB	POUND
LF	LINEAR FOOT
LKR	LOCKER
LN	LINE
LT	LIGHT
M	
MACH	MACHINE
MAINT	MAINTENANCE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MDF	MEDIUM DENSITY FIBERBOARD
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MDO	MEDIUM DENSITY OVERLAY PLYWOOD
MECH	MECHANICAL
MEMB	MEMBRANE
MET	METAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MS	MACHINE SCREW
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MULL	MULLION
N	
N	NORTH
NA	NOT APPLICABLE
NC	NOISE CRITERIA
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O	
OA	OUTSIDE AIR
OC	ON CENTER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OFF	OFFICE
OH	OVER HEAD
OPH	OPPOSITE HAND
OPNG	OPENING
OPP	OPPOSITE
OPPHD	OPPOSITE HAND
ORD	OVERFLOW ROOF DRAIN
OUTS	OUTSIDE
OVHD	OVERHEAD
P	
P	PAINT
PAV	PAVING
PARTN	PARTITION
PBD	PARTICLEBOARD
PDF	POWER DRIVEN FASTENER
PERF	PERFORATED
PERIM	PERIMETER
PERP	PERPENDICULAR
PL	PLATE
PLAM	PLAM
PLBG	PLUMBING
PLYWD	PLYWOOD
PMMA	POLYMETHYL WATERPROOFING
PNL	PANEL
POL	POLISHED
PR	PAIR
PREFAB	PREFABRICATED
PROJ	PROJECT
PSF	POUNDS PER SQUARE FOOT
PT	POINT / PRESSURETREATED
PTD	PAPER TOWEL DISPENSER / PAINTED
PTN	PARTITION
PTR	PAPER TOWEL RECEPTACLE

Q	
Q	QUARRY TILE
QTY	QUANTITY
R	
(R)	RELOCATED
R	RADIUS OR RISER (PIPING)
RA	RETURN AIR
RAD	RADIUS
RB	RESILIENT BASE
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
RECOM	RECOMMENDED
RECPT	RECEPTACLE
REC	RECESSED
REF	REFERENCE
REFL	REFLECTED / REFLECTIVE / REFLECT
REFR	REFRIGERATOR
REG	REGISTER
REINF	REINFORCED / REINFORCING
REL	RELOCATE
REM	REMOVABLE
REQ	REQUIRE / REQUIRED
RESIL	RESILIENT
REV	REVISION / REVISED
RM	ROOM
RO	ROUGH OPENING
RTD	RATED
RTG	RATING
RWL	RAIN WATER LEADER
S	
S	SOUTH
SA	SUPPLY AIR
SAF	SELFADHERED FLASHING
SAM	SELFADHERED MEMBRANE
SAN	SANITARY AIR
SC	SOLID CORE
SCHED	SCHEDULE
SD	STORM DRAIN / SOAP DISPENSER
SECT	SECTION
STS	SELF TAP METAL SCREW
SF	SQUARE FEET/FOOT
SH	SPRINKLER HEAD
SHT	SHEET
SHR	SHOWER
SIM	SIMILAR
SM	SHEET METAL
SND	SANITARY NAPKIN DISPENSER
SP	STANDPIPE
SPEC	SPECIFICATION
SPR	SPRINKLER
SPKR	SPEAKER
SQ	SQUARE
SSE	STRUCTURE SLAB ELEVATION
SST	STAINLESS STEEL
SSK	SERVICE SINK
STA	STATION
STD	STANDARD
STL	STEEL
STLJST	STEEL JOIST
STOR	STORAGE
STRG	STRINGER
STRL	STRUCTURAL
STRUCT	STRUCTURAL
SUBCAT	SUBCATEGORY
SUSP	SUSPENDED
SYMM	SYMMETRICAL
SYS	SYSTEM
T	
T&G	TONGUE AND GROOVE
T	TREAD / THERMOSTAT
TB	TOWEL BAR
TC	TOP OF CURB
TCONC	TOP OF CONCRETE
TEL	TELEPHONE OR TELECOM
TEMP	TEMPERATURE
TER	TERRAZZO
TGB	TOGGLE BOLT
THK	THICKNESS
THRES	THRESHOLD
THRU	THROUGH
TKBD	TACKBOARD
TMPD	TEMPERED
TO	TOP OF (SEE OTHER WORD)
TOS	TOP OF SLAB, TOP OF STRUCT
TOSTL	TOP OF STEEL
TP	TOP OF PAVEMENT
TPD	TOILET PAPER DISPENSER
TRACT	TRACTION
TV	TELEVISION
TW	TOP OF WALL
TYP	TYPICAL
U	
UNFIN	UNFINISHED
UON	UNLESS OTHERWISE NOTED
UR	URINAL
V	
VAC	VENTILATION AND AIR CONDITIONING
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VIF	VERIFY IN FIELD
VR	VAPOR RETARDER
VT	VINYL TILE
VWC	VINYL WALL COVERING
W	
W/	WITH
W	WIDE, WIDTH/WEST
WC	WATER CLOSET
WD	WOOD
WDS	WOOD SCREW
WDW	WINDOW
W/O	WITHOUT
WP	WATERPROOFING
WPM	WATERPROOF MEMBRANE
WPT	WORK POINT
WR	WATER RESISTANT/REPELLANT
WRB	WEATHER RESISTANT BARRIER
WS	WEATHERSTRIPPING
WSCT	WAINSCOT
WT	WEIGHT
WW	WALL TO WALL

PROJECT KEYNOTES

NO.	DESCRIPTION
0302	CONCRETE STEM WALLS, WITH ELASTOMERIC COATING
0401	BRICK VENEER, TYPICAL
0402	THIN BRICK VENEER, TYPICAL
0408	EXPANSION JOINT AT BRICK VENEER, TYPICAL
0409	EXPANSION JOINT AT THIN BRICK VENEER, TYPICAL
0501	SHEET METAL COPING, PAINTED TO MATCH ADJACENT WALL COLOR
0505	CANOPY ASSEMBLY, PRE-FINISHED CORRUGATED METAL ROOFING WITH STEEL CHANNEL FRAME AND SUPPORT,PAINTED TO MATCH STOREFRONT COLOR, WITH WOOD SOFFIT, STAINED
0604	STRUCTURAL SHEATHING
0702	HORIZONTAL THRU WALL FLASHING, ALIGN WITH WINDOW HEAD FLASHING AT EACH LEVEL
0705	FIBER CEMENT PANEL PAINTED, P-1
0706	FIBER CEMENT PANEL PAINTED, P-2
0707	FIBER CEMENT PANEL PAINTED, P-3
0708	STAIR/ELEVATOR BULKHEAD - FIBER CEMENT FLAT PANEL
0710	METAL REVEAL TRIM, PAINTED TO MATCH ADJACENT FIBER CEMENT PANEL
0711	METAL EXHAUST VENT, PAINTED TO MATCH ADJACENT WALL
0712	METAL TRIM BETWEEN WINDOW, PAINT TO MATCH WINDOW COLOR
0713	SHEET METAL WINDOW TRIM, PAINTED TO MATCH WINDOW COLOR
0714	SHEET METAL WINDOW SHROUD, INSIDE SURFACE PAINTED, TBD; OUTSIDE SURFACE PAINTED TO MATCH WINDOW COLOR
0801	ALUMINUM STOREFRONT SYSTEM, TYPICAL
0803	VINYL WINDOW, TYPICAL
0805	OVERHEAD COILING DOOR, PAINTED TO MATCH ADJACENT WALL COLOR
0808	WOOD EXTERIOR DOOR, STAINED
0809	INTERIOR ALUMINUM STOREFRONT SYSTEM
0810	HM DOOR & FRAME, PAINTED TO MATCH ADJACENT WALL COLOR
0814	ALUMINUM OPERABLE WINDOW, PRE-FINISHED
0817	ALUMINUM BI-FOLDING DOOR SYSTEM, PRE-FINISHED
0818	PRE-FINISHED ALUMINUM LOUVER, COLOR TO MATCH STOREFRONT
0905	PLASTIC LAMINATE: PLAM-1, WILSONART
0906	PAINT: PT-1, TYPICAL PAINT
0912	RESILIENT FLOORING: RF-5, SHAW TATAMI SHEET
0914	RUBBER WALL BASE: RB-1, ROPPE 4" COVE
0915	RUBBER WALL BASE: RB-2, ROPPE 4" COVE TBD
0916	SOLID SURFACE: SS-1, CORIAN
0918	WOOD CEILING: WD-1, 9-WOOD
0919	FIBER-REINFORCED PLASTIC: FRP-1
0920	ACOUSTIC CEILING PANEL: ACP-1, FSORB PET 2"
1001	SIGNAGE: BUILDING NAME
1002	SIGNAGE: BUILDING ADDRESS
1110	PARCEL LOCKER
2101	2-WAY FIRE DEPARTMENT CONNECTION

GENERAL SHEET NOTES

1. DO NOT SCALE DRAWINGS. WRITTEN DIMENSIONS TAKE PRECEDENCE.
2. DRAWINGS HAVE BEEN PREPARED ON AN ORIGINAL SHEET SIZE OF 30" x 42".
3. LEVEL 1-2 DIMENSIONS.
   FLOOR PLAN PARTITION DIMENSIONS ARE TO GRIDLINE OR CENTERLINE OF METAL FRAMING ELEMENT. EXTERIOR WALLS AT LEVEL 1 ARE DIMENSIONED TO MASONRY FINISH.
4. LEVEL 3-8 DIMENSIONS.
   FLOOR PLANS WALLS ARE DIMENSIONED TO GRIDLINE OR CENTERLINE OF WOOD FRAMING ELEMENT, UNLESS NOTED OTHERWISE. GRIDLINES ARE LOCATED AT FACE OF WOOD STUD AT CORRIDORS, FACE OF WOOD STUD AT EXTERIOR WALLS AND CENTERLINE OF WOOD FRAMING AT UNIT DEMISING WALLS.
5. VERTICAL DIMENSIONS INDICATE TOP OF (T.O.) SLAB, T.O. GYPSUM CEMENT UNDERLAYMENT, UNLESS OTHERWISE NOTED.
6. INFORMATION REGARDING EXISTING CONDITIONS USED TO PREPARE THESE DRAWINGS HAS BEEN PROVIDED BY OTHERS. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS PRIOR TO COMMENCING CONSTRUCTION. PROVIDE WRITTEN NOTIFICATION TO THE ARCHITECT OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND THE DRAWINGS. THE ARCHITECT WILL ISSUE A WRITTEN DIRECTIVE IF FURTHER CLARIFICATION IS REQUIRED.
7. CONTRACTOR TO FIELD VERIFY ALL DIMENSIONS, DATUM, LEVELS AND CONDITIONS PERTAINING TO THE WORK PRIOR TO COMMENCING CONSTRUCTION. PROVIDE WRITTEN NOTIFICATION TO THE ARCHITECT OF ANY DISCREPANCIES WITH THE DOCUMENTS. THE ARCHITECT WILL ISSUE A WRITTEN DIRECTIVE IF FURTHER CLARIFICATION IS REQUIRED.
8. THESE DRAWINGS ARE THE EXCLUSIVE PROPERTY OF MITHUN, INC. AND HAVE BEEN PREPARED FOR USE IN THE EXECUTION OF THE ENCLOSED PROJECT. USE OR REPRODUCTION FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN PERMISSION OF MITHUN, INC. IS PROHIBITED.
9. ALL APPLICABLE ASME CODES, SEATTLE BUILDING CODES, SEATTLE ELECTRICAL CODES AND ELEVATOR CODES ADOPTED BY REFERECE APPLY. NOTE THAT EACH CONVEYANCE REQURIES A SEPARATE PERMIT WITH DETAILED INSTALLATION PLANS AND SHALL BE INSTALLED BY A WASHINGTON STATE LICENSED ELEVATOR CONTRACTOR.
10. THIS BUILDING MUST PROVIDE MINIMUM IN-BUILDING SIGNAL STRENGTH FOR EMERGENCY RESPONDER RADIOS PURSUANT TO SFC SECTION 510. PRIOR TO RECEIVING A CERTIFICATE OF OCCUPANCY, THIS BUILDING WILL REQUIRE BDA/DAS INSTALLED, OR A FORM CERTIFYING THAT THE BUILDING OR PORTIONS OF THE BUILDING MEET SECTION 510 SIGNAL STRENGTH REQUIREMENTS WITHOUT THE USE OF BDA/DAS. FOR MORE INFORMATION SEE CLIENT ASSISTANCE MEMO #5123 AND THE "COVERAGE SUFFICIENT WITHOUT BDA" FORM HERE: HTTP://WWW.SEATTLE.GOV/DOCUMENTS/DEPARTMENTS/FIRE/BUSINESS/ASSESSMENT%200F%20COVERAGE%20WITHOUT%20BDA-DAS.PDF
11. SMOKE AND CO ALARMS TO BE INSTALLED PER 2021 SFC:
    A. 907.2.10 SMOKE ALARMS PER 2016 NFPA 72 STANDARD CHAPTER 29.
    B. 915 CARBON MONOXIDE ALARMS PER 2015 NFPA 720 STANDARD

VICINITY MAP

1001 S JACKSON ST

PROJECT SYMBOLS

1 VIEW NAME — 1/8" = 1'-0" | 22/A5.11 — DRAWING NUMBER AND NAME DESCRIPTION; SHEET REFERENCE

1A View Name — 1/8" = 1'-0" | 22/A5.11 — INTERIOR ELEVATIONS, CURTAINWALLS AND STOREFRONT DRAWING NUMBER AND NAME DESCRIPTION

10.8 / 10.8 — GRID LINE AND BUBBLE

LEVEL NAME / ELEVATION — BUILDING STORY / FLOOR NUMBER AND ELEVATION DATUM

SIM 1 / 1 A10.01 / Ref — BUILDING ELEVATION REFERENCES

Ref 1 A8.88 1 Ref / 1 Ref — INTERIOR ELEVATION REFERENCES

1 A10.01 1 A10.01 — BUILDING SECTION REFERENCES

1 A10.01 — WALL SECTION REFERENCES

1 A10.01 — DETAIL SECTION REFERENCES

1 A10.01 — DETAIL REFERENCES

1 A10.01 — ENLARGED PLAN AND DETAIL CALL OUT REFERENCES

PROJECT NORTH ARROW

0' 1' 2' 4' / 0 4' 8' 16' / Scale: 1/8" = 1'-0" — SCALE BAR

ROOM NAME 101 — ROOM NAME AND NUMBER

ROOM NAME 101 150 SF — ROOM NAME AND NUMBER WITH ROOM AREA

ROOM NAME 101 OCCUPANCY — ROOM NAME AND NUMBER WITH OCCUPANCY TYPE

ACCESSIBILE SYMBOL AND DESIGNATION

WHITE CEILING HEIGHT ACP-1 — CEILING TYPE, HEIGHT AND FINISH

WHITE CEILING HEIGHT ACP-1 Level 1

WORK PT / DIM PT — DIMENSION AND WORK POINT REFERENCE

101B — DOOR NUMBER / TYPE

W# / S# / R# — WINDOW (W), STOREFRONT (S), INTERIOR RELITE (R) TYPE/NUMBER

1H SG/T — GLAZING TYPE NUMBER, FIRE RATING

F 1 — FLOOR TYPE NUMBER

R 1 — ROOF TYPE NUMBER

— WALL TYPE

— PARTITION TYPE

1i COMPACT — PARKING STALL NUMBER AND TYPE

1i — PARKING STALL NUMBER ONLY

0901 — KEYNOTE NUMBER

WD-1 — MATERIAL TYPE MARK

F 1i — FURNITURE NUMBER / TYPE

AA AA — APPLIANCES, TOILET ACCESSORIES AND SPECIALTY EQUIPMENT MARK OR NUMBER

DS — DOWNSPOUT

FD — FLOOR DRAIN

FINISH / GRADE / SLAB HEIGHT CHANGE

SLOPE 1/2" PER FT. — SLOPE DIRECTION

CPT 1 CPT 2 / CPT 1 — FINISH, ASSEMBLY AND MATERIAL TYPE TRANSITION

P-2 — ACCENT WALL MATERIAL AND FINISH EXTENT

REVISION CLOUD AND DELTA TAG

RESIDENTIAL APARTMENT UNITS

1. TOTAL OF 70 DWELLING UNITS ON 6 LEVELS

LEVEL 1	NO UNITS
LEVEL 2	NO UNITS
LEVEL 3	10 UNITS
LEVEL 4	12 UNITS
LEVEL 5	12 UNITS
LEVEL 6	12 UNITS
LEVEL 7	12 UNITS
LEVEL 8	12 UNITS
TOTAL	70 UNITS

2. UNIT TYPES/QUANTITY/PERCENT OF TOTAL

1 BED	24 (34.3%)
2 BED	34 (48.6%)
3 BED	12 (17.1%)

3. SBC CHAPTER 11 ACCESSIBLITY / 2010 ADA SECTION 233,809 (HUD)

1107.6.2.2 - TYPE 'A' AND TYPE 'B' UNITS
(5%) REQUIRED TYPE 'A' = 4 TOTAL **TYPE 'A'**

ALLOCATION:

1 BED	1
2 BED	2
3 BED	1
TOTAL	4

4. 2010 ADA SECTION 809.5 - COMMUNICATION FEATURES (HUD)

2% OF TOTAL UNITS PROVIDED
4 REQUIRED - **ADA 809.5**

ALLOCATION:

1BED	1
2BED	1
TOTAL	2

TYPE A/ADA MOBILITY UNITS

LEVEL	UNIT TYPE	UNIT NUMBER
LEVEL 03	1B/1B	309
LEVEL 03	3B/1.5B	311
LEVEL 07	2B/1B	703
LEVEL 07	2B/1B	706

ADA COMMUNICATION UNITS (809.5)

LEVEL	UNIT TYPE	UNIT NUMBER
LEVEL 03	1B/1B	309
LEVEL 07	2B/1B	706

PROJECT SUMMARY

THE PROPOSED PROJECT WILL BE A EIGHT-STORY MIXED-USE BUILDING WITH SIX STORIES OF RESIDENTIAL FLOORS ABOVE A TWO-STORY PODIUM.

THE BUILDING WILL PROVIDE 70 AFFORDABLE HOUSING UNITS (A MIX OF THREE, TWO AND ONE-BEDROOM UNITS), RESIDENTIAL LOBBY AND INTERIOR AMENITY SPACES, AN OUTDOOR LANDSCAPED COURTYARD, ON-SITE BUILDING MANAGER OFFICE, AND STREET LEVEL COMMERCIAL SPACE.

THIS PROJECT INCLUDES SITE IMPROVEMENTS AND UTILITY CONNECTIONS.

PROJECT ADDRESS

1001 S JACKSON STREET
SEATTLE, WA 98104

COUNTY: KING

PARCEL INFORMATION

TAX PARCEL NUMBER:
817010-0005

LEGAL DESCRIPTION

FROM BRH TOPOGRAPHIC & BOUNDARY SURVEY DATED 10/18/23:

PARCEL A:
LOT 1 AND THE NORTH 60 FEET OF LOTS 21 AND 22 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;
EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO.15291 OF THE CITY OF SEATTLE.

PARCEL B:
LOT 2 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;
EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING THE JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.

TITLE REPORT REFERENCE:
THIS SURVEY WAS CONDUCTED ACCORDING TO THE DESCRIPTION SHOWN, FURNISHED BY FIRST AMERICAN TITLE INSURANCE COMPANY, COMMITMENT NO. NCS-1184153-WA1, DATED AUGUST 25, 2023. THE EASEMENTS SHOWN OR NOTED HEREON RELATE TO THIS COMMITMENT.

SDOT AGREEMENT

SDOT MAINTENANCE AGREEMENT FOR CANOPIES ENCROACHING OVER THE RIGHT-OF-WAYS WILL BE OBTAINED PRIOR TO FINAL INSPECTION.

PERMIT INFORMATION

JURISDICTION: CITY OF SEATTLE

RELATED PERMIT NUMBERS

EARLY DESIGN GUIDANCE	DONH-COA-1062
MASTER USE PERMIT	3041180-LU
DEMOLITION PERMIT	6982287-DM
CONSTRUCTION PERMIT	6982286-CN

ZONING:	LAND USE CODE OF THE CITY OF SEATTLE
BUILDING:	2021 SEATTLE BUILDING CODE
FIRE:	2021 SEATTLE FIRE CODE
MECHANICAL:	2021 SEATTLE MECHANICAL CODE
ELECTRICAL:	2023 SEATTLE ELETRICAL CODE
PLUMBING:	2021 SEATTLE PLUMBING CODE
ENERGY:	2021 SEATTLE ENERGY CODE

CODE AS AMENDED AND ADOPTED BY THE STATE BUILDING CODE COUNCIL AND THE CITY OF SEATTLE

ZONE CLASSIFICATION:
NC3- 75(M)

SITE AREA:
45,748SF

ZONE DISTRICTS:
URBAN CENTER VILLAGE - 12TH AVE URBAN CENTER VILLAGE

OCCUPANCY GROUPS:
RESIDENTIAL (R2), BUSINESS (B), MERCANTILE (M)

TYPE OF CONTRUCTION:
TYPE IIIA (6 STORIES) OVER TYPE IA CONSTRUCTION (2 STORY PODIUM)

FIRE PROTECTION:
SFC 903: NFPA 13 AUTOMATIC SPRINKLER SYSTEM PER 2016 NFPA 13
SFC 905: STANDPIPE SYSTEM PER 2016 NFPA 14
SFC 906: PORTABLE FIRE EXTINGUISHERS PER 2018 NFPA 10
SFC 907: FIRE ALARM SYSTEM PER 2016 NFPA 72

RCW 64.55.020(2):
THE UNDERSIGNED HAS PROVIDED BUILDING ENCLOSURE DOCUMENTS THAT IN MY PROFESSIONAL JUDGMENT ARE APPROPRIATE TO SATISFY THE REQUIREMENTS OF RCW 64.55.005 THROUGH 64.55.090.

HUANG HAO

DEFERRED SUBMITTAL LIST

DEFERRED SUBMITTALS REQUIRED BY SDCI SHALL BE PREPARED BY LICENSED PROFESSIONAL AND REVIEWED AND APPROVED BY ARCHITECT OR ENGINEER OR RECORD PRIOR TO SUBMITTAL TO SDCI

1. SEISMIC HOLD-DOWN SYSTEM
2. CONCRETE POST TENSIONING SYSTEM
3. FALL PROTECTION SAFETY ANCHORS

SEPARATE PERMITS

1. ELECTRICAL
2. PLUMBING
3. FIRE ALARM / PROTECTION
4. SIDE SEWER PERMIT FOR TEMPORARY DEWATERING
5. LOW VOLTAGE AND COMMUNICATION SYSTEM
6. FIRE SPRINKLER DESIGN
7. GAS PIPING DESIGN
8. IRRIGATION

PROJECT TEAM

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CONTACT: JOSH SELLERS PARK
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OWNER
EDGE DEVELOPERS
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CONTACT: CJ BROCKWAY
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4EA BUILDING SCIENCE
12721 30TH AVE NE 2ND FLOOR
SEATTLE, WA 98125

CONTACT: JEFF SPEERT
205.728.2358

ENERGY
IMEG
1725 WESTLAKE AVE N SUITE 300
SEATTLE, WA 98109

CONTACT: NATHAN MILLER
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ACOUSTICAL
A3 ACOUSTICS
1909 25TH AVE S. SUITE A
SEATTLE, WA 98144

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ACCESSIBILITY
STUDIO PACIFICA
2144 WESTLAKE AVE N # F
SEATTLE, WA 98109

GENERAL CONTRACTOR
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206.382.3443

CONTACT: LOUIS HAN
206.382.3443

MITHUN

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California, CA 94105 / 415.956.0688

LOS ANGELES / 5837 Adams Blvd
Culver City, CA 90232 / 323.937.2150

mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
PROJECT INFORMATION

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
G1.01

90% CD SET

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ORIGINAL SHEET SIZE 30" x 42"

2/7/2025 2:24:08 PM

Your use of the attached/enclosed media or transferred files shall constitute an acceptance the following
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All recipient agrees, to the fullest extent permitted by law, to defend, indemnify, and hold Mithun, Inc., its shareholders and employees harmless from any against any claim, liability, deficiency, loss, damages, penalties or cost (including attorney's fees and defense) costs, whether or not a suit is filed, arising or allegedly arising out of any unauthorized use, reuse or modification or in any way connected with, the incompatibility, readability, or usability of the information contained herein by the recipient or any person or entity that acquires or obtains this information thereon from the recipient without written authorization from Mithun, Inc.
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Adobe Doc# 2243260 - LANDMARK\LANDMARK_ARCH.rvt

Meeting Agenda

Project:	SDCI #3041180-LU (DONH-COA-01062) 1001 S Jackson St Landmark	**Date/Time:**	9:00 AM - 11/29/2023
		Project #:	2324000
Meeting:	Land Use Pre-Submittal Conference	**Location:**	MS Project
Attendees:	Katrina Nygard, Land Use - Zoning Andy Sandberg, SDCI – building permit coord. Bernard Morris, SPU – water Clayton Scott, SPU – solid waste Ray Ramos, SCL Kelsey Timmer, SDOT Rebecca Frestedt, DON ISRD Laura Hewitt Walker, OH Doug Leigh, Mithun – PM/applicant Casey Huang, Mithun – designer Michael O'Meara, Mithun – project architect Tammy Lee, Mithun – landscape arch Ken Wiersema, CPL – civil engineer Joshua Sellers Park, SCIDpda – owner Evan Chan, Edge– owner consultant Don Mar, Edge – owner consultant John Kennedy, SKL – TI architect Nicole Lew, SKL – TI architect	**Submitted by:**	Doug Leigh
Attachments:			

LAND USE QUESTIONS:

LU-1: The PAR does not indicate that we are SEPA exempt. Confirm that we are SEPA exempt under State Bill 5412 given the project contains new housing units.

- *SEPA exempt through September 2025 - a complete building permit application will determine the vesting date for the project. However, SEPA is a process, so the project may become eligible for SEPA review, even if the building permit has vested prior to the temporary exemption.*
- *60% SIP approval required for building permit submission*
- *No MUP required*
- *SMC 23.52 provides standards for transportation impacts. For projects with over 30 units that are not subject to SEPA, a traffic impact analysis is required*
  - *Please direct any questions to Audrey Spang, the SDCI transportation planner: Audrey.spang@seattle.gov*

LU-2: The PAR indicates that Design Review will be required. Confirm that the ISRD review is the only required Design Review that the project must complete.

- *Confirmed that ISRD is only Design Review required*
  - *ISRD COA required prior to issuance of building permit*
  - *ISRD Demo Certificate required prior to issuance of demo permit*
    An application for demolition must comply with the provisions of SMC 23.66.318. The Board cannot take action on an application for demolition without concurrent plans for a replacement structure or proposed alterations.
  - *ISRD process can happen concurrently with the construction permit application*

LU-3: Can common areas in corridors be included in calculations for 23.49.010.B?

- *Identify amenity and dimensional standards to demonstrate it meets standards on plans for LU review*
- *Departure for affordable area can be applied for if not able to meet requirements.*

SDOT QUESTIONS:

SDOT-1: 10th Ave S is identified as a Downtown Neighborhood Access street classification. Existing curb is 10' off of property line which does not provide enough width to meet the 6' sidewalk+6' planter requirements for Downtown Neighborhood Access. Can the project move curb west 2' to meet Downtown Neighborhood Access street requirements?

- *6" curb, min 6' sidewalk are required on 10th Ave S. Street trees are required in a minimum 5-5' planting strip on each frontage. May require SIP Lite for ADA curb ramp replacement.*
- S Jackson Street – per map 1C in SMC a 18' pedestrian space required (measured from face of curb to property line). SDOT strongly recommends 8' of sidewalk width. A minimum 6' sidewalk is required. A 6" pedestrian easement might be required to meet the required 18' pedestrian space per Map 1C.
- Civil engineer to confirm if existing curb ramps at the project site corner of 10th Ave S and S Jackson St are ADA compliant. If they are not, they are required to be replaced and existing companion ramps will also be required to be assessed and may be required to be replaced. ADA curb ramp replacement requires a SIP Lite permit. If the project realigns the curb on 10th Ave, new ADA compliant curb ramps will be required and a full SIP will be required.

SDOT-2: Project is hoping to make this corner of S Jackson St and 10th Ave S a community hub. Would the city be open to extending sidewalk curb along 10th Ave S 2-5' beyond existing curb to provide more landscape furniture zone for restaurant/seating areas?

- *SDOT conceptually approves of realigning the curb 3.5 feet towards ROW centerline on 10th Ave S and a 6' pedestrian curb bulb on 10th Ave S at the intersection of 10th Ave S and S Jackson St To achieve a 36' curb to curb width on 10th . This change in curb alignment will require full SIP. Exact location of curb will be reviewed at 30% SIP.*

SDOT-3: Project is in Chinatown International District and requires the installation of decorative Chinatown light poles. Are there spacing requirements we should be aware of for these?

- *SLC streetlighting to provide guidance for lighting spacing (pole to pole) and clearance to trees.*
- *Check SDOT streets illustrated for guidance.*

SDOT-4: If kick-rail/planter fencing is installed at planters, will it be considered landscape furniture?

- *See streets illustrated for clearances around sidewalk and vertical height specifications.*

SDOT-5: Does SDOT Urban Forestry have preferred tree species for 10th Ave S and S Jackson St?

- *Landscape to contact UF directly for direction.*

SDOT-6: Can exterior bike racks for building be located in landscape/furniture zone of ROW?

- *Bike racks can be located in the pedestrian zone, must meet clearances in Streets Illustrated.*

SDOT-7: Discuss potential Vietnamese cultural & economic center use of ROW areas for events.

- *Submit plan to Public Space Management*
- *Any permanent furniture locations to be included in Public Space Management plan.*

SDOT-8: Existing curb cut on 10th at south end of site on adjacent property was reviewed.

- *The existing curb cut/ramp is to be used to move trash containers to street for pickup, versus constructing a new one on the project site. If curb is moved to the west the curb cut may need to be maintained and rebuilt as part of the SIP.*

SCL

SCL-1: Review and confirm service location assumptions.

- *Service will likely be from pole near southwest corner of site on 10th, to be determined and confirmed with SCL engineering as part of service application and pre-app meeting process. Underground service will be required.*
- *Survey is attached to meeting notes at Ray's request.*
- *Refer to SCL 0751.00 for in-building transformer vault requirements.*

SCL-2: Review and confirm transformer vault options assumptions.

- *Use 0751.00 In building transformer vault for guidance on vault location and design.*
  - Evan asked if 712 in ground vault is an option?
    - *Use 0732.50 standard for below-grade vaults and clearances to evaluate if an in-ground vault is an option. Further discussion at the SCL pre-app meeting can address any questions.*

SCL-3: Review and confirm overhead high voltage (26kV) line clearance assumptions.

- *14' clearance from nearest line to any part of building, including window shades. Provide survey – SCL will provide "low sag" confirmation*
  - *Submit survey w/meeting minutes Using elevations on survey: N-Pole @ 196.77 and S-Pole @ 192.95; distance between poles @ 111-ft. SCL-calculated low sag is 192.49 @ approx. 27.5-ft from the lower (S) pole.*
- *Construction: Schedule service pre-app – Ray can assist with scheduling. Include in request any question and:*
  - *Temp power requirements*
  - *Clearances during construction*
  - *Have an estimate of service size*
  - *SCL ESR Commercial contact:*

- **ESR:** Antonio Hernandez
  Phone: 206-386-1635
  Email: Antonio.Hernandez@seattle.gov
  https://seattle.gov/city-light/construction-services/apply-for-new-or-upgraded-service
- *Confirm in pre-app meeting that the new project to north across Jackson is not moving any poles along 10th Ave S and high voltage lines that would impact high voltage line alignments and setback requirements for this project.*

SCL-4: Street lighting fixtures were discussed. ID decorative lighting fixtures were discussed. See SDOT-3 question for SDOT street lighting notes.

- *Coordination between SDOT and SCL for locations, spacing and service to be done during SIP reviews and with SCL streetlighting.*

SPU

SPU-1: Review trash staging and pickup area options with SDOT.

- *Storage*
  - *Minimum 500 SF with minimum horizontal dimension of 12'*
  - *Floor must be level and hard surfaced*
  - *If located outdoors, storage space must be screened from public view and minimize light, odor, and glare impacts*
- *Trash ramp Ken reviewed desired location adjacent to neighbor drive*
  - *See SDOT-8 question for direction on ramp.*
  - *On site storage and collection of containers for pickup preferred, limited space available within property lines for storage. Location would put containers next to entry doors on sidewalk.*
    - *Clayton – containers are not allowed to be stored or staged in the sidewalk ROW. Carts may be staged in planting strip.*
  - *Michael reviewed restrictions – use larger containers that are staged in street for pickup Clayton: 2% slope max (3-12/% slope estimated) - 2 yd can be staged higher slope*
    - *Clayton to investigate potential for loading zone staging and pickup in street. Desired option is to use existing curb cut south of property for on-site solid waste access. Since project is in a commercial zone, solid waste can be coordinated during off hours.*
  - *For containers 2 cubic yards and smaller (uncompacted)*
    - *Containers must be within 50' of the truck collection location*
    - *Dumpster path no more than 6% slope*
  - *Trash storage capacity to be per checklist for room size and containers.*
    - *Residential trash 7 yards per week, recycling – 11 yards per week, 2-96 carts*
    - *Commercial – trash 1 yard per week, recycling 1 yard per week, 2-96 carts*
  - *Commercial and residents can share garbage but not recycle or compost.*

SPU-2: The PAR indicates that we will receive a separate water availability certificate from SPU "if required". Please confirm if one is required and if so when issued.

- *WAC issued 8/17/23.*
- *Water service to be off of Jackson.*
- *2" high flow recommended*
- *Complete water service application – indicate Priority 2*
  - https://www.seattle.gov/documents/Departments/SPU/Engineering/Water_Services_Application.pdf
- *Installation follows approval and payment of installation fees, currently about 6-mos from time fees are paid.*

OH/SDCI

OH/SDCI-1: Affordable housing SDCI project support services were reviewed.

- *Andy Sandberg supports affordable housing projects for Demo, Construction and TI permits.*

OH/SDCI-2: Laura reviewed priority 2 designation with facilitates streamlined permitting process.

- *Complete and submit low-income housing Checklist with meeting notes to establish Priority 2 status for project. (ISRD reviews are not subject to Priority2 times – on a 14 day cycle for Certificate of Approval correction submissions)*

DON/ISRD

DON/ISRD-1: Rebecca reported on ISRD Meeting #1.

- *Preferred massing scheme was generally supported at 11/28/23 meeting. No approvals can be granted until Certificate of Approval is complete and reviewed by ISRD Board for formal action.*

DON/ISRD-2: Miscellaneous ISRD notes:

- *Rebecca requested to be kept informed of street tree selection and alignment. Asked to be included in SIP meetings, for interdepartmental alignment. Mentioned history of cherry trees on S. Jackson and coordination of plantings for other new construction projects along S. Jackson.*
- *Right-of-way improvements, including curb expansion, street furnishings, plantings, bike racks require Certificate of Approval.*
- *DONH-COA-01062 was linked as a "child" to 3041180-LU record.*
- *Rebecca requested to be kept informed of trash staging and pickup decisions.*

END OF NOTE

MITHUN
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California, CA 94105 / 415.956.0688
LOS ANGELES / 5837 Adams Blvd
Culver City, CA 90232 / 323.937.2150
mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
SMC - LAND USE - PRE-SUBMITTAL CONFERENCE MINUTES

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
G2.00

90% CD SET

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ORIGINAL SHEET SIZE 30" x 42"

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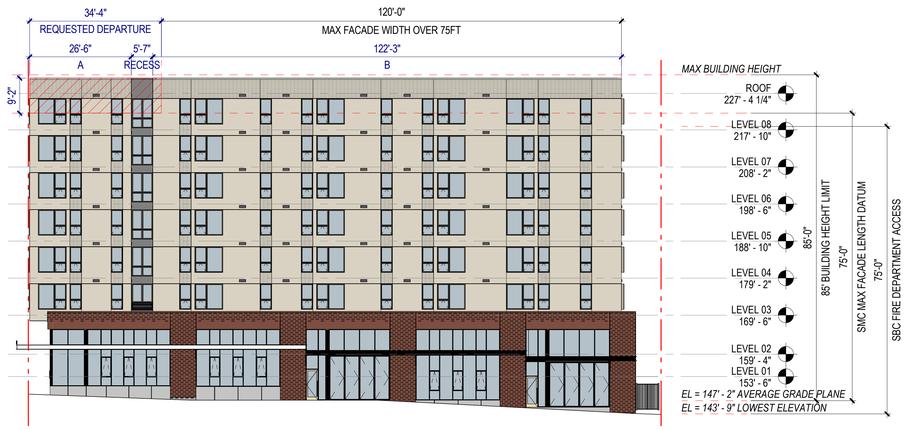
		F.1 FOR CONTAINERS 2 CUBIC YARDS OR SMALLER: A. CONTAINERS TO BE MANUALLY PULLED SHALL BE PLACED NO MORE THAN 50 FEET FROM A CURB CUT OR COLLECTION LOCATION; C. ACCESS RAMPS TO THE STORAGE SPACE SHALL NOT EXCEED A GRADE OF 6%. D. ANY GATES OR ACCESS ROUTES FOR TRUCKS SHALL BE A MINIMUM OF 10' WIDE.		
		G ACCESS FOR OCCUPANTS TO THE STORAGE SPACE FROM THE COLLECTION LOCATION SHALL MEET THE FOLLOWING REQUIREMENTS: 1. DIRECT ACCESS SHALL BE PROVIDED FROM THE ALLEY OR STREET TO THE CONTAINERS. 2. A PICK-UP LOCATION WITHIN 50' OF A CURB CUT OR COLLECTION LOCATION SHALL BE DESIGNATED THAT MINIMIZES ANY BLOCKAGE OF PEDESTRIAN MOVEMENT ALONG A SIDEWALK OR OTHER RIGHT-OF-WAY.		
SIGNAGE	SMC 23.55			
	SMC 23.55.002.A	THE PROVISIONS OF THIS CHAPTER SHALL APPLY TO SIGNS IN ALL ZONES, EXCEPT THOSE ZONES REGULATED BY 23.66, SPECIAL REVIEW DISTRICTS.		
	SMC 23.55.004	A. SIGNS PROJECTING INTO ANY PUBLIC RIGHT-OF-WAY… SHALL HAVE A MIN. CLEARANCE OF 8' OVER ADJACENT SIDEWALK OR ANY OTHER GRADE. C. NO PERMANENT SIGN SHALL EXTEND INTO ANY RIGHT-OF-WAY… MORE THAN 6' BEYOND THE PROPERTY LINE.		
	SMC 23.66.338	BUSINESS ESTABLISHMENTS MAY ERECT SIGNS, INCLUDING BANNERS AND FLAGS THAT ARE SIGNS, IF THE DIRECTOR OF NEIGHBORHOODS DETERMINES THE PROPOSED SIGN MEETS THE STANDARDS IN THIS SECTION 23.66.388 AND ISSUES A CERTIFICATE OF APPROVAL, EXCEPT AS PROVIDED IN SUBSECTION 23.66.388.H.		
	SMC 23.66.338.D	D. PERMITTED SIGNS. 1. THE TYPES OF SIGNS THAT MAY BE APPROVED ARE BANNERS AND FLAGS, PROJECTING AND NON-PROJECTING SIGNS INTEGRATED INTO THE BUILDING FAÇADE, MARQUEE, AWNING, AND WINDOW SIGNS.	PROPOSED SIGNS INCLUDE: BUILDING NAME, BUILDING ADDRESS	A3.01
SPECIAL REVIEW DISTRICTS	23.66			
DEPARTURE FROM LUC REQUIREMENTS	23.66.050	C. A SPECIAL REVIEW BOARD SHALL RECOMMEND, IN WRITING, TO THE DIRECTOR OF THE SDCI WHETHER TO APPROVE, OR DENY, AND DEPARTURE.	REQUESTED DEPARTURES SHOWN AT THE BOTTOM OF THIS CHART AND IN SEPARATE DEPARTURE CHART.	
DEMOLITION APPROVAL	23.66.318	A. TO DISCOURAGE THE UNNECESSARY DEMOLITION OF USEFUL EXISTING STRUCTURES THAT CONTRIBUTE TO THE DISTRICT'S CULTURAL AND SOCIAL CHARACTER, AND ASSESSMENT OF THE STRUCTURE PROPOSED TO BE DEMOLISHED SHALL BE PREPARED AND CIRCULATED TO THE BOARD PRIOR TO ITS CONSIDERATION OF A CERTIFICATE OF APPROVAL.	HISTORIC RESOURCE REPORT FOR 1001 S. JACKSON BUILDING PROVIDED.	
		D.2 STREET-LEVEL USES SHALL COMPLY WITH EXTERIOR BUILDING FINISH REQUIREMENTS OF 23.66.336.		
HEIGHT AND ROOFTOP FEATURES	23.66.332	B.1. THE SPECIAL REVIEW BOARD AND THE DIRECTOR OF NEIGHBORHOODS SHALL REVIEW ROOFTOP FEATURE TO PRESERVE VIEWS FROM KOBE TERRACE PARK		APPROVED ISRD FINAL DESIGN PACKAGE (TO FOLLOW)
	23.66.332	B.3 OPEN RAILINGS, PLANTER, CLERESTORIES, SKYLIGHTS, PLAY EQUIPMENT, PARAPETS AND FIREWALLS MAY EXTEND UP TO 4' ABOVE THE MAXIMUM HEIGHT LIMIT AND MAY HAVE UNLIMITED ROOFTOP COVERAGE.	NO FEATURES OF THE LOWER ROOF EXTEND ABOVE THE 85' HEIGHT LIMIT.	
		B.4 SOLAR COLLECTORS EXCLUDING GREENHOUSES MAY EXTEND UP TO 7' ABOVE THE MAXUMUM HEIGHT LIMIT AND MAY HAVE UNLIMITED ROOFTOP COVERAGE.	SOLAR COLLECTORS DO NOT EXCEED 85' HEIGHT LIMIT AND DO NOT EXTEND ABOVE LOWER ROOF PARAPET.	
		B.8 MEASURES MAY BE TAKEN TO SCREEN ROOFTOP FEATURES FROM PUBLIC VIEW. THE AMOUNT OF ROOF AREA ENCLOSED BY ROOFTOP SCREENING MAY EXCEED THE MAXIMUM PERCENTAGE OF THE COMBINED COVERAGE OF ROOFTOP FEATURES IN 23.66.332.B.5 IN NO CIRCUMSTANCES SHALL THE HEIGHT OF THE ROOFTOP SCREENING EXCEED 15' ABOVE THE MAXIMUM HEIGHT LIMIT.	NO SCREENING PROPOSED.	
EXTERIOR BUILDING FINISHES ASIAN DESIGN CHARACTER DISTRICT.	23.66.336	A. …RETAIN AND ENHANCE THE VISUAL ORDER OF THE DISTRICT, WHICH IS CREATED BY EXISTING OLDER BUILDINGS THAT PROVIDE UNIQUE CHARACTER AND FORM THROUGH THEIR SUBTLE DETAILING AND QUARTER-BLOCK AND HALF-BLOCK COVERAGE. THROUGH SYMPATHETIC USE OF COLORS, MATERIAL, AND STYLE. EXTERIOR BUILDING FACADES SHALL BE OF A SCALE COMPATIBLE WITH SURROUNDING STRUCTURES. WINDOW PROPORTIONS, FLOOR HEIGHT, CORNICE LINE, STREET ELEVATIONS, AND OTHER ELEMENTS OF THE BUILDING FAÇADE SHALL RELATE TO THE SCALE OF THE EXISTING BUILDINGS IN THE IMMEDIATE AREA.		
		C. EXTERIOR BUILDING DESIGN OUTSIDE THE ASIAN DESIGN CHARACTER DISTRICT. OUTSIDE THE ASAIN DESIGN CHARACTER DISTRICT, EARTHEN COLORS AND MASONRY CONSTRUCTION WITH NONMETALLIC SURFACES ARE PREFERRED. CONCRETE CONSTRUCTION WILL ALSO BE PERMITTED IF TREATED IN A MANNER OR INCORPORATED INTO A DESIGN THAT PROVIDES VISUAL INTEREST AND AVOIDS LARGE UNBROKEN SURFACE AREAS.	EARTHEN COLORS AND MASONRY CONSTRUCTION/VENEER ARE PROVIDED AS PART OF THE EXTERIOR BUILDING DESIGN.	A3.01-A3.03
		B.4. SURFACES. TEXTURED CONCRETE, BRICK & WOOD SURFACES ARE PREFERRED OVER NON-TEXTURED SURFACES. RECESS AND VOIDS THAT BREAK UP MONOTONOUS SURFACE AREAS AND CREATE VISUAL RELIEF ARE ENCOURAGED. THE DESIGN AND LOCATION OF MECHANICAL EQUIPMENT VISIBLE FROM THE STREET MUST BE REVIEWED.	PROPOSED FACADES ON JACKSON ST. AND 10TH AVENUE S. ARE FIBER CEMENT PANELS. SUBJECT TO APPROVAL OF THE DIRECTOR OF NEIGHBORHOODS.	APPROVED ISRD FINAL DESIGN CERTIFICATE TO FOLLOW
		B.5. AWNINGS SHALL BE FUNCTIONAL, SURVING AS WEATHER PROTECTION FOR PEDESTRIANS AT STREET LEVEL. AWNINGS OVER SIDEWALKS SHALL OVERHANG THE SIDEWALK BY A MINIMUM OF 5'. ALL AWNINGS SHALL BE OF A DESIGN COMPATIBLE WITH THE AREA.	A CONTINUOUS CANOPY THAT IS GREATER THAN 5 FEET IS PROVIDED ON 10TH ST. AND FUNCTIONS AS WEATHER PROTECTION. THE LEVEL 2 STRUCTURE CANTILEVERS OVER LEVEL 1 ON THE JACKSON STREET FRONTAGE TO PROVIDE WEATHER PROTECTION.	A1.01, A2.01, A2.02, A5.30, A5.31
PARKING AND ACCESS	23.66.342	B.2 EXCEPTIONS TO PARKING QUANTITY. TO MITIGATE THE POTENTIAL IMPACTS OF REQUIRED ACCESSORY PARKING AND LOADING ON THE DISTRICT, THE DEPT OF NEIGHBORHOODS DIRECTOR, AFTER REVIEW AND RECCOMMENDATON BY THE SPECIAL REVIEW BOARD, MAY WAIVE OR REDUCE REQUIRED PARKING AND LOADING UNDER THE FOLLOWING CONDITIONS:	NO PARKING IS PROPOSED ON SITE. SUBJECT TO APPROVAL OF THE DIRECTOR OF THE DEPT OF NEIGHBORHOODS ON THE RECCOMMENDATION OF THE ISRD BOARD.	
BUILDING HEIGHT	23.86.006.E.3.a	HEIGHT MEASUREMENT TECHNIQUES IN DOWNTOWN ZONES… 1. DETERMINE THE MAJOR STREET LOT LINE. 2. DETERMINE THE SLOPE OF THE LOT ALONG THE ENTIRE LENGTH OF THE MAJOR STREET LOT LINE. 3. MAXIMUM HEIGHT SHALL BE MEASURED AS FOLLOWS: a. WHEN THE SLOPE OF THE MAJOR STREET LOT LINE IS LESS THAN OR EQUAL TO 7.5%, THE ELEVATION OF THE MAXIMUM HEIGHT SHALL BE DETERMINED BY ADD THE MAXIMUM PERMITTED HEIGHT TO THE EXISTING GRADE ELEVATION AT THE MIDPOINT ON THE MAJOR STREET LOT LINE.	SEE G2.20 FOR BUILDING HEIGHT CALCULATION	
STREETS AND SIDEWALKS	23.66.334	REVIEW BY THE SPECIAL REVIEW BOARD AND APPROVAL BY THE DIRECTOR OF NEIGHBORHOODS ARE REQUIRED BEFORE ANY CHANGES MAY BE MADE TO SIDEWALK PRISM LIGHTS, SIDEWALK FURNITURE, SIDEWALK WIDITHS, OR STREET PAVINGS AND CURBS. REVIEW BY THE SPECIAL REVIEW BOARD AND THE DIRECTOR OF NEIGHBORHOODS, WITH RESPECT TO THE INTERNATIONAL SPECIAL REVIEW DISTRICT GOALS AND OBJECTIVES IN SECTION 23.66.302 AS APPLICABLE, ARE REQUIRED FOR ANY STREET DESIGN CONCEPT PLAN PRIOR TO INCLUSION IN THE RIGHT-OF-WAY IMPROVEMENT MANUAL.	REVIEW BY ISRD TO FOLLOW	L1.01
GREEN FACTOR MEASUREMENT	23.86.019	DEVELOPMENT STANDARDS FOR CERTAIN AREAS REQUIRE LANDSCAPING THAT MEETS A MINIMUM GREEN FACTOR SCORE.		L6.01, L6.02
SEPA	SMC 25.05.675H	APPLICABLE SEPA POLICIES: SEPA REVIEW INCLUDES EVALUATION OF IMPACTS TO HISTORIC BUILDINGS, DISTRICTS, OR SITES OF ARCHAEOLOGICAL SIGNIFICANCE. SMC 25.05.675h ESTABLISHED BOTH POLICIES AND REVIEW CRITERIA WHEN NEW DEVELOPMENT THAT IS SUBJECT TO ENVIRONMENTAL REVIEW INCLUDES A PROPOSAL TO DEMOLISH OR SUBSTANTIALLY MODIFY A BUILDING THAT IS MORE THAN 50 YEARS OLD. IN ADDITION, IF A PROPOSAL THAT IS SUBJECT TO SEPA IS ACROSS THE STREET OR ADJACENT TO A DESIGNATED CITY OF SEATTLE LANDMARK, HISTORIC REVIEW IS REQUIRED.	SEPA THRESHOLD DETERMINATION IS NOT REQUIRED. PER SDCI, MUP IS NOT REQUIRED. THE SITE IS WITHIN THE INTERNATIONAL SPECIAL REVIEW DISTRICT (ISRD). THE EXISTING BUILDING TO BE DEMOLISHED IS >50 YEARS OLD, CONSTRUCTED IN 1962.	
	SMC 25.05.675.H.2.c	FOR PROJECTS INVOLVING STRUCTURES OR SITES WHICH ARE NOT YET DESIGNATED AS HISTORICAL LANDMARKS, BUT WHICH APPEAR TO MEET THE CRITERIA FOR DESIGNATION, THE DECISIONMAKER OR ANY INTERESTED PERSON MAY REFER THE SITE OR STRUCTURE TO THE LPB FOR CONSIDERATION. IF THE PROJECT IS REJECTED FOR CONSIDERATION, THE PROJECT SHALL NOT BE CONDITIONED OR DENIED FOR HISTORICAL PRESERVATION PURPOSES, EXCEPT PURSUANT TO PARAGRAPHS D OR E OF THIS SUBSECTION.		

LITTLE SAIGON LANDMARK
DEVELOPMENT DEPARTURES

	SUBJECT	CODE SECTION	REQUIRED	PROPOSED	SHEET REFERENCE
	COMMON RECREATION AREA	23.49.010.B	B. COMMON RECREATION AREA IS REQUIRED FOR ALL NEW DEVELOPMENT WITH MORE THAN 20 DWELLING UNITS… SHALL MEET THE FOLLOWING STANDARDS: 1. AN AREA EQUIVALENT TO 5% OF THE TOTAL GROSS FLOOR AREA IN RESIDENTIAL USE… SHALL BE PROVIDED AS COMMON RECREATION AREA. THE COMMON RECREATION AREA SHALL BE AVAILABLE TO ALL RESIDENTS AND MAY BE PROVIDED AT OR ABOVE GROUND LEVEL. 2. A MAXIMUM OF 50% OF THE COMMON RECREATION AREA MAY BE ENCLOSED. 3. THE MIN. HORIZ. DIM. FOR REQ. COMMON RECREATION AREAS SHALL BE 15', EXCEPT FOR OPEN SPACE PROVIDED AS A LANDSCAPED SETBACK AREA AT STREET LEVEL, WHICH SHALL HAVE A MIN. HORIZ. DIM. OF 10'. NO REQ. COMMON RECREATION AREA SHALL BE LESS THAN 225 SF. 4. COMMON RECREATION AREA THAT IS PROVIDED AS OPEN SPACE AT STREET LEVEL SHALL BE COUNTED AS TWICE THE ACTUAL AREA IN DETERMINING THE AMOUNT PROVIDED TO MEET THE… REQUIREMENT. B. IN IDM AND IDR ZONES, THE DIR. OF THE DEPT. OF NEIGHBORHOODS, ON RECCOMENDATION OF THE ISRD BOARD, MAY WAIVE THE REQUIREMENT FOR COMMON RECREATION AREA, PURSUANT TO THE CRITERIA OF SECTION 23.66.155, WAIVER OF COMMON AREA REQUIREMENTS.	REQUESTED DEPARTURE FROM COMMON RECREATION AREA REQUIREMENTS. COMMUNITY ROOM (821 SF) AND RESIDENTIAL LOUNGES (846 SF) ARE PROVIDED AS ENCLOSED COMMON RECREATION AREA AND COURTYARD (1,208 SF) IS PROVIDED AS OPEN COMMON RECREATION. REQUIRED AREA: (5% X 75,159 SF) = 3,758 SF PROPOSED AREA: (821 SF + 846 SF + 1,208 SF) = 2,875 SF (3.83% OF 75,159 SF) REDUCTION FROM REQUIRED: 23.4% (PER 23.66.155, IN FAVOR OF AN ADDITIONAL FLOOR OF HOUSING (12 UNITS)) NEARBY PARK SPACES AVAILABLE TO RESIDENTS: YESLER TERRACE CITY PARK, 0.1 MILE (1 BLOCK) LITTLE SAIGON LANDBANKED SITE PARK, 0.2 MILE (2 BLOCKS) HING HAY PARK, 0.3 MILE (4 BLOCKS)	
1	**DOWNTOWN MIXED RESIDENTIAL, MAXIMUM WIDTH**	23.49.164.D.2	D. FACADE WIDTH LIMITS AND SEPARATION REQUIREMENTS IN SOUTH DOWNTOWN. ON A LOT IN A DMR/C ZONE IN SOUTH DOWNTOWN, THE FOLLOWING STANDARDS APPLY: 2.FOR THE PORTION OF A STRUCTURE ABOVE 75 FEET IN HEIGHT, THE MAXIMUM WIDTH OF A STREET-FACING FACADE IS 120 FEET.	REQUESTED DEPARTURE FROM MAXIMUM WIDTH REQUIREMENTS FOR PORTIONS OF A STRUCTURE ABOVE 75 FEET IN HEIGHT. REQUIRED MAXIMUM FAÇADE WIDTH: 120'-0" PROPOSED FAÇADE WIDTH: 154'-4" REQUESTED ADDITIONAL WIDTH: 35'-0" (12%) RATIONALE FOR REQUESTED DEPARTURE: AS PART OF THE DESIGN PROCESS WITH "FRIENDS OF LITTLE SAIGON", IT WAS DETERMINED THAT A SECOND STORY WAS REQUIRED TO MAKE THE LOWER LEVEL COMMERCIAL FACILITY (PROPOSED AS A VIETNAMESE COMMUNITY CENTER) VIABLE. THE ADDITION OF THE ADDITIONAL STORY PUSHED THE BUILDING ABOVE THE 75FT HEIGHT DATUM. LOWERING THE COMMERCIAL FLOOR HEIGHT WOULD RESULT IN AN INFEASIBLE COMMUNITY CENTER. LIMITING THE BUILDING WIDTH OF THE UPPER FLOOR WOULD RESULT IN THE LOSS OF (5) PROPOSED LOW INCOME HOUSING UNITS, IMPOSING A SIGNIFICANT HARDSHIP ON THE PROJECT, IMPACTING POTENTIAL FINANCIAL VIABILITY, AND RESULTING IN FEWER LOW INCOME HOUSING UNITS FOR THE LITTLE SAIGON COMMUNITY. IN ALIGNMENT WITH THE CODE INTENT, THE WEST BUILDING FACADE DIVIDED INTO (2) SEGMENTS, SEPARATED BY A RECESS, TO REDUCE THE OVERALL CONTINUOUS WIDTH. THE PROPOSED UPPER FLOOR CONFIGURATION IS IN COMPLIANCE WITH ALL OTHER APPLICABLE CODE PROVISIONS: 1) THE MAXIMUM BUILDING HEIGHT IS INCREASED TO 85'-0" PER 23.49.008.F. FOR RESIDENTIAL USES; 2) SBC 510.10 INCREASES THE NUMBER OF STORIES OF TYPE IIIA WOOD CONSTRUCTION FROM (5) TO (6) FOR RESIDENTIAL USES; 3) THE PROPOSED HEIGHT OF THE HIGHEST OCCUPIED FLOOR IS LESS THAN 75'-0" ABOVE THE LOWEST GRADE FOR FIRE DEPARTMENT VEHICLE…	G2.11, A2.08, A3.01



1 SMC - WEST ELEVATION - FACADE WIDTH DEPARTURE
1/16" = 1'-0"

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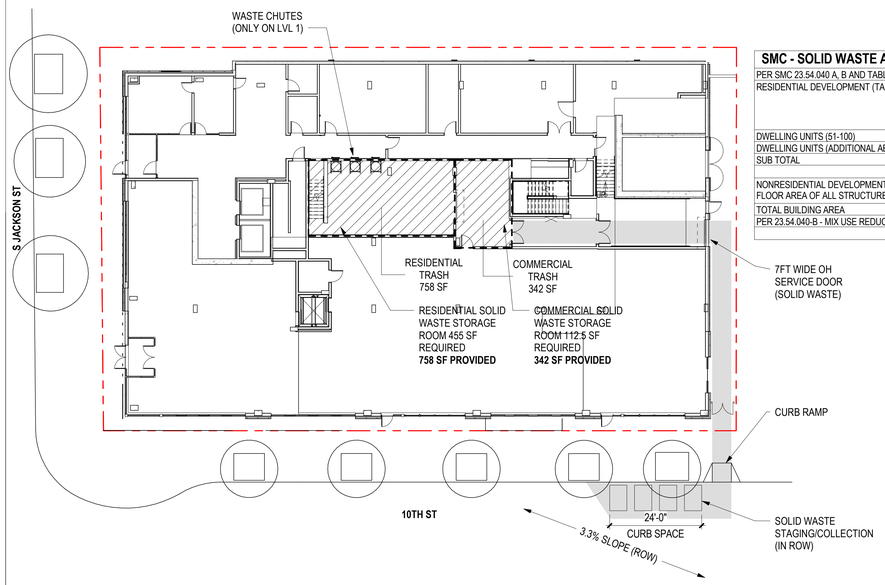
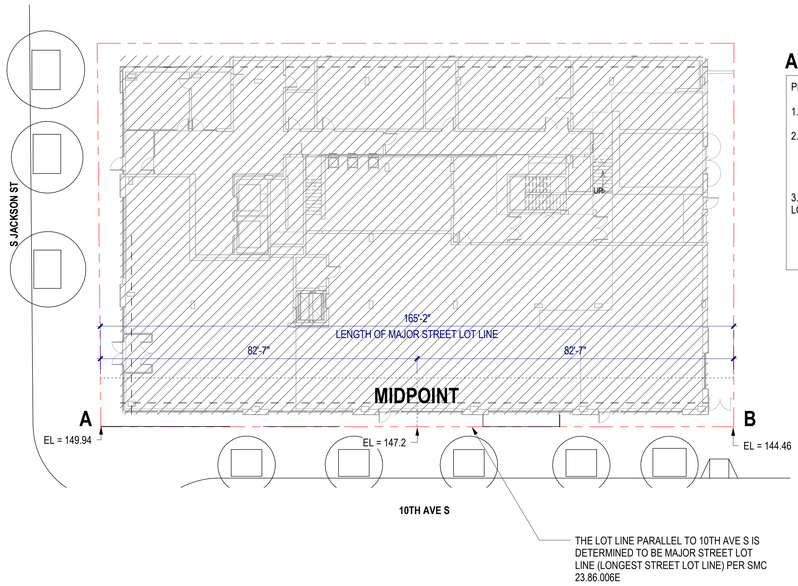


SMC - SOLID WASTE AND RECYCLABLE MATERIAL STORAGE AND ACCESS

PER SMC 23.54.040 A, B AND TABLE A RESIDENTIAL DEVELOPMENT (TABLE A)	NUMBER OF UNITS	AREA / AREA FACTOR (SQ FT)	MINIMUM AREA FOR SHARED STORAGE SPACE
DWELLING UNITS (51-100)	50	375	375
DWELLING UNITS (ADDITIONAL ABOVE 50)	20	4	80
SUB TOTAL	70		455
		RESIDENTIAL TOTAL	455
NONRESIDENTIAL DEVELOPMENT(TABLE A) BASED ON GROSS FLOOR AREA OF ALL STRUCTURE	TOTAL AREA		
TOTAL BUILDING AREA	85,709	225	
PER 23.54.040-B - MIX USE REDUCTION		0.5	112.5
TOTAL MINIMUM REQUIRED AREA (SQ FT)			**568**

1 SMC - SOLID WASTE STORAGE - LEVEL 01/GRADE

1/16" = 1'-0" | 1/00-PRES_05



AVERAGE GRADE PLANE CALC

PER SMC 23.85.006E

1. DETERMINE MAJOR STREET LOT LINE

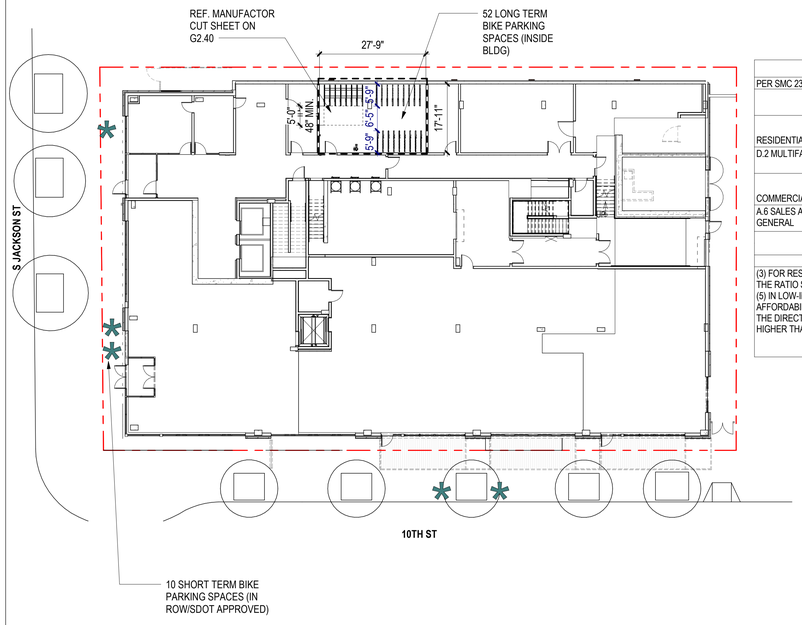
2. DETERMINE SLOPE OF MAJOR STREET LOT LINE
   (A-B) / LENGTH OF MAJOR STREET LOT LINE
   (149.94-144.46) / 165.16 = 0.03
   3% SLOPE

3. 3% < 7.5% SO DETERMINE MIDPOINT OF MAJOR STREET LOT LINE
   (A+B) / 2
   (149.94+144.45) / 2 = 147.2

   AVERAGE GRADE PLANE = 147.2'

3 LEVEL 01 - AVERAGE GRADE PLANE

1/16" = 1'-0" | 1/00-PRES_05



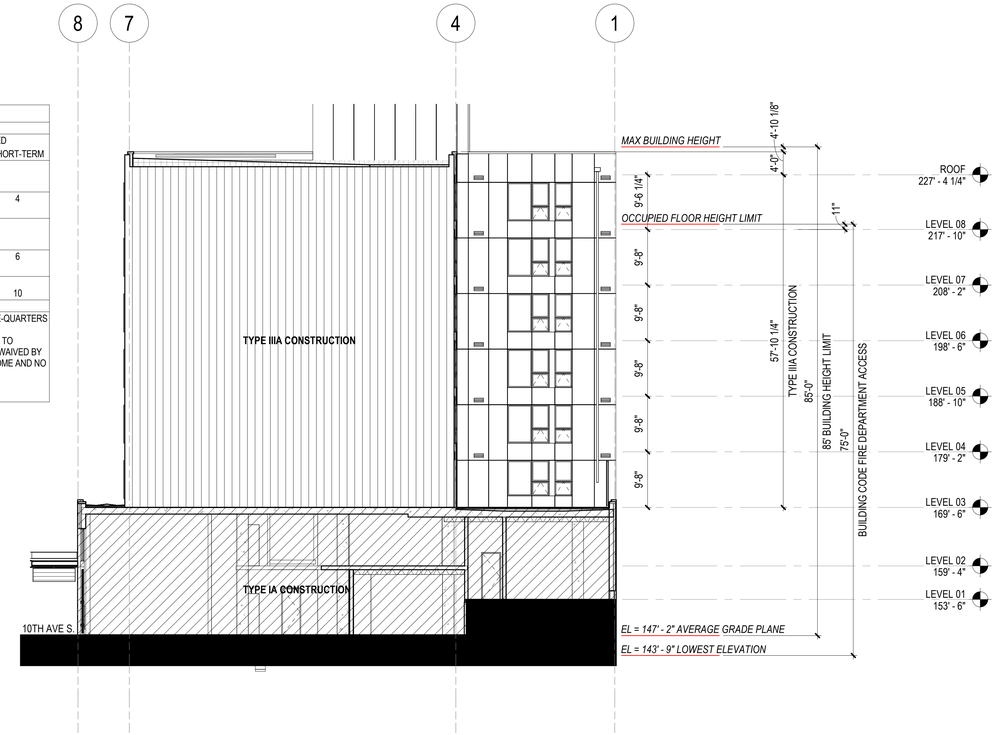
SMC - BICYCLE PARKING - TABLE D

PER SMC 23.54.015.K - TABLE D	REQUIREMENTS			REQUIRED		PROVIDED	
USE	LONG-TERM	SHORT-TERM	USE AREA/UNITS	LONG-TERM	SHORT-TERM	LONG-TERM	SHORT-TERM
RESIDENTIAL USES (3)							
D.2 MULTIFAMILY STRUCTURES	1 PER DWELLING	1 PER 20 DWELLING	70 UNITS	52	4	52	4
COMMERCIAL USES							
A.6 SALES AND SERVICES, GENERAL	1 PER 4,000SF	1 PER 2,000SF	10,550 SF	0	6	0	6
			SUBTOTAL	52	10	52	10
			TOTAL BICYCLE PARKING	**62**		**62**	

(3) FOR RESIDENTIAL USES, AFTER THE FIRST 50 SPACES FOR BICYCLES ARE PROVIDED, ADDITIONAL SPACES ARE REQUIRED AT THREE-QUARTERS THE RATIO SHOWN IN THIS TABLE D FOR 23.54.015.
(5) IN LOW-INCOME HOUSING, THERE IS NO MINIMUM REQUIRED LONG-TERM BICYCLE PARKING REQUIREMENT FOR EACH UNIT SUBJECT TO AFFORDABILITY LIMITS NO HIGHER THAN 30 PERCENT OF MEDIAN INCOME AND LONG-TERM BICYCLE PARKING REQUIREMENTS MAY BE WAIVED BY THE DIRECTOR AS A TYPE I DECISION FOR EACH UNIT SUBJECT TO AFFORDABILITY LIMITS GREATER THAN 30 PERCENT OF MEDIAN INCOME AND NO HIGHER THAN 80 PERCENT OF MEDIAN INCOME IF A REASONABLE ALTERNATIVE IS PROVIDED.

2 SMC - BIKE PARKING -LEVEL 01/GRADE

1/16" = 1'-0" | 1/00-PRES_05



4 BUILDING SECTION - AVERAGE GRADE PLANE

3/32" = 1'-0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
LAND USE DIAGRAMS

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
G2.20

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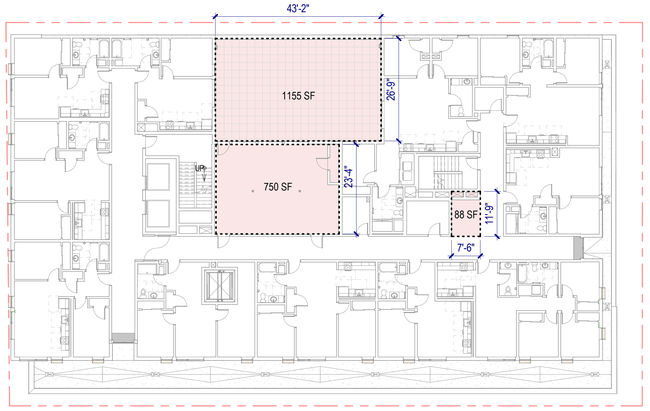
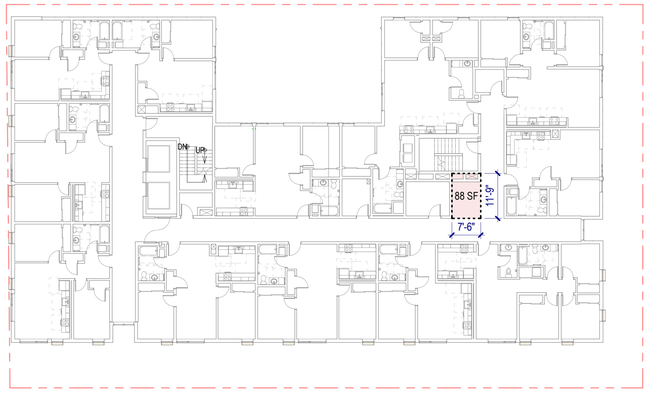
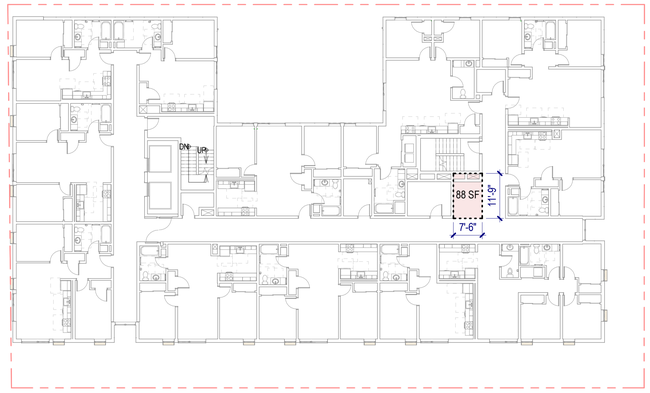


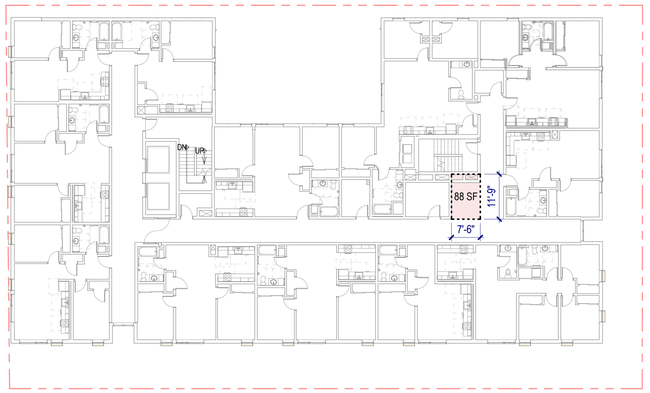
1 LEVEL 03 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05



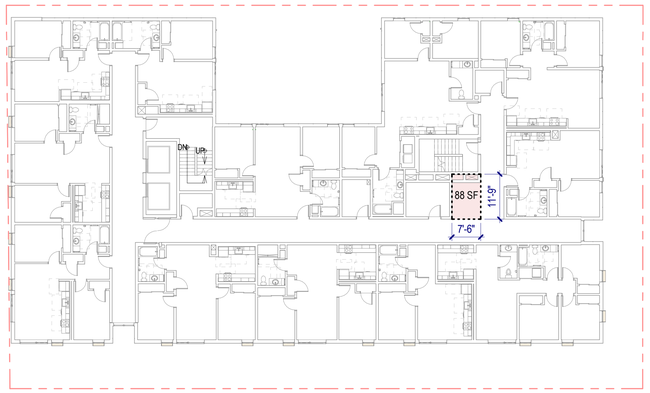
2 LEVEL 04 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05



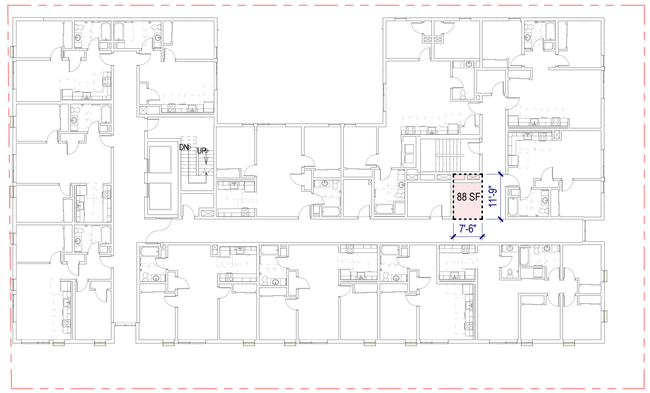
3 LEVEL 05 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05



4 LEVEL 06 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05



5 LEVEL 07 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05



6 LEVEL 08 - COMMON RECREATION
1/16" = 1'-0" | 1/00-PRES_05

COMMON RECREATION AREAS	
Level	Area
LEVEL 03	750 SF
LEVEL 03	88 SF
LEVEL 03	1155 SF
LEVEL 03	1994 SF
LEVEL 04	88 SF
LEVEL 04	88 SF
LEVEL 05	88 SF
LEVEL 05	88 SF
LEVEL 06	88 SF
LEVEL 06	88 SF
LEVEL 07	88 SF
LEVEL 07	88 SF
LEVEL 08	88 SF
LEVEL 08	88 SF
TOTAL	2435 SF

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PROJECT
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LOCATION
1001 S Jackson
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98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
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PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
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TITLE
COMMON RECREATION AREAS

PROJECT NO
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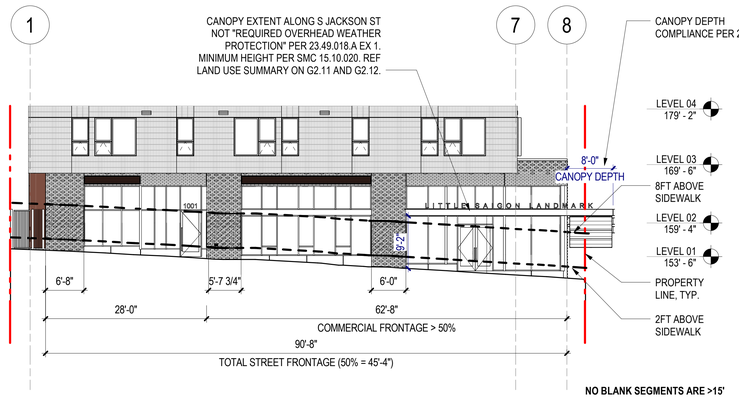
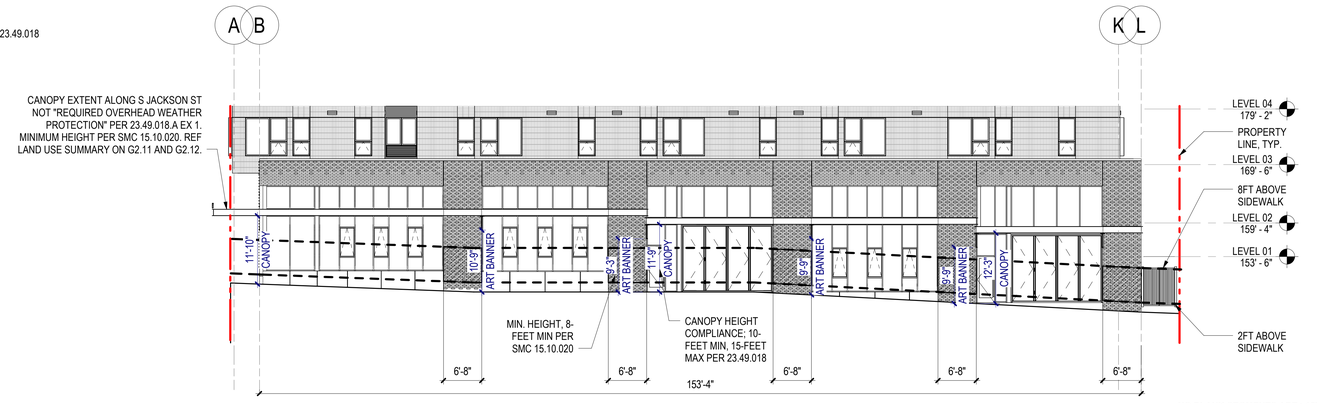


1 SMC - NORTH ELEVATION - BLANK FACADE

3/32" = 1'-0"



3 SMC - WEST ELEVATION - BLANK FACADE

3/32" = 1'-0"

TRANSPARENCY ZONE AREA: 544.92 SF
TRANSPARENCY AREA TOTAL: 424.40 SF
TRANSPARENCY PERCENTAGE: 77.9%
MINIMUM FACADE TRANSPARENCY PERCENTAGE: 60%

2 SMC - NORTH ELEVATION - TRANSPARENCY

3/32" = 1'-0"

TRANSPARENCY ZONE AREA: 920.70 SF
TRANSPARENCY AREA TOTAL: 637.64 SF
TRANSPARENCY PERCENTAGE: 69.3%
MINIMUM FACADE TRANSPARENCY PERCENTAGE: 30%

4 SMC - WEST ELEVATION - TRANSPARENCY

3/32" = 1'-0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
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DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
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PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
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STREET LEVEL STANDARDS

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09/10/24
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Seattle Public Utilities

March 11, 2024

Michael O'Meara
Mithum

Dear Michael,

Thank you for submitting to SPU the solid waste service plans for **1001 S. Jackson St.,** subject to review by the Seattle Department of Construction and Inspections (SDCI) as Permit **# 3041180-LU.**

SPU has reviewed your solid waste plans and approves the following conditions:

71 apartments + 3,498 ft² office + 6,769 ft² retail

- Building staff will stage all containers in the street ROW along 10th Ave S. per the attached site plan.
- Developer agreed to include on-floor solid waste access to all three waste streams – garbage, recycle, and food+yard via chutes.
- SDOT-approved 5' waste access ramp (WAR) for solid waste.

Residential Service:

- Recycle: 3 — 4 cubic yards dumpsters collected 1x/week
- Garbage: 2 — 4 cubic yards dumpsters collected 1x/week
- Food+yard: 1 — 2 cubic yards dumpster collected 1x/week

Commercial Service:

- Recycle: 1 — 4 cubic yards dumpster collected 1-2x/week
- Garbage: 1 — 4 cubic yards dumpster 1-2x/week
- Food+yard: 1 — 2 cubic yards dumpster collected 1x/week

Please work with the assigned SDCI zoning reviewer to adopt this plan. If the attached drawings differ from the MUP drawings, you will need to update your application to consistently reflect the proposal.

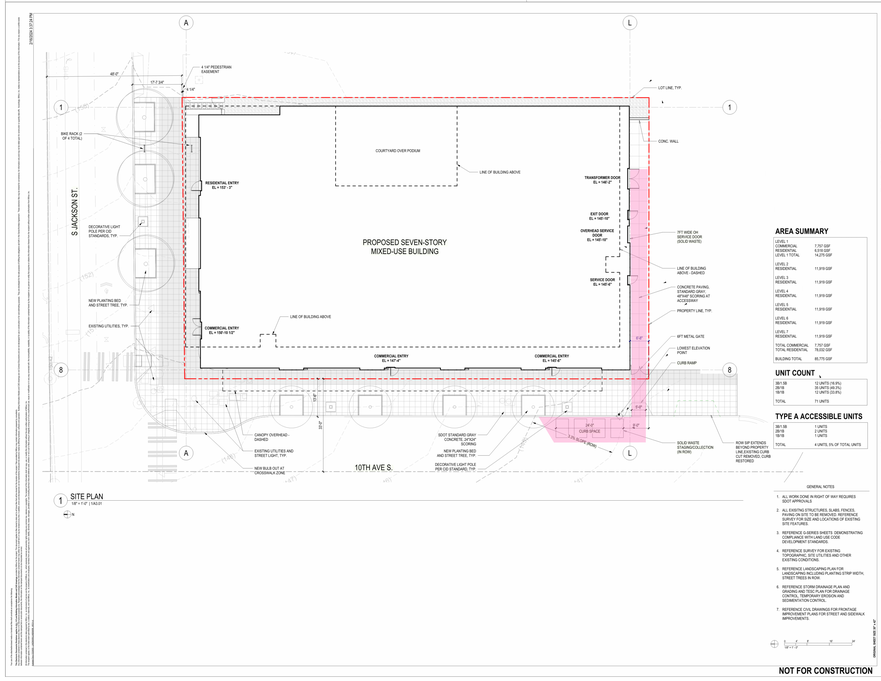
Call SPU Customer Service at 206.684.3000 one month prior to occupancy to request residential solid waste services.

Call Recology at 206.250.7500 one month prior to occupancy to request commercial solid waste services.

Sincerely,

Adam Maurer
Seattle Public Utilities – Solid Waste Division
adam.maurer@seattle.gov

700 Fifth Avenue | PO Box 34018 | Seattle, WA 98124-4018 | 206-684-3000 | seattle.gov/util



1 SITE PLAN
1/8" = 1'-0" 1" DIELS7

AREA SUMMARY

LEVEL 1 COMMERCIAL	7,757 GSF
LEVEL 1 RESIDENTIAL	6,518 GSF
LEVEL 1 TOTAL	14,275 GSF
LEVEL 2 RESIDENTIAL	11,910 GSF
LEVEL 3 RESIDENTIAL	11,910 GSF
LEVEL 4 RESIDENTIAL	11,910 GSF
LEVEL 5 RESIDENTIAL	11,910 GSF
LEVEL 6 RESIDENTIAL	11,910 GSF
LEVEL 7 RESIDENTIAL	11,910 GSF
TOTAL COMMERCIAL	7,757 GSF
TOTAL RESIDENTIAL	78,010 GSF
BUILDING TOTAL	85,775 GSF

UNIT COUNT

SM / M	12 UNITS (16.9%)
2M / B	35 UNITS (49.3%)
1M / B	12 UNITS (23.9%)
TOTAL	71 UNITS

TYPE A ACCESSIBLE UNITS

SM / M	1 UNITS
2M / B	2 UNITS
1M / B	1 UNITS
TOTAL	4 UNITS, 5% OF TOTAL UNITS

GENERAL NOTES

1. ALL ROW DONE IN RIGHT OF WAY REQUIRES SDOT APPROVALS
2. ALL EXISTING STRUCTURES, SLABS, FENCES, PAVING ON SITE TO BE REMOVED. REFERENCE SURVEY FOR NOTES AND LOCATIONS OF EXISTING SITE FEATURES.
3. REFERENCE G-SERIES SHEETS DEMONSTRATING COMPLIANCE WITH LAND USE CODE DEVELOPMENT STANDARDS
4. REFERENCE SURVEY FOR EXISTING TOPOGRAPHIC, SITE UTILITIES AND OTHER EXISTING CONDITIONS.
5. REFERENCE LANDSCAPING PLAN FOR STREET TREE AND PLANTING STRIP WIDTH, STREET TREES IN ROW.
6. REFERENCE STORM DRAINAGE PLAN AND GRADING AND TESC PLAN FOR DRAINAGE CONTROL, TEMPORARY EROSION AND SEDIMENTATION CONTROL.
7. REFERENCE CIVIL DRAWINGS FOR FRONTAGE IMPROVEMENTS AND FOR STREET AND SIDEWALK IMPROVEMENTS.

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PROJECT
SCIDpda / Friends of Little Saigon

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

SITE PLAN

2324000

02/07/25

A1.01
DESIGN DEVELOPMENT
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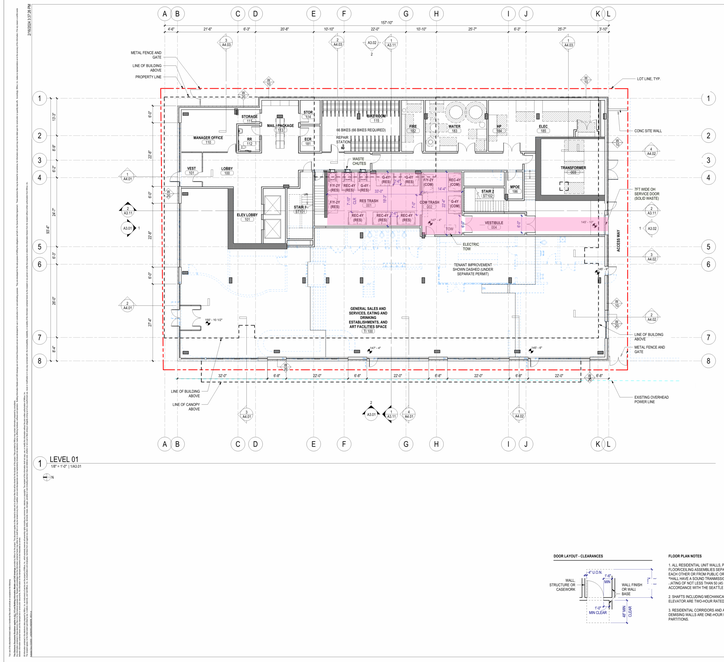

1 LEVEL 01
1/8" = 1'-0" 1" DIELS7

DOOR LAYOUT - CLEARANCES

FLOOR PLAN NOTES

1. ALL RESIDENTIAL UNIT WALLS, PARTITIONS, AND FLOOR/CEILING ASSEMBLIES SEPARATING UNITS FROM EACH OTHER OR FROM PUBLIC OR SERVICE AREAS SHALL HAVE A SOUND TRANSMISSION CLASS (STC) RATING OF NOT LESS THAN 50 (45 IF FIELD TESTED) IN ACCORDANCE WITH THE SEATTLE BUILDING CODE.
2. SHAFTS INCLUDING MECHANICAL, STAIR AND ELEVATOR ARE TWO-HOUR RATED FIRE BARRIERS.
3. RESIDENTIAL CORRIDORS AND APARTMENT DEMISING WALLS ARE ONE-HOUR RATED FIRE PARTITIONS.
4. LEVEL 2 BEARING WALLS SUPPORTING LEVEL 3 FLOOR FRAMING ARE TWO-HOUR FIRE RESISTANCE RATED.
5. LEVEL 3 FLOOR FRAMING IS A HORIZONTAL FLOOR/CEILING ASSEMBLY WITH A TWO-HOUR FIRE RESISTANCE RATING.
6. ALL EXTERIOR WALLS ARE NON-COMBUSTIBLE.
7. ALL EXTERIOR BEARING WALLS ARE TWO-HOUR FIRE RESISTANCE RATED. ALL INTERIOR BEARING WALLS ARE ONE-HOUR FIRE RESISTANCE RATED MINIMUM.

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

LEVEL 01 LOBBY

2324000

02/07/25

A2.01
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PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
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TITLE
SPU SOLID WASTE APPROVAL

PROJECT NO.
2324000

DATE
02/07/25

SHEET NUMBER
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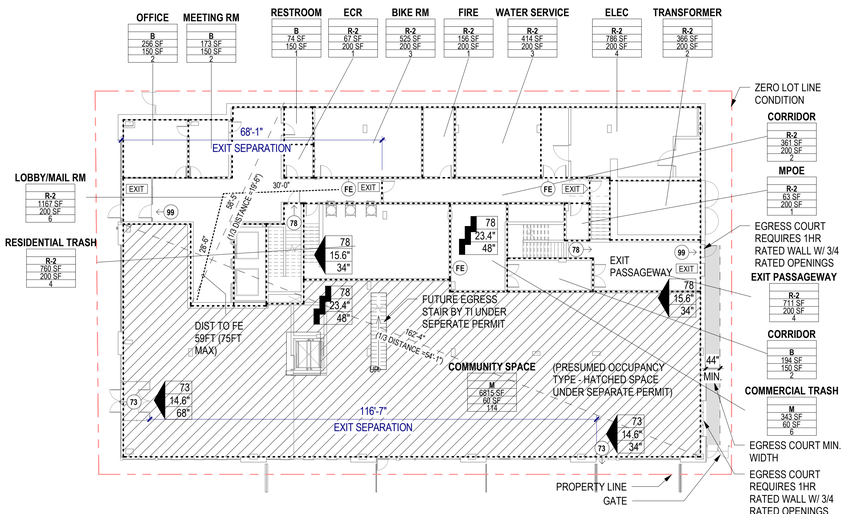
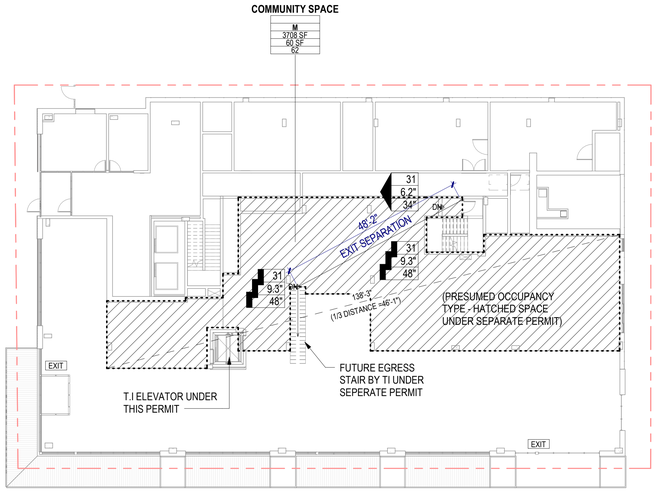


Level	Name	OCCUPANCY USE GROUP	OCCUPANT LOAD FACTOR	Area	Comments	NUMBER OF OCCUPANT
LEVEL 01	OFFICE	B	150 SF	256 SF		2
LEVEL 01	MEETING RM	B	150 SF	173 SF		2
LEVEL 01	RESTROOM	B	150 SF	74 SF		1
LEVEL 01	ECR	R-2	200 SF	67 SF	ACCESSORY	1
LEVEL 01	BIKE RM	R-2	200 SF	525 SF	ACCESSORY	2
LEVEL 01	FIRE	R-2	200 SF	156 SF	ACCESSORY	1
LEVEL 01	WATER SERVICE	R-2	200 SF	414 SF	ACCESSORY	2
LEVEL 01	ELEC	R-2	200 SF	786 SF	ACCESSORY	3
LEVEL 01	TRANSFORMER	R-2	200 SF	366 SF	ACCESSORY	2
LEVEL 01	EXIT PASSAGEWAY	R-2	200 SF	711 SF		5
LEVEL 01	MPOE	R-2	200 SF	63 SF	ACCESSORY	1
LEVEL 01	CORRIDOR	B	150 SF	194 SF		2
LEVEL 01	COMMERCIAL TRASH	M	60 SF	343 SF	ACCESSORY	6
LEVEL 01	RESIDENTIAL TRASH	R-2	200 SF	760 SF	ACCESSORY	4
LEVEL 01	LOBBY/MAIL RM	R-2	200 SF	1167 SF		6
LEVEL 01	COMMUNITY SPACE	M	60 SF	6815 SF		114
LEVEL 01	CORRIDOR	R-2	200 SF	361 SF	ACCESSORY	2
Grand total: 17						156

1 LEVEL 01 - OCCUPANCY AND EGRESS DIAGRAM

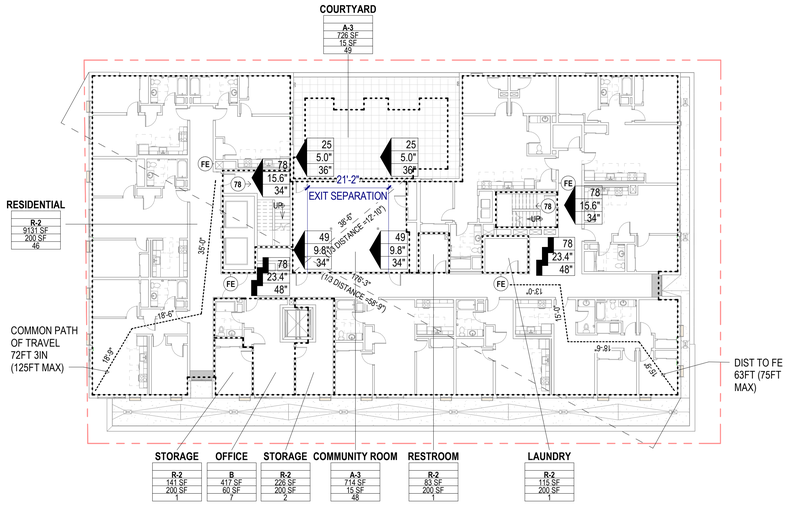
1/16" = 1'-0" | 1/00-PRES_05



Level	Name	OCCUPANCY USE GROUP	OCCUPANT LOAD FACTOR	Area	Comments	NUMBER OF OCCUPANT
LEVEL 02	COMMUNITY SPACE	M	60 SF	3708 SF		62
Grand total: 1						62

2 LEVEL 02 - OCCUPANCY AND EGRESS DIAGRAM

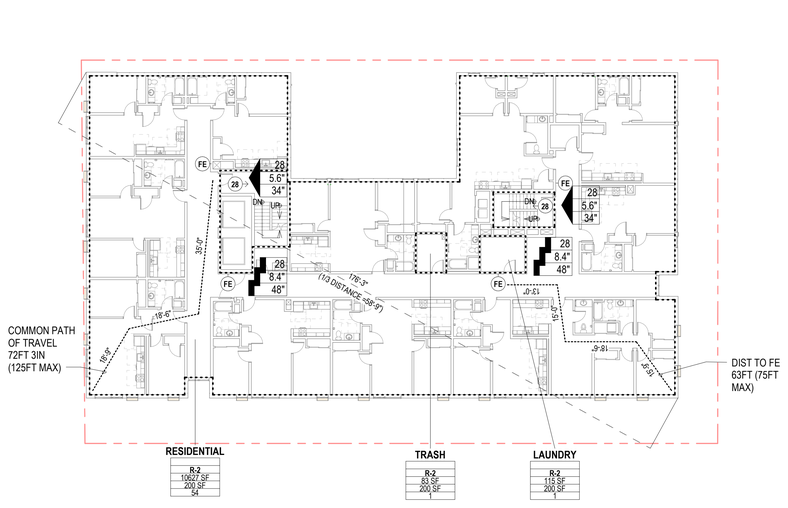
1/16" = 1'-0" | 1/00-PRES_05



Level	Name	OCCUPANCY USE GROUP	OCCUPANT LOAD FACTOR	Area	Comments	NUMBER OF OCCUPANT
LEVEL 03	RESIDENTIAL	R-2	200 SF	9131 SF		46
LEVEL 03	COMMUNITY ROOM	A-3	15 SF	714 SF		48
LEVEL 03	RESTROOM	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 03	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1
LEVEL 03	COURTYARD	A-3	15 SF	726 SF		49
LEVEL 03	STORAGE	R-2	200 SF	141 SF	ACCESSORY	1
LEVEL 03	OFFICE	B	60 SF	417 SF		7
LEVEL 03	STORAGE	R-2	200 SF	226 SF	ACCESSORY	2
Grand total: 8						155

3 LEVEL 03 - OCCUPANCY AND EGRESS DIAGRAM

1/16" = 1'-0" | 1/00-PRES_05



Level	Name	OCCUPANCY USE GROUP	OCCUPANT LOAD FACTOR	Area	Comments	NUMBER OF OCCUPANT
LEVEL 04	RESIDENTIAL	R-2	200 SF	10627 SF		53
LEVEL 04	TRASH	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 04	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1
LEVEL 04: 3						55
LEVEL 05	RESIDENTIAL	R-2	200 SF	10630 SF		53
LEVEL 05	TRASH	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 05	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1
LEVEL 05: 3						55
LEVEL 06	RESIDENTIAL	R-2	200 SF	10629 SF		53
LEVEL 06	TRASH	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 06	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1

Level	Name	OCCUPANCY USE GROUP	OCCUPANT LOAD FACTOR	Area	Comments	NUMBER OF OCCUPANT
LEVEL 06: 3						55
LEVEL 07	RESIDENTIAL	R-2	200 SF	10626 SF		53
LEVEL 07	TRASH	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 07	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1
LEVEL 07: 3						55
LEVEL 08	RESIDENTIAL	R-2	200 SF	10630 SF		53
LEVEL 08	TRASH	R-2	200 SF	83 SF	ACCESSORY	1
LEVEL 08	LAUNDRY	R-2	200 SF	115 SF	ACCESSORY	1
LEVEL 08: 3						55
Grand total: 15						275

4 LEVEL 04-08 - OCCUPANCY AND EGRESS DIAGRAM

1/16" = 1'-0" | 1/00-PRES_05

OCCUPANCY AND EGRESS LEGEND

INGRESS EXIT SYMBOL:

- 200 / 40" / 0" — CALCULATED EXIT OCCUPANT LOAD; MINIMUM CALCULATED DOOR EXIT WIDTH; DOOR EXIT WIDTH PROVIDED
- 200 / 60" / 0" — CALCULATED EXIT OCCUPANT LOAD; MINIMUM CALCULATED STAIR EXIT WIDTH; STAIR EXIT WIDTH PROVIDED

EGRESS EXIT SYMBOL:

- 200 / 40.0" / 0" — CALCULATED EXIT OCCUPANT LOAD; MINIMUM CALCULATED EXIT WIDTH; EXIT WIDTH PROVIDED

ACCESSIBLE CLEARANCES

FUNCTION
INDEX
USE GROUP
AREA (SF)
SF/OCC
OCCUPANTS

- SPACE/AREA FUNCTION
- TABULAR INDEX (WHERE USED)
- SBC CHAPTER 3 USE AND OCCUPANCY CLASSIFICATION
- AREA (SF); GROSS/NET PER SBC 1004.1.2T
- AREA/OCCUPANT; MAXIMUM FLOOR AREA ALLOWANCE PER SBC 1004.1.2T
- CALCULATED NUMBER OF OCCUPANTS

12'-6" (1/3 DISTANCE =4'-2") — EXIT ACCESS DIAGONAL DISTANCE CALCULATION

EGRESS PATH; TRAVEL DISTANCE, COMMON PATH OF TRAVEL

X — ACCUMULATED OCCUPANT COUNT

FE — FIRE EXTINGUISHER/CABINET

EXIT — EXIT SIGN / SYMBOL

DIM PT — WORK STARTING / DIMENSION POINT

ACCESSIBLE: RESIDENTIAL UNIT, PARKING STALL AND ENTRY / EXIT

MITHUN

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Culver City, CA 90232 / 323.937.2150

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
SBC - OCCUPANCY AND EGRESS

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
G3.20

90% CD SET

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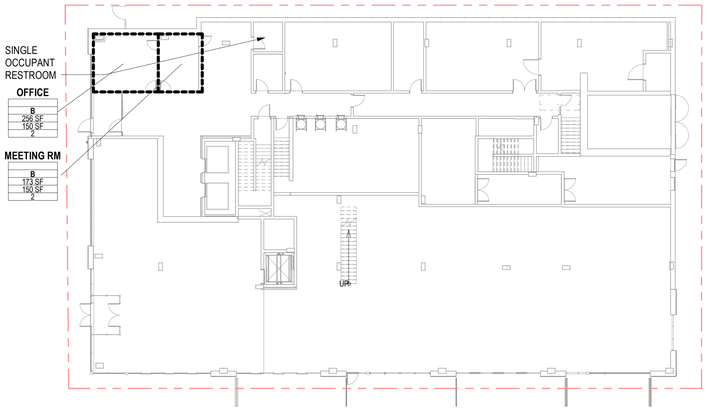


2 LEVEL 01 - PLUMBING FIXTURES

1/16" = 1'-0" | 1/00-PRES_05

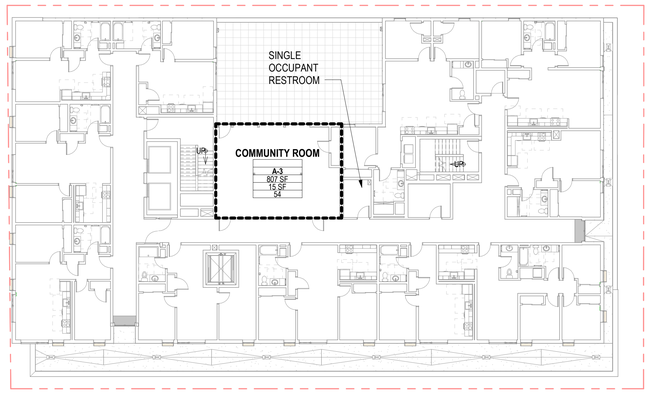
SBC - LEVEL 01 FIXTURE COUNT

SBC - CHAPTER 29 TABLE 2902.1

ROOM/SPACE	AREA(SF)	USE GROUP	NUMBER OF OCCUPANTS			WATER CLOSET FACTOR		WATER CLOSET REQUIRED		LAVATORY FACTOR	LAVATORY REQUIRED		PROPOSED NUMBER OF FIXTURES
			TOTAL	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE		MALE	FEMALE	
OFFICE	256	B	2	1	1	1 PER 25	1 PER 25	1	1	1 PER 40	1	1	(2) SINGLE OCCUPANT RESTROOMS; 2 WATER CLOSETS, 2 LAVATORIES
MEETING RM	173	B	2	1	1	1 PER 25	1 PER 25	1	1	1 PER 40	1	1	(2) SINGLE OCCUPANT RESTROOMS; 2 WATER CLOSETS, 2 LAVATORIES

SECTION 2902.1 EXCEPTION: PLUMBING FIXTURES NEED NOT BE PROVIDED FOR THE FOLLOWING: 3. BUILDING ENTY LOBBIES ACCESSORY TO AND USED ONLY FOR CIRULATION IN GROUP B OFFICE AND GROUP R-2 RESIDENTIAL OCCUPANCIES.

SECTION 2902.2 EXCEPTION: 4. SEPARATE FACILITIES SHALL NOT BE REQUIRED IN BUSINESS OCCUPANCIES IN WHICH THE MAXIMUM OCCUPANT LOAD IS 25 OR FEWER.



3 LEVEL 03 - PLUMBING FIXTURES

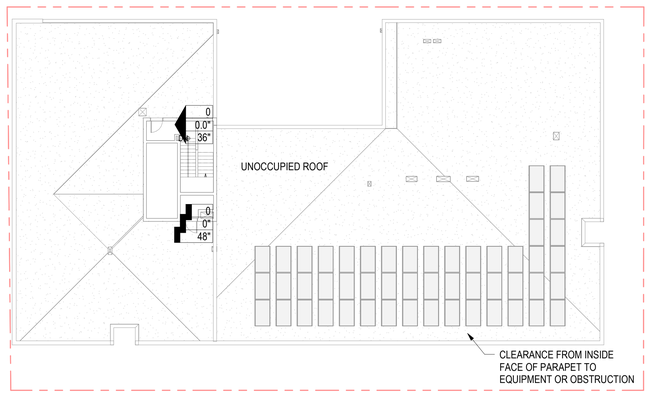
1/16" = 1'-0" | 1/00-PRES_05

SBC - LEVEL 02 FIXTURE COUNT

SBC - CHAPTER 29 TABLE 2902.1

ROOM/SPACE	AREA(SF)	USE GROUP	NUMBER OF OCCUPANTS			WATER CLOSET FACTOR		WATER CLOSET REQUIRED		LAVATORY FACTOR	LAVATORY REQUIRED		PROPOSED NUMBER OF FIXTURES
			TOTAL	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE		MALE	FEMALE	
COMMUNITY ROOM	807	A-3	54	27	27	1 PER 125	1 PER 65	1	1	1 PER 200	1	1	(2) SINGLE OCCUPANT RESTROOMS; 2 WATER CLOSETS, 2 LAVATORIES

NOTE: THE TWO PROPOSED FIXTURES FOR THE COMMUNITY ROOM - (1) SINGLE OCCUPANT RESTROOM IS LOCATION ON LEVEL 01 AND (1) SINGLE OCCUPANT RESTROOM IS LOCATED ON LEVEL 02.



1 ROOF OCCUPANCY AND EGRESS DIAGRAM

1/16" = 1'-0" | 1/00-PRES_05

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mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
SBC - OCCUPANCY AND EGRESS & FIXTURES

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
G3.21

ORIGINAL SHEET SIZE 36" x 42"

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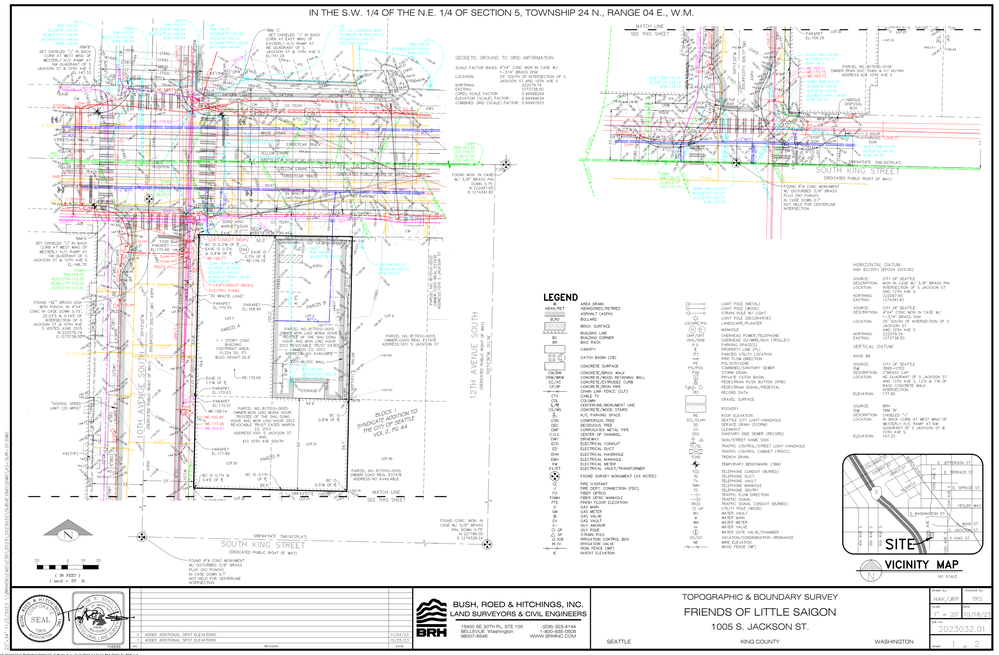
IN THE S.W. 1/4 OF THE N.E. 1/4 OF SECTION 5, TOWNSHIP 24 N., RANGE 04 E., W.M.



BUSH, ROED & HITCHINGS, INC.
LAND SURVEYORS & CIVIL ENGINEERS
15400 SE 30TH PL, STE 100 (206) 323-4144
BELLEVUE, Washington 1-800-935-0506
98007-6546 WWW.BHHINC.COM

TOPOGRAPHIC & BOUNDARY SURVEY
FRIENDS OF LITTLE SAIGON
1005 S. JACKSON ST.
SEATTLE KING COUNTY WASHINGTON

Date F.I.	Checked by
11/AM/JRT	TBG
Scale	Date
1" = 20'	10/18/23
Job no.	
2023032.01	
Sheet	
1 OF 2	

NO.	DATE	REVISION
1	10/30/23	ADDED ADDITIONAL SPOT ELEVATIONS
2	10/30/23	ADDED ADDITIONAL SPOT ELEVATIONS

IN THE S.W. 1/4 OF THE N.E. 1/4 OF SECTION 5, TOWNSHIP 24 N., RANGE 04 E., W.M.

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2 OF 2	

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1001 S Jackson
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98104

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PARTNER IN CHARGE
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DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
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TITLE
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PROJECT NO.
2324000
DATE
10/29/24
SHEET NUMBER
1/2 & 2/2

90% CD SET

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ORIGINAL SHEET SIZE 30" x 42"

General Demolition Notes

1. EXISTING UTILITIES AND UNDERGROUND STRUCTURES SHOWN ON THE PLAN ARE BASED UPON THE BEST AVAILABLE PUBLIC RECORDS AND/OR PRIVATE RECORDS AS SUPPLIED BY THE PROJECT OWNER AND/OR DATA OBTAINED VERBALLY FROM OWNERS OR OFFICIALS ASSOCIATED WITH THE PARTICULAR UTILITY. NEITHER THE OWNER NOR THE ENGINEER GUARANTEE ACCURACY OR COMPLETENESS OTHER UNDERGROUND FACILITIES NOT SHOWN ON THE DRAWINGS OF THIS INFORMATION AND ASSUME NO RESPONSIBILITY FOR OF THE WORK. ALL INVERT ELEVATIONS SHOWN ON THE DRAWINGS SHALL IMPROPER LOCATIONS ON THE CONSTRUCTION PLANS. MAY BE ENCOUNTERED DURING THE COURSE BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. IF CHANGED CONDITIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL NOTIFY THE ENGINEER PROMPTLY OF (1) PRE-EXISTING SUBSURFACE CONDITIONS DIFFERING FROM THOSE INDICATED IN THE PLANS, OR (2) PRE-EXISTING UNKNOWN SUBSURFACE CONDITIONS, OR AN UNUSUAL NATURE, DIFFERING MATERIALLY FROM THOSE ORIGINALLY ENCOUNTERED AND GENERALLY RECOGNIZED AS INHERENT IN WORK OF THE CHARACTER PROVIDED FOR IN THE CONTRACT. THE CONTRACTOR AND OR OWNER SHALL MAKE NO CLAIMS TO THE ENGINEER FOR RECOMPENSATION FOR EXTRA WORK RESULTING FROM CHANGED CONDITIONS UNLESS THE ENGINEER HAS APPROVED THE WORK IN WRITING.
3. CONTRACTOR SHALL CALL THE UTILITIES UNDERGROUND LOCATION CENTER FOR FIELD LOCATION OF ALL UTILITIES BEGIN EXCAVATION UNTIL ALL KNOWN UNDERGROUND FACILITIES IN THE VICINITY OF THE PROPOSED WORK HAVE BEEN LOCATED AND AND SHALL NOT MARKED. IF THE UTILITY IS NOT A SUBSCRIBER OF THE UNDERGROUND LOCATION CENTER THEN THE CONTRACTOR SHALL GIVE NOTICE TO THAT UTILITY.
4. THE CONTRACTOR IS RESPONSIBLE FOR REVIEW OF ALL UTILITY PURVEYOR, AND CITY OR STATE RECORDS RELATIVE TO THE EXISTING UNDERGROUND UTILITIES. THE CONTRACTOR IS RESPONSIBLE FOR AVOIDING DAMAGE TO THESE FACILITIES AND SHALL RESTORE ALL UTILITIES AT CONTRACTOR'S OWN EXPENSE.
5. VERIFY THAT ALL UTILITY SERVICES TO BE DEMOLISHED HAVE BEEN DISCONNECTED.
6. ERECT BARRIERS, SHORING AND THE LIKE TO PROTECT PERSONNEL, CONSTRUCTION AND VEGETATION TO REMAIN, COMPLY WITH ALL STATE AND LOCAL AGENCY REQUIREMENTS.
7. DO NOT SHUT OFF OR CAP UTILITIES WITHOUT PRIOR NOTICE. COORDINATE WORK WITH LOCAL UTILITY PURVEYORS.
8. MAINTAIN VEHICULAR AND PEDESTRIAN TRAFFIC ROUTES: ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, SIDEWALKS, AND ADJACENT FACILITIES; DO NOT CLOSE OR OBSTRUCT STREETS, SIDEWALKS, OR PASSAGEWAYS WITHOUT PERMISSION FROM AUTHORITIES HAVING JURISDICTION; MAINTAIN FIRE ACCESS ALONG ACCESS ROAD AT ALL TIMES; MEET ALL APPLICABLE CODES AND ORDINANCES.
9. PROTECT FROM HARM ANY TREES, OR OTHER OBJECTS SELECTED TO REMAIN.
10. RESTORE ANY IMPROVEMENTS DAMAGED BY THIS WORK TO THEIR ORIGINAL CONDITION, AS ACCEPTABLE TO OWNER. REPAIR ANY DAMAGE TO ADJACENT STRUCTURES, UTILITIES, SITE, AND WORK OF THIS CONTRACT TO REMAIN AT NO ADDITIONAL COST TO OWNER.
11. SPRINKLE DEBRIS AS NECESSARY TO LIMIT DUST TO LOWEST PRACTICABLE LEVEL. DO NOT SPRINKLE TO EXTENT THAT WOULD CAUSE FLOODING, CONTAMINATED RUNOFF, OR ICING.
12. REMOVE EXISTING ABOVE-GRADE AND BELOW-GRADE IMPROVEMENTS AS INDICATED AND AS NECESSARY TO FACILITATE NEW CONSTRUCTION. CARE SHALL BE TAKEN THAT DAMAGE DOES NOT OCCUR TO EXISTING PAVEMENT WHICH IS TO REMAIN IN PLACE AND THAT ALL PAVEMENT REMOVALS ARE ACCOMPLISHED BY MAKING A NEAT VERTICAL SAW CUT AT THE BOUNDARIES OF THE AREA TO BE REMOVED.
13. THE CONTRACTOR WILL BE RESPONSIBLE FOR FURNISHING, SETTING AND MARKING ALL LINE AND LOCATION STAKES. INCLUDING OFFSETS AND GENERAL CONSTRUCTION STAKING. WHEN WORK REQUIRING CONTROL IS BEING PERFORMED, ALL NECESSARY RELATED EQUIPMENT, SUPPLIES AND INSTRUMENTS SHALL BE ON SITE. A QUALIFIED LAYOUT ENGINEER, SURVEYOR, OR TECHNICAL SPECIALIST MUST BE ASSIGNED TO THE CONTRACTOR'S CREW FOR THIS WORK. THIS EQUIPMENT AND PERSONNEL MUST BE AVAILABLE AT NO ADDITIONAL COST TO OWNER FOR THE PURPOSE OF VERIFYING LAYOUT AND CERTIFYING THE ACCURACY OF WORK ON THE SITE.
14. TRAFFIC: DO NOT OBSTRUCT WALKS OR PUBLIC WAYS WITHOUT THE WRITTEN PERMISSION OF GOVERNING AUTHORITIES AND OF THE OWNER. WHERE ROUTES ARE PERMITTED TO BE CLOSED, PROVIDE ALTERNATE ROUTES IF REQUIRED.
15. THE CONTRACTOR IS RESPONSIBLE FOR PRESERVING ALL BENCHMARKS AND STAKES AND THE REPLACEMENT OF ANY THAT ARE DISPLACED OR MISSING.
16. THE REFUSE RESULTING FROM CLEARING AND GRUBBING SHALL BE DISPOSED OF BY THE CONTRACTOR IN A MANNER CONSISTENT WITH ALL GOVERNMENT REGULATIONS. IN NO CASE SHALL REFUSE MATERIAL BE LEFT ON THE PROJECT SITE, SHOVED ONTO ABUTTING PRIVATE PROPERTIES, OR BE BURIED IN EMBANKMENTS OR TRENCHES ON THE PROJECT SITE. DEBRIS SHALL NOT BE DEPOSITED IN ANY STREAM OR BODY OF WATER, WETLAND, OR IN ANY STREET OR ALLEY, OR UPON ANY PRIVATE PROPERTY EXCEPT BY WRITTEN CONSENT OF THE PRIVATE PROPERTY OWNER. MAINTAIN HAULING ROUTES CLEAN AND FREE OF ANY DEBRIS RESULTING FROM DEMOLITION WORK ON THIS PROJECT.

Legend

- LIMITS OF WORK
- SAWCUT LINE
- REMOVE CURBING
- REMOVE ASPHALT PAVEMENT
- REMOVE CONCRETE PAVEMENT
- DEMOLISH BUILDING
- REMOVE TREE(S)
- FENCING
- CABLE TV SERVICE
- ELECTRICAL SERVICE
- ELECTRICAL JBOX/VAULT
- GAS MAIN/SERVICE
- GAS METER/VALVE
- IRRIGATION LINE
- OVERHEAD POWER
- FIBER OPTIC LINE
- SANITARY SEWER
- SANITARY MH/CO
- STEAM LINE
- STORM DRAINAGE PIPE
- YD/CO/CB/CB 2/MH
- TELEPHONE SERVICE
- TELEPHONE BOX
- WATER MAIN
- FH/FDC/PIV/VALVE

Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

0 5 10 20

SCALE 1"=10'

Sheet Index

CIVIL PLANS
C1.00 DEMOLITION PLAN
C2.00 TESC PLAN
C2.10 TESC DETAILS
C3.00 CIVIL SITE PLAN
C3.10 CIVIL SITE DETAILS

COORDINATE SIDEWALK REMOVAL W/ STREET USE PERMITS AND TRAFFIC PLANS. DO NOT CLOSE PUBLIC WALKS WITHOUT A STREET USE PERMIT, APPROVED TEMPORARY TRAFFIC CONTROL PLAN, AND AN ALTERNATE PATHWAY ESTABLISHED. STREET IMPROVEMENTS TO BE PERFORMED UNDER SDOT # SUSIP0000772. SCOPE SHOWN HERE FOR COORDINATION AND PLANNING PURPOSES.

South Jackson Street (Dedicated Public Right of Way)

South King Street (Dedicated Public Right of Way)

10th Avenue South (Dedicated Public Right of Way)

SAWCUT AND REMOVE EX CONC (TYP)
REMOVE EX ECO-BLOCK WALL
REMOVE EX ECO-BLOCK WALL (TYP)
REMOVE EX WATER METER. COORDINATE WITH SPU.
REMOVE EX WATER SERVICE (TYP)
CUT AND CAP EX GAS. COORDINATE WITH PSE.
REMOVE EX ASPHALT (TYP)
RECORDS INDICATE 75-FT OF 3-FT DETENTION PIPE BELOW. PAVING REMOVE ALL OF IT.
REMOVE EX SHED
REMOVE EX CB AND STORM DRAIN (TYP)
CUT AND CAP EX SIDE SEWER
SAWCUT AND REMOVE EX CONC (TYP)
CUT AND CAP EX WATER SERVICE AT MAIN
REMOVE EX CONC CURB (TYP)
REMOVE EX DRIVEWAY (TYP)
STREET AND SIDEWALK WORK UNDER SUSIP 0000772.
REMOVE EX FENCE (TYP)
"30' MINUTE LOAD/UNLOAD"
CUT AND CAP EX GAS. COORDINATE WITH PSE.
PROTECT EX STRAIN POLE TO REMAIN
REMOVE EX WATER METER
OLD UTILITY POLE REMOVED BY OTHERS
PROTECT EX UTILITY POLE TO REMAIN (TYP)
DEMO OVERHEAD POWER AND COMM SERVICES
REMOVE EX POWER GEAR
CUT AND CAP EX GAS. COORDINATE WITH PSE.
CUT AND CAP EX WATER SERVICE AT MAIN
PROTECT EX SIGNAL GEAR TO REMAIN (TYP)
PROTECT EX ELEC'L VAULTS TO REMAIN (TYP)
REMOVE EX DRIVEWAY (TYP)
PROTECT EX OVERHEAD MAINS. COORDINATE WITH PROVIDERS.
REMOVE EX BUILDINGS AND ALL ASSOCIATED APPURTENANCES
PROTECT EX ADJACENT BUILDING
PROTECT EX WALLS BELOW GRADE AND AT GRADE SLAB FLOOR. REMOVE FLOORS, WALLS AND SLABS ABOVE GRADE. SEE STRUCTURAL IN 6982/86-ON FOR TEMPORARY CONDITION.
TW=155.75 (EX GRADE) BW=145.0 (EX FF)
TW=152.2 (EX GRADE) BW=145.0 (EX FF)
TW=147.2 (EX GRADE) BW=145.0 (EX FF)
OLD UTILITY POLE REMOVED BY OTHERS
PROTECT EX UTILITY POLE TO REMAIN (TYP)
REMOVE EX DRIVEWAY (TYP)
REMOVE EX CONC CURB (TYP)
STREET AND SIDEWALK WORK UNDER SUSIP 0000772.
DEMO OVERHEAD POWER AND COMM SERVICES
CUT AND CAP EX GAS. COORDINATE WITH PSE.
CUT AND CAP EX SIDE SEWER
SAWCUT AND REMOVE EX CONC (TYP)
PROTECT EX UTILITY POLE TO REMAIN (TYP)
REMOVE EX INLET AND STORM DRAIN (TYP)
CUT AND CAP EX STORM DRAIN FOR REUSE

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COUGHLIN PORTER LUNDEEN

801 SECOND AVENUE, SUITE 900 SEATTLE, WA 98104

(206) 343-0460 www.cplinc.com

PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON ST SEATTLE, WA 98104

PREPARED FOR
SCIDPpda/FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PROJECT DIRECTOR

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

CHECK

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
DEMOLITION PLAN

PROJECT NO.
C2324000

DATE
2/7/25

SHEET NUMBER
C1.00

90% CD SET

ORIGINAL SHEET SIZE 36" x 42"

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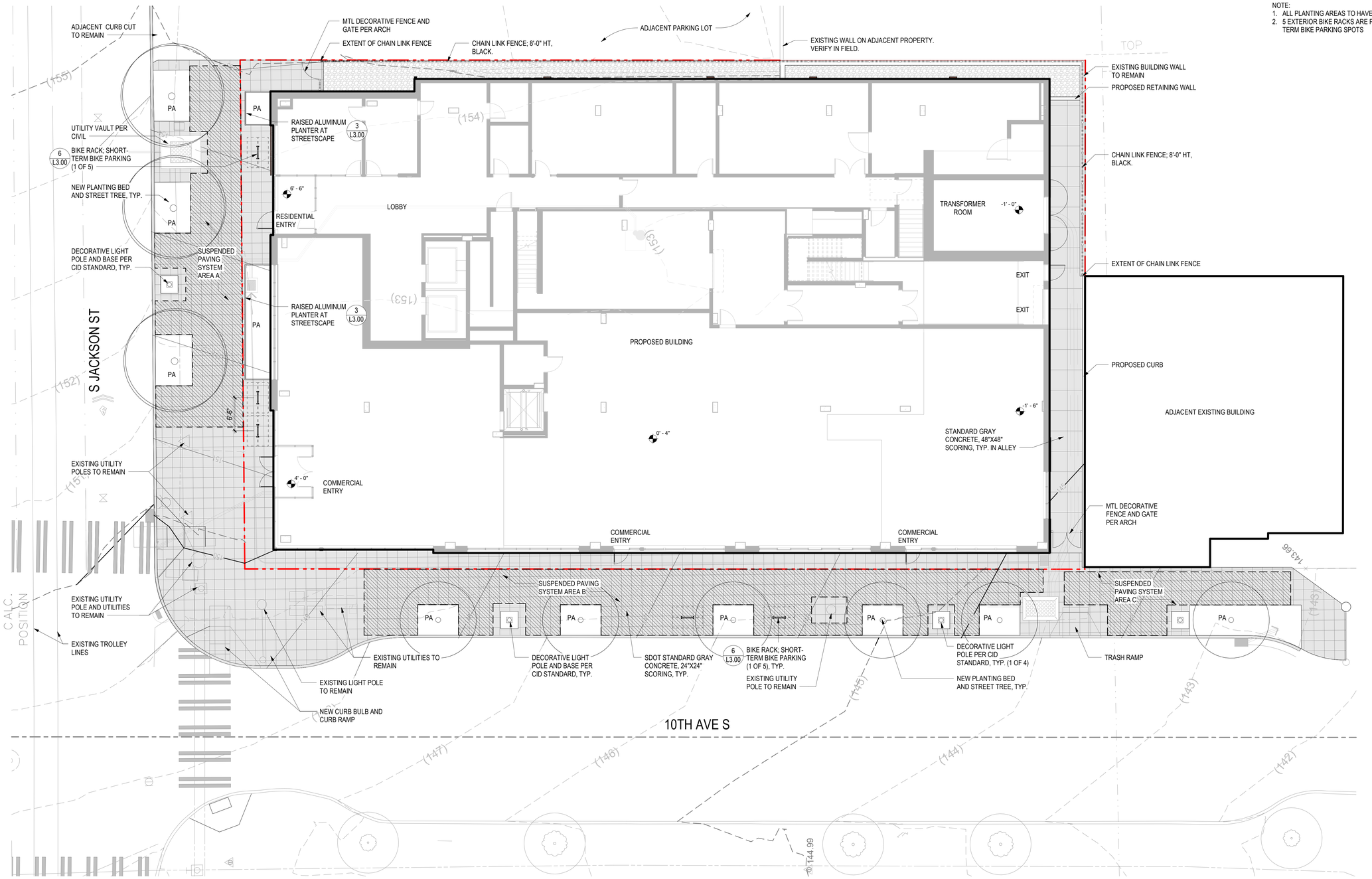
LEGEND

- PROPERTY LINE
- CONCRETE PAVING - SIDEWALK
  SDOT STANDARD CONCRETE MIX,
  COLOR: GRAY, FINISH: LIGHT BROOM FINISH
  2'X2' SCORING, NO SHINERS
- CONCRETE PAVING - ALLEY/UTILITY CORRIDOR
  SDOT STANDARD CONCRETE MIX,
  COLOR: GRAY, FINISH: LIGHT BROOM FINISH
  4'X4' SCORING, NO SHINERS
- GRAVEL
- PA — LANDSCAPE PLANTING AREA:
  SHRUBS, GROUNDCOVERS, PERENNIALS
  ASSUME 12" IMPORTED TOP SOIL
  (PROVIDE IRRIGATION TO ALL AREAS)
- 9 / L3.00 — SUSPENDED PAVING SYSTEM (SOIL CELLS) - 2,550 SF
  AREA A (NORTH) - 840 SF X 4' DEPTH = 3,360 CU FT
  AREA B (WEST) - 1350 SF X 4' DEPTH = 5,400 CU FT
  AREA C (WEST) - 360 SF X 4' DEPTH = 1,440 CU FT
  TOTAL CU FT = 10,200 CU FT
- PROPOSED STREET TREES

NOTE:
1. ALL PLANTING AREAS TO HAVE PERMANENT IRRIGATION.
2. 5 EXTERIOR BIKE RACKS ARE PROVIDED FOR A TOTAL OF 6 SHORT-TERM BIKE PARKING SPOTS



1 STREETSCAPE
1/8" = 1'-0"

0 4" 8" 16"
Scale: 1/8" = 1'-0"

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Culver City, CA 90232 / 323.937.2150

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
SITE PLAN

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L1.01
90% CD SET

ORIGINAL SHEET SIZE 30" x 42"
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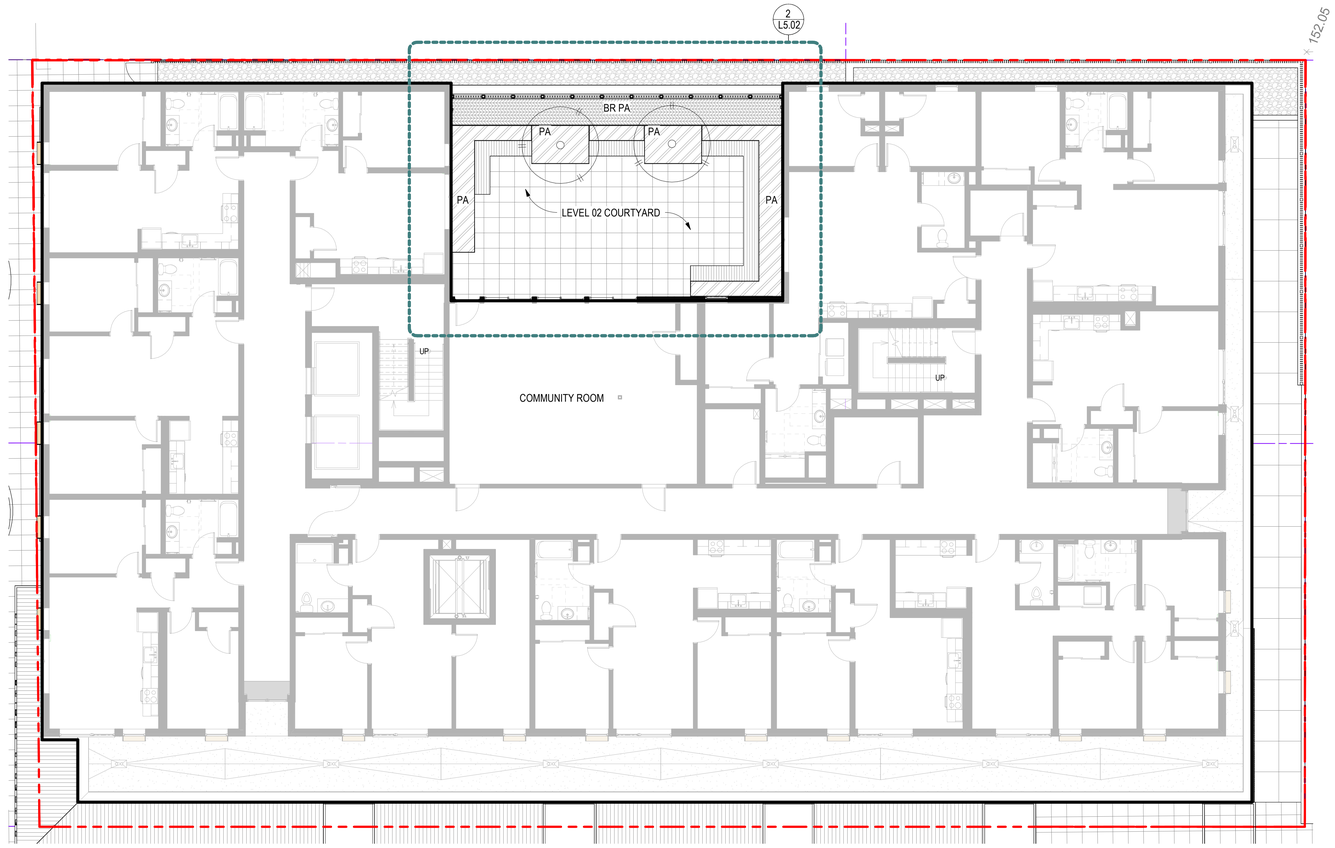
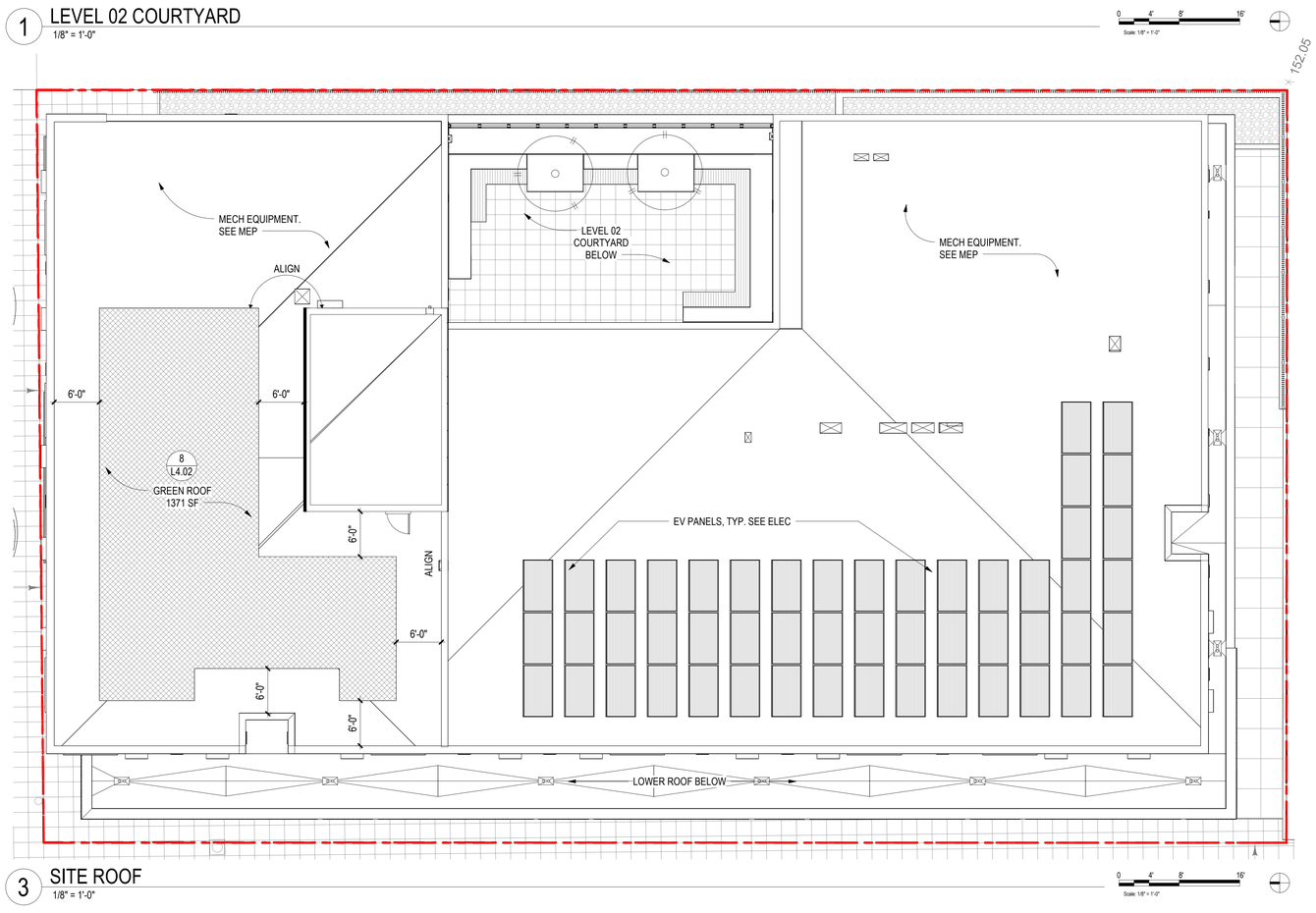


1 LEVEL 02 COURTYARD
1/8" = 1'-0"

Scale: 1/8" = 1'-0"

2 LEVEL 02 COURTYARD - ENLARGEMENT
1/4" = 1'-0" | 1/L1.02

Scale: 1/4" = 1'-0"



3 SITE ROOF
1/8" = 1'-0"

Scale: 1/8" = 1'-0"

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
LEVEL 02 COURTYARD AND ROOF

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L1.02
90% CD SET

ORIGINAL SHEET SIZE: 36" x 42"

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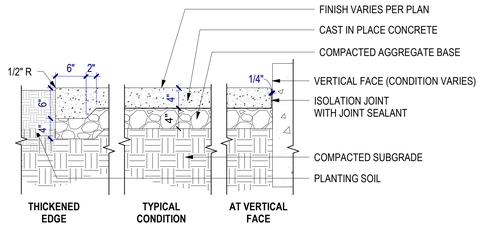
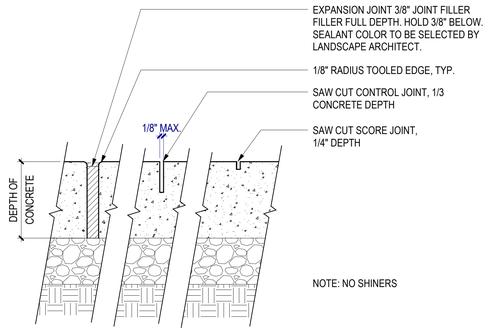
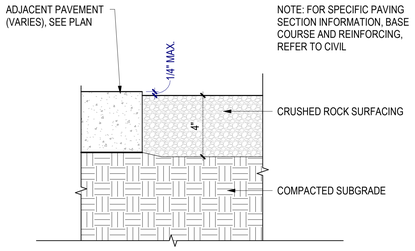


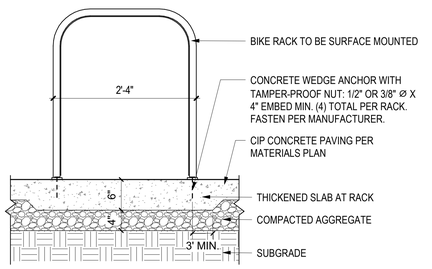
1 PEDESTRIAN CONCRETE PAVING
1" = 1'-0"



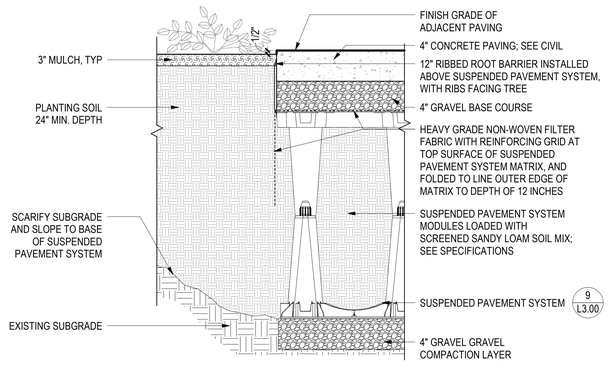
2 CONCRETE JOINTS
6" = 1'-0"



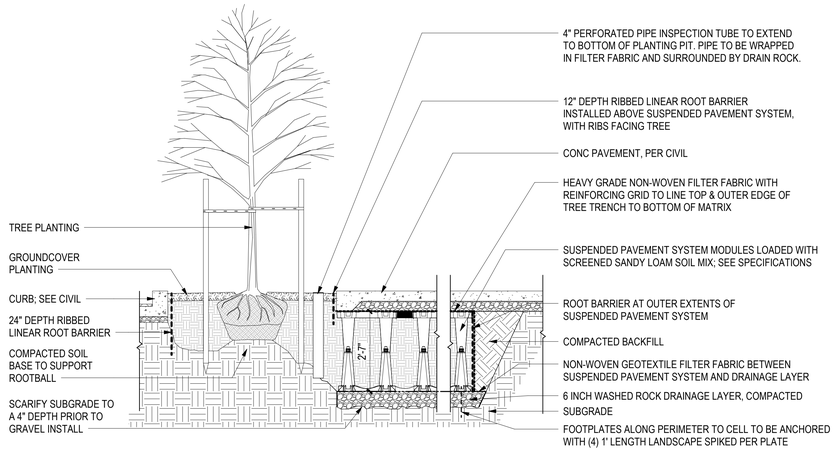
4 CRUSHED ROCK SURFACING
3" = 1'-0"



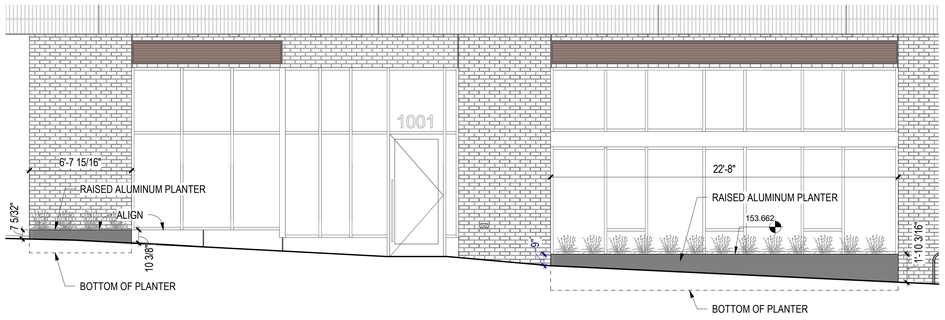
6 BIKE RACK
1" = 1'-0"



7 SUSPENDED PAVEMENT SYSTEM AT PLANTING AREA
1 1/2" = 1'-0"



9 SUSPENDED PAVEMENT SYSTEM AT TREE PITS
1/2" = 1'-0"



3 RAISED PLANTERS AT STREETSCAPE
1/4" = 1'-0" | 2/L6.01

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Culver City, CA 90232 / 323.937.2150

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
SITE DETAILS

PROJECT NO
2324000
DATE
02/07/2025

SHEET NUMBER
L3.00
90% CD SET

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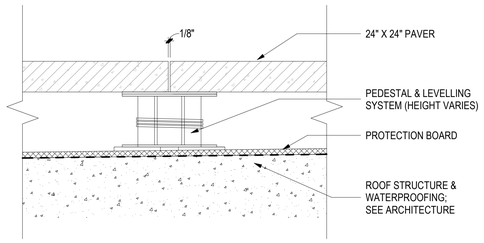
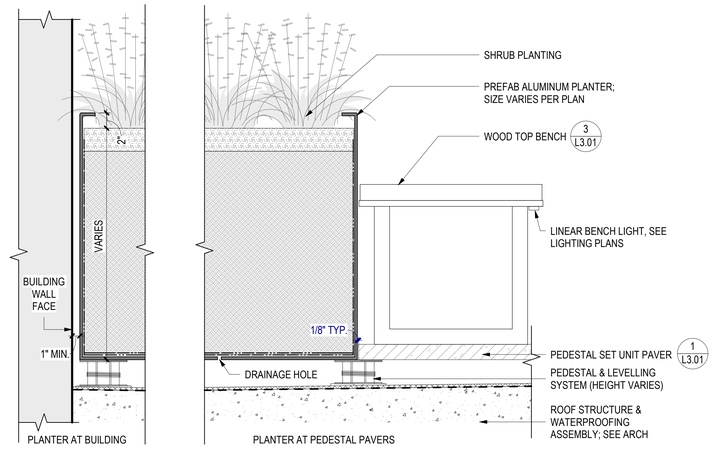
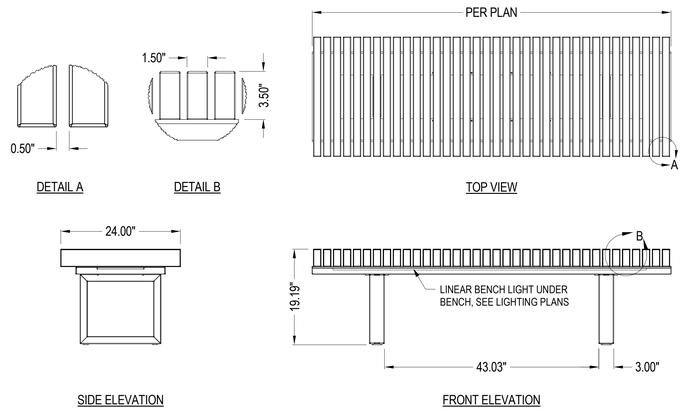


1 PEDESTAL SET CONCRETE UNIT PAVER
3" = 1'-0"



2 ALUMINUM PLANTER
1 1/2" = 1'-0"



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4. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info AND ENTER REFERENCE NUMBER 928-976.

3 WOOD TOP BENCH
3/4" = 1'-0"

4 BIORETENTION PLANTERS ON STRUCTURE
3/4" = 1'-0" | 2/L1.02

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
SITE DETAILS

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L3.01
90% CD SET

ORIGINAL SHEET SIZE: 36" x 42"

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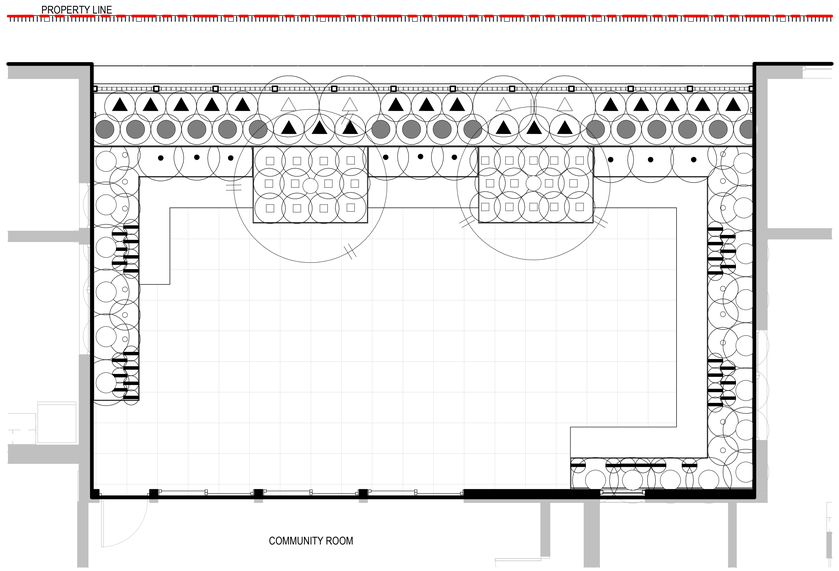
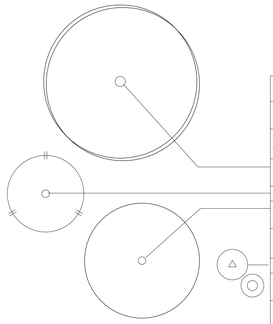


2 LEVEL 02 COURTYARD PLANTING PLAN

1/4" = 1'-0" | 1/L1.02

0 2' 4' 8'

Scale: 1/4" = 1'-0"



PLANT SCHEDULE

QTY	KEY	BOTANICAL NAME	COMMON NAME	SIZE	ON-CENTER SPACING	ROOT CONDITION	NATIVE/ADAPTED	COMMENTS
TREE								
3	AES CAR	Aesculus x carnea 'Briottii'	RED HORSECHESTNUT	2" - 2.5" CAL	AS SHOWN	B&B		FULL EVEN UPRIGHT STRUCTURE WITH STRONG CENTRAL LEADER
2	ALB JUL	Albizia julibrissin	MIMOSA	2" - 2.5" CAL	AS SHOWN	B&B		
6	PRU SAR	Prunus sargentii	SARGENT'S CHERRY	2" - 2.5" CAL	AS SHOWN	B&B		FULL EVEN UPRIGHT STRUCTURE WITH STRONG CENTRAL LEADER
SHRUB								
4	COR SER	Cornus sericea 'Flaviramea'	YELLOW TWIG DOGWOOD	5 GAL	48" O.C.	CONTAINER	X	
18	VAC OVA	Vaccinium ovatum 'Scarlet Ovation'	SCARLET OVATION HUCKLEBERRY	5 GAL	36" O.C.	CONTAINER	X	
GROUNDCOVER								
34	EPI PER	Epimedium × perralchicum 'Frohnleiten'	BARRENWORT	1 GAL	12" O.C.	CONTAINER		
GRASSES + RUSHES								
26	HAK MAC	Hakonechloa macra	JAPANESE FOREST GRASS	5 GAL	24" O.C.	CONTAINER		
16	JUN PAT	Juncus patens	COMMON RUSH	5 GAL	24" O.C.	CONTAINER	X	
9	PHY SPE	Phyllostachys aureosulcata 'Spectabilis'	SPECTABILIS BAMBOO	5 GAL	36" O.C.	CONTAINER		
BULBS								
14	CRO LUC	Crocosmia 'Lucifer'	LUCIFER CROCOSMIA	5 GAL	24" O.C.	CONTAINER		
19	IRI DOU	Iris douglasiana	DOUGLAS IRIS	5 GAL	24" O.C.	CONTAINER	X	
BAMBOO								
209	CIS COR	Pleioblastus pygmaeus	PYGMY BAMBOO	5 GAL	24" O.C.	CONTAINER	X	ADAPTED TO SEATTLE

NOTE: ALL PLANTING AREAS TO HAVE PERMANENT IRRIGATION

1 STREETSCAPE PLANTING PLAN

1/8" = 1'-0"

0 4" 8" 16"

Scale: 1/8" = 1'-0"

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
PLANTING PLAN

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L4.01
90% CD SET

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ORIGINAL SHEET SIZE: 36" x 42"

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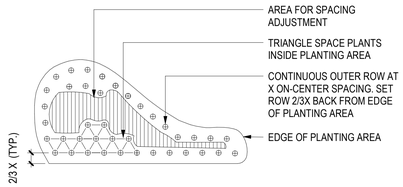
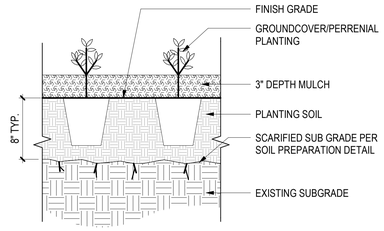
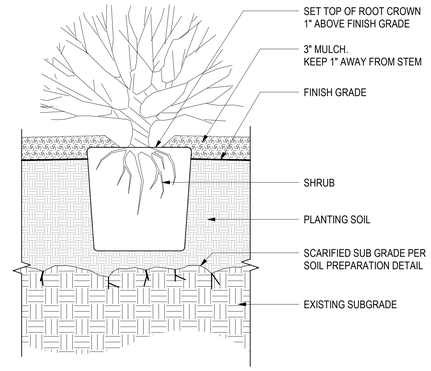


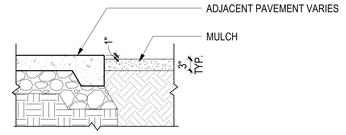
1 PLANT SPACING
1/2" = 1'-0"



2 GROUNDCOVER PLANTING
1 1/2" = 1'-0"



3 SHRUB PLANTING
1 1/2" = 1'-0"



4 MULCH AT PAVEMENT
3/4" = 1'-0"

6 TREE PLANTING WITH STAKES
3/8" = 1'-0"

7 SOIL PREPARATION
6" = 1'-0"

8 6" EXTENSIVE GREEN ROOF
3" = 1'-0"

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NO. DATE REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
PLANTING DETAILS AND PLANT SCHEDULE

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L4.02
90% CD SET

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ORIGINAL SHEET SIZE: 30" x 42"

IRRIGATION SCHEDULE

SYMBOL	DESCRIPTION
8 7 6 / RPPA	POINT OF CONNECTION: (1) 1" BRONZE GATE VALVE (1) 1" WILKENS 975 XL-S, REDUCED PRESSURE PRINCIPLE ASSEMBLY (1) HUNTER ICV-101G-FS-AS-ADJ, 1" PRESSURE REGULATED AUTOMATIC VALVE (1) HUNTER ICZ-101-LF-25, 1" DRIP CONTROL ZONE (1) HUNTER ICV-101G-FS-AS-ADJ, 1" PRESSURE REGULATED AUTOMATIC VALVE
QC	HUNTER HQ-44-LRC, 1" QUICK COUPLING VALVE
	IRRIGATION CONTROLLER: HUNTER IC-600-PL-ICM-600, 12 STATION SMART CONTROLLER W/ HUNTER SOLAR-SYNC-SEN
	ET/RAIN/FREEZE SENSOR: HUNTER SOLAR-SYNC-SEN, WIRED ET/RAIN/FREEZE SENSOR
	HUNTER ICV-101G-FS, 1" AUTOMATIC VALVE W/ 1" ISOLATION BALL VALVE
	HUNTER ICZ-101-LF-25, 1" DRIP CONTROL ZONE W/ 1" ISOLATION BALL VALVE
	HUNTER PROS-02, 2" POP-UP ROTATOR W/ HUNTER ROTATOR NOZZLE AS NOTED
RWS	HUNTER RZWS-18-50-CV, ROOT WATERING SYSTEM WITH 0.50 G.P.M. BUBBLER
	HUNTER HDL-06-12-CV , DRIPLINE WITH 0.60 GPH EMITTERS 12" O.C.
F	HUNTER PLD-BV, MANUAL FLUSH VALVE
A	HUNTER PLD-AVR, AIR / VACUUM RELIEF VALVE
	SCHEDULE 40 PVC, 1" MAINLINE
	SCHEDULE 40 PVC, LATERAL (3/4" UNLESS NOTED OTHERWISE)
	CPVC INTERIOR PIPE, MAINLINE OR LATERAL PIPE, (SEE PLUMBING)
	THREADED CPVC CONNECTION POINT (REFER TO PLUMBING DRAWINGS)
	SCHEDULE 40 PVC, SLEEVING (MIN. 4")

SPRINKLER SCHEDULE

SYMBOL	DESCRIPTION	P.S.I.	RADIUS	G.P.M.
MP3	HUNTER PROS-02-MP-3000-90, 2" POP[-UP ROTATOR	30	27'	1.58
MP3	HUNTER PROS-02-MP-3000-90, 2" POP[-UP ROTATOR	30	27'	0.76
MP2	HUNTER PROS-02-MP-2000-90, 2" POP[-UP ROTATOR	30	17'	0.64
MP2	HUNTER PROS-02-MP-2000-90, 2" POP[-UP ROTATOR	30	18'	0.38
MP1	HUNTER PROS-02-MP-1000-90, 2" POP[-UP ROTATOR	30	12'	0.17
MPSS	HUNTER PROS-02-MP-MPSS-530, 2" POP[-UP ROTATOR	30	4' X 28'	0.38
MPRS	HUNTER PROS-02-MP-MPRS-515, 2" POP[-UP ROTATOR	30	4' X 14'	0.19
MPLS	HUNTER PROS-02-MP-MPLS-515, 2" POP[-UP ROTATOR	30	4' X 14'	0.19

PIPE SIZING TABLE

PIPE SIZE	MAX. G.P.M.
3/4" SCHEDULE 40 P.V.C.	UP TO 8 G.P.M.
1" SCHEDULE 40 P.V.C.	UP TO 12 G.P.M.
1-1/4" SCHEDULE 40 P.V.C.	UP TO 22 G.P.M.

1	1"D
6 GPM	
DRIP	G.R.

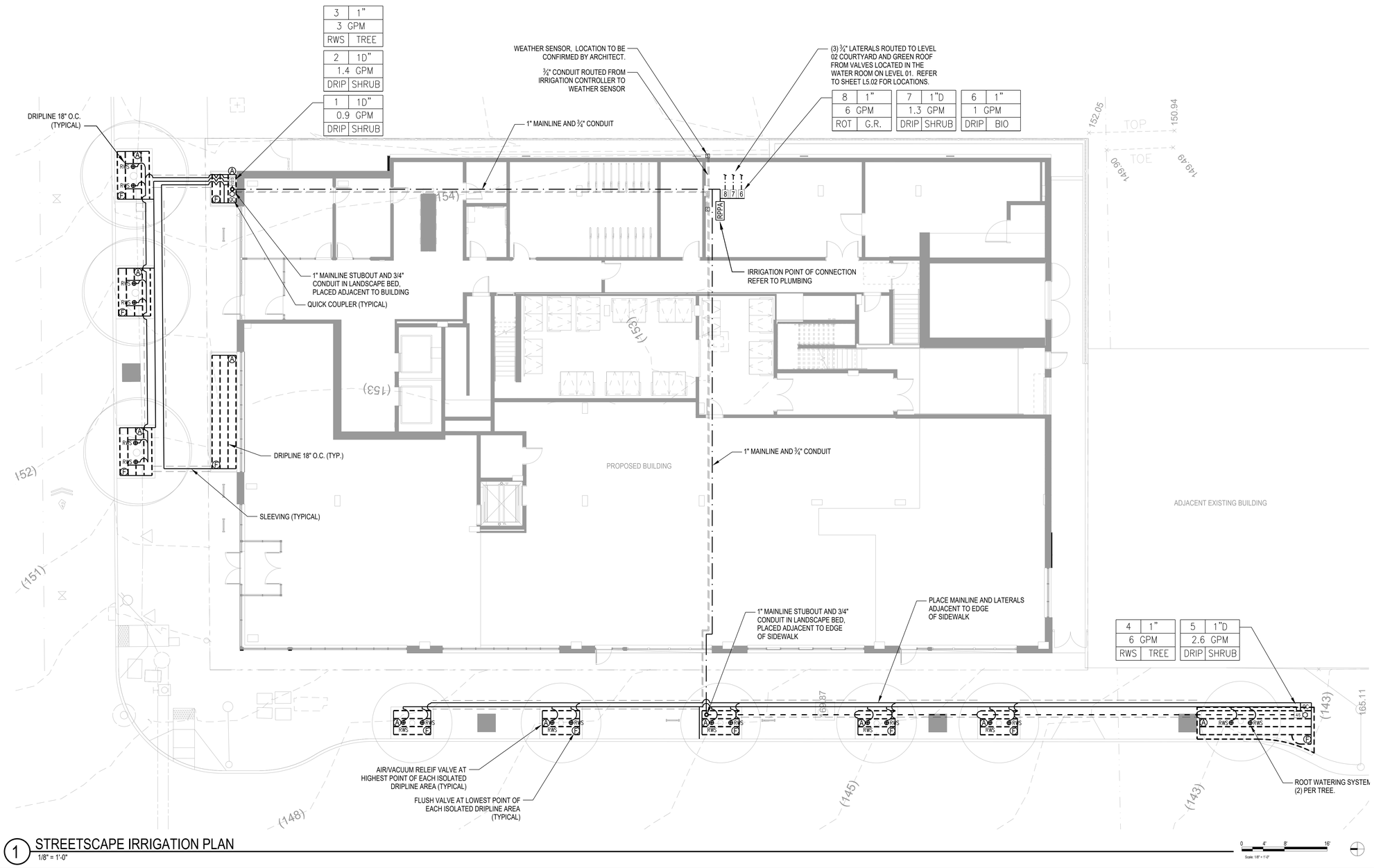
- 1 — VALVE / ZONE NUMBER
- 1"D — VALVE SIZE / TYPE
- 6 GPM — FLOW RATE
- DRIP — PLANT TYPE
- G.R. — IRRIGATION TYPE

ABBREVIATIONS:

APPROX.	APPROXIMATE
D	DRIP CONTROL ZONE
DRIP	DRIPLINE
G.P.M.	GALLONS PER MINUTE
G.R.	GREEN ROOF
L.F.	LINEAL FEET
MAX.	MAXIMUM
O.C.	ON CENTER
P.S.I.	PRESSURE PER SQUARE INCH
ROT	MP ROTATOR
RWS	ROOT WATERING SYSTEM

IRRIGATION NOTES

1. All new planted areas shall be fully irrigated by a high efficient underground irrigation system meeting the current E.S.D.S. Evergreen Sustainable Development Standard, version 3.0. Refer to Irrigation Specification section 328400 Planting Irrigation for further information.
2. Coordinate all interior piping and irrigation equipment with Plumbing Contractor.
3. Stake locations of all new valve boxes and review with Landscape Architect before proceeding with installation. Ensure that valve box location is accessible.
4. Set valve boxes square to adjacent building, structures, or paving. Set valve boxes at finish grade after mulch installation and set in-line to each other.
5. All pipe or wire under roads, walks, pavers, walls, or other paved surfaces shall be sleeved. Sleeves shall be 4" min. Piping within sleeves to not exceed 50% of interior volume of sleeve.
6. Verify pressure at P.O.C. prior to beginning work. Notify Landscape Architect if less than static 60 P.S.I.. Provide Booster pump for roof irrigation if under 45 P.S.I. at roof.
7. See corresponding planting plan for precise planting layout. Confirm location of new trees/shrubs and adjust layout as needed.
8. Electrical Contractor to provide 120VAC power to irrigation controller. Locate wired Solar-Sync sensor at a location approved by Architect. Coordinate installation of conduit with Electrical Contractor..
9. Refer to L5.03 for irrigation details.



1 STREETSCAPE IRRIGATION PLAN
1/8" = 1'-0"

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WB LA Landscape Architecture Site Planning Irrigation
16630 30th Dr. S.E. Bothell, WA 98012
phone (425) 417-6609

PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
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DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
IRRIGATION PLAN STREETSCAPE

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L5.01
90% CD Set

ORIGINAL SHEET SIZE 30" x 42"

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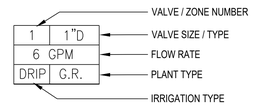
1 IRRIGATION PLAN - ROOF
1/8" = 1'-0"

0 4' 8' 16'
Scale: 1/8" = 1'-0"

IRRIGATION LEGEND

SYMBOL	DESCRIPTION
	HUNTER PROS-02, 2" POP-UP ROTATOR W/ NOZZLES AS NOTED
	DRIPLINE
Ⓕ	MANUAL FLUSH VALVE
Ⓐ	AIR / VACUUM RELIEF VALVE
	LATERAL (3/4" UNLESS NOTED OTHERWISE)
	THREADED CPVC CONNECTION POINT (REFER TO PLUMBING DRAWINGS)



ABBREVIATIONS:

APPROX.	APPROXIMATE
BIO	BIOFILTRATION PLANTER
D	DRIP CONTROL ZONE
DRIP	DRIPLINE
G.P.M.	GALLONS PER MINUTE
G.R.	GREEN ROOF
L.F.	LINEAL FEET
MAX.	MAXIMUM
O.C.	ON CENTER
P.S.I.	PRESSURE PER SQUARE INCH
ROT	MP ROTATOR
RWS	ROOT WATERING SYSTEM

IRRIGATION NOTES

1. Refer to L5.01 for Irrigation Point of Connection located Water room on level 1, irrigation schedule, and Irrigation notes.
2. Refer to L5.03 for Irrigation Details.
3. Refer to Irrigation Specification 328400 for additional information.

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NO.	DATE	REVISION

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PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
IRRIGATION PLAN LEVEL 02 COURTYARD AND ROOF

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L5.02
90% CD Set

ORIGINAL SHEET SIZE 36" x 48"

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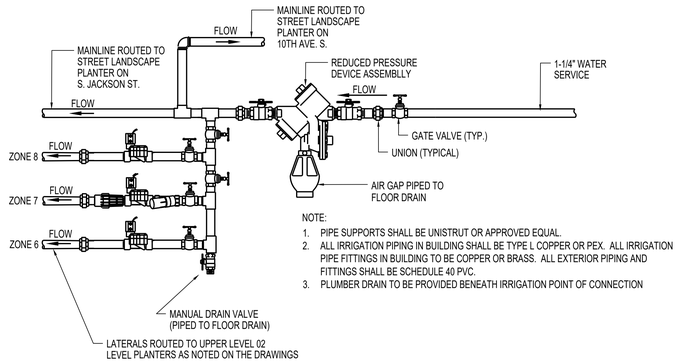
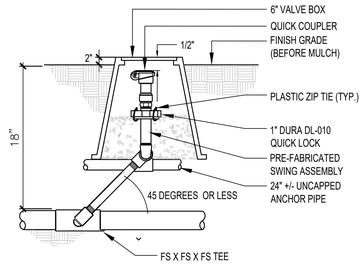
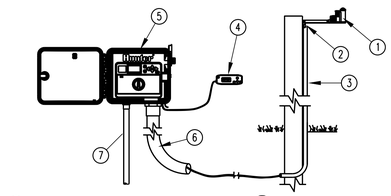


NOTE:
1. PIPE SUPPORTS SHALL BE UNISTRUT OR APPROVED EQUAL.
2. ALL IRRIGATION PIPING IN BUILDING SHALL BE TYPE L COPPER OR PEX. ALL IRRIGATION PIPE FITTINGS IN BUILDING TO BE COPPER OR BRASS. ALL EXTERIOR PIPING AND FITTINGS SHALL BE SCHEDULE 40 PVC.
3. PLUMBER DRAIN TO BE PROVIDED BENEATH IRRIGATION POINT OF CONNECTION

1 POINT OF CONNECTION
NOT TO SCALE



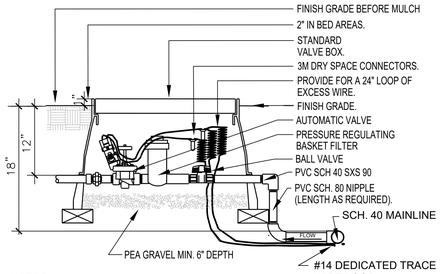
2 QUICK COUPLER
NOT TO SCALE



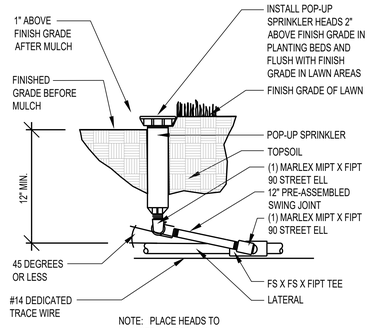
1. MODEL: WIRED SOLAR SYNC SENSOR, MOUNT UP TO 800' FROM RECEIVER
2. MOUNT SENSOR ON ROOF PARPIT ABOVE CONTROLLER LOCATION WHERE SENSOR CAN RECEIVE FULL SUN, IS OPEN TO RAINFALL.
3. CONDUIT FOR SOLAR SYNC COMMUNICATION WIRE TO CONTROLLER
4. MODEL: SOLAR SYNC MODULE MOUNT LESS THAN 6' AWAY FROM CONTROLLER (OPTIONAL)
5. HUNTER PRO-C CONTROLLER WALL MOUNTED
6. VALVE CONTROL WIRE CONDUIT TO EXTERIOR LANDSCAPE BED
7. 1/2" POWER SUPPLY CONDUIT J-BOX INSIDE CONTROLLER CONNECT PER LOCAL CODE

NOTE
MOUNT CONTROLLER WITH LCD SCREEN AT EYE LEVEL. CONFIRM LOCATION OF WEATHER SENSOR WITH ARCHITECT.

3 IRRIGATION CONTROLLER
NOT TO SCALE

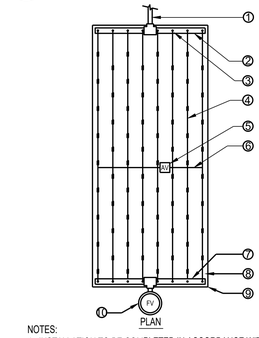


NOTES
1. ALL WIRE INSTALLATIONS TO BE IN COMPLIANCE WITH APPLICABLE CODE.
2. TAPE AND BUNDLE WIRE EVERY TEN FEET.
3. PROVIDE EXPANSION 24" COILS AT EACH WIRE CONNECTION IN VALVE BOX.
4. COMPACT SOIL AROUND VALVE BOX TO SAME DENSITY AS UNDISTURBED ADJACENT SOIL.
5. ALL PIPE AND FITTINGS TO BE SCHEDULE 40 PVC.
6. VALVE BOX SHALL NOT REST ON PIPES. SEE SPECIFICATIONS.



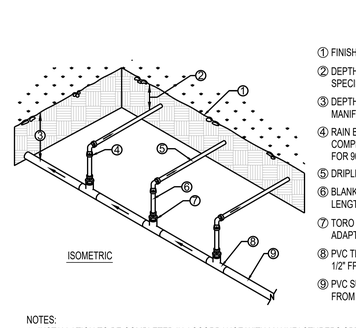
NOTE: PLACE HEADS TO MINIMIZE OVERSPRAY

9 POP-UP SPRINKLER
NOT TO SCALE



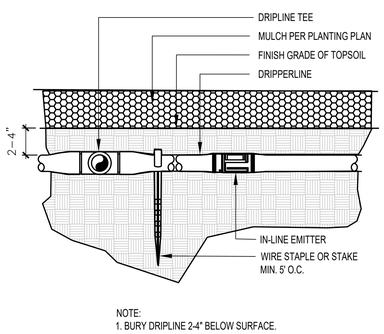
NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS
2. REFER TO DETAIL FOR DRIPLINE HEADER

10 DRIPLINE LAYOUT
NOT TO SCALE



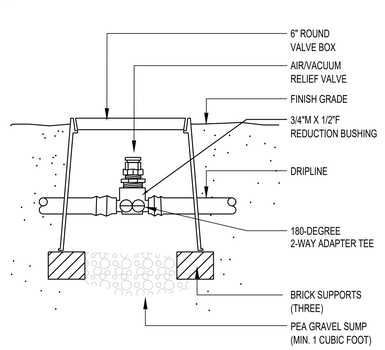
NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
2. AIR/VACUUM RELIEF VALVE TO BE PLACED ON BLANK TUBING AT HIGH POINT OF DRIPLINE.

11 DRIPLINE HEADER
NOT TO SCALE

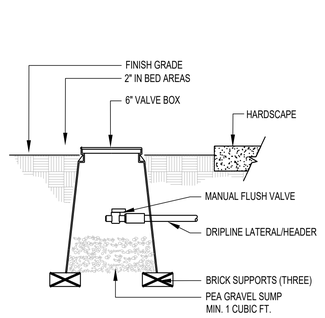


NOTE:
1. BURY DRIPLINE 2-4" BELOW SURFACE. NO DRIPLINE SHALL BE VISIBLE ON THE SURFACE.

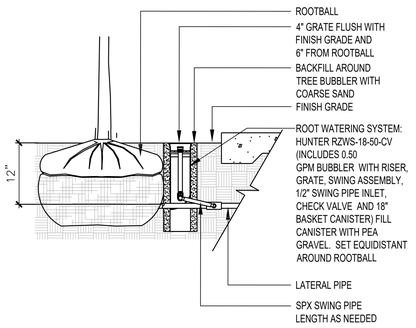
12 DRIPLINE EMITTER
NOT TO SCALE



13 AIR/VACUUM RELIEF VALVE
NOT TO SCALE



14 FLUSH VALVE
NOT TO SCALE



15 ROOT WATERING SYSTEM
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WB LA Landscape Architecture Site Planning Irrigation
16630 30th Dr. S.E. Bothell, WA 98012
phone (425) 417~4609

PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO. DATE REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS
CHECK

TITLE
IRRIGATION DETAILS

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L-5.03
90% CD Set

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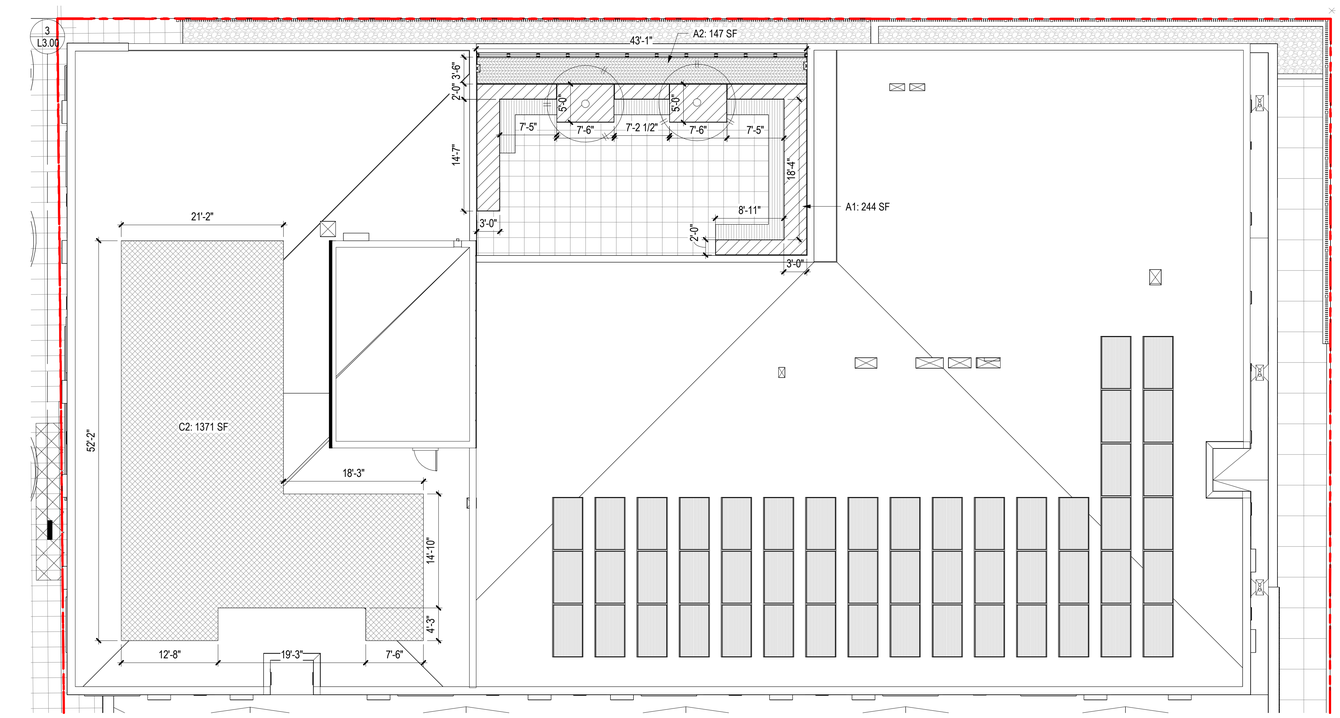
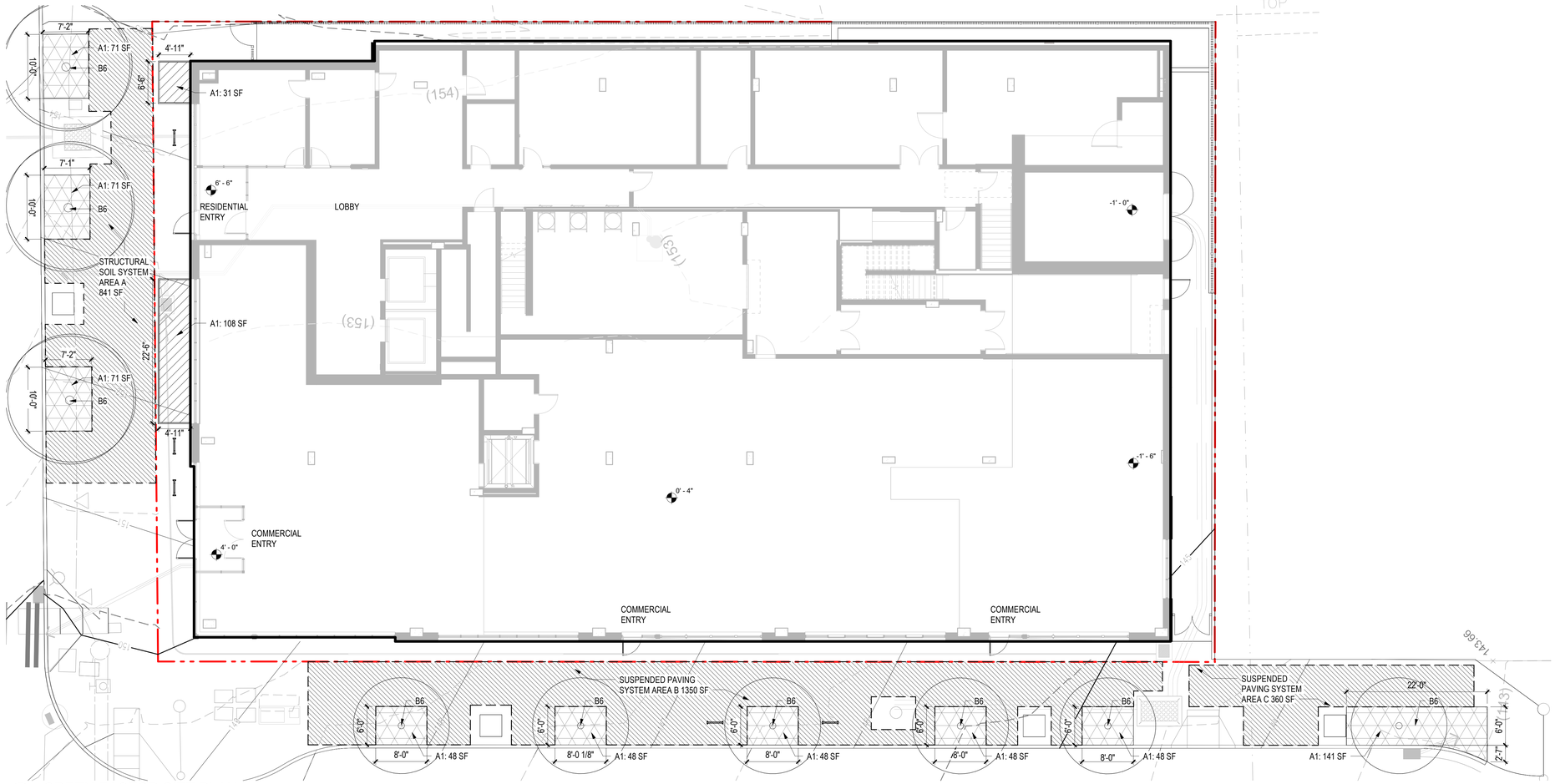


2 GREEN FACTOR LEVEL 02 COURTYARD AND SITE ROOF
1/8" = 1'-0"

Scale: 1/8" = 1'-0"



1 GREEN FACTOR SITE PLAN
1/8" = 1'-0"

Scale: 1/8" = 1'-0"

LEGEND

PROPERTY LINE

A1 LANDSCAPE AREA ON PROPERTY - 384 SF
PLANTED AREA WITH A SOIL DEPTH OF 24" OR GREATER

A1 LANDSCAPE AREA IN ROW - 594 SF
PLANTED AREA WITH A SOIL DEPTH OF 24" OR GREATER

A2 BIORETENTION FACILITIES - 147 SF
BIORETENTION PLANTING AREA

C2 GREEN ROOFS 4"-8" OF GROWTH MEDIUM - 1371 SF
GREEN ROOF AREA

F STRUCTURAL SOIL SYSTEMS (SOIL CELLS) - 2,550 SF
4' DEPTH IN ROW
AREA A (NORTH) - 840 SF
AREA B (WEST) - 1350 SF
AREA C (SOUTH) - 360 SF

B4 SMALL TREE
QTY: 2 ON COURTYARD

B6 MEDIUM/LARGE TREE
QTY: 9 IN ROW

NOTES:
1. SEE L6.02 FOR GREEN FACTOR WORKSHEET AND SCORE SHEET
2. ALL PLANTINGS AND LANDSCAPE ELEMENTS REQUIRED AS PART OF THIS BUILDING PERMIT MUST BE MAINTAINED FOR THE LIFE OF THE PROJECT. IF ALTERATIONS OR FAILURES REDUCE LANDSCAPE FEATURES TO A LEVEL BELOW THE MINIMUM REQUIRED PLANTING AREA OR GREEN FACTOR SCORE, NEW FEATURES MUST BE ADDED TO COMPENSATE. THIS REQUIREMENT ALSO APPLIES TO LANDSCAPE IMPROVEMENTS IN THE RIGHT-OF-WAY IF USED TO MEET GREEN FACTOR REQUIREMENTS (DR 30-2015).

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO.	DATE	REVISION

PARTNER IN CHARGE
DG
PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
GREEN FACTOR SITE PLAN

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L6.01
90% CD SET

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Green Factor Scoresheet PAGE 1

SEATTLE×green factor

Project title:

Enter sq ft of parcel

Parcel size: **16,500** SCORE: **0.348685**

	Landscape Elements**	Totals calculate automatically from Green Factor Worksheet		Factor	Total
A	**Planted areas**	978 square feet		0.6	587
1	Planted areas with a soil depth of 24" or greater				
2	Bioretention facilities	147 square feet		1	147
B	**Plantings (credit for plants in landscaped areas from Section A)**				
1	Mulch, ground covers, or other plants less than 2' tall at maturity	1125 square feet		0.1	113
2	Medium shrubs or perennials 2'-4' tall maturity - calculated at 9 sq ft per plant (typically planted no closer than 18" on center)	349 plants	3141	0.3	942
3	Large shrubs or perennials 4'+ at maturity - calculated at 36 sq ft per plant (typically planted no closer than 24" on center)	0 plants	0	0.3	0
4	**Small Trees** Tree canopy for "Small Trees" or equivalent (canopy spread of 8' to 15') - calculated at 75 sq ft per tree	2 trees	150	0.3	45
5	**Small/Medium Trees** Tree canopy for "Small/Medium Trees" or equivalent (canopy spread 16' to 20') - calculated at 150 sq ft per tree	0 trees	0	0.5	0
6	**Medium/Large Trees** Tree canopy for "Medium/Large Trees" or equivalent (canopy spread of 21' to 25') - calculated at 250 sq ft per tree	9 trees	2250	0.7	1,575
7	**Large Trees** Tree canopy for "Large Trees" or equivalent (canopy spread of 26' or more) - calculated at 350 sq ft per tree	0 trees	0	0.9	0
8	**Preserved Trees** Tree canopy for preservation of existing trees with trunks 6"+ DBH (Diameter at Breast Height, 4.5' above the ground) - calculated at 20 sq ft per inch diameter	0 inches	0	1	0

*** Do not count public rights-of-way in parcel size calculation.**

**** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards Director's Rule (DR XX-2020).**

REVISED 07-07-2020

Green Factor Scoresheet PAGE 2

SEATTLE×green factor

C	**Green roofs**				
1	Green roofs over at least 2" and less than 4" of growth medium	0 square feet		0.4	0
2	Green roofs 4" - 8" of growth medium	1371 square feet		0.6	823
3	Green roofs 8"+ of growth medium	0 square feet		0.8	0
D	**Vegetated walls** NC, C, SM, and South Downtown zones only	0 square feet		0.4	0
E	**Permeable paving**				
1	Permeable paving over at least 6" and less than 24" of soil or gravel	0 square feet		0.2	0
2	Permeable paving over at least 24" of soil or gravel	0 square feet		0.5	0
F	**Structural soil systems**	2550 square feet		0.5	1,275
	sub-total of sq ft =	11,712			
G	**Bonuses**				
1	Landscaping that consists of drought-tolerant and/or native plant species	1005 square feet		0.1	101
2	Landscaped areas where at least 50% of annual irrigation needs are met through the use of harvested rainwater or collected greywater	0 square feet		0.2	0
3	Vegetation visible to passersby from adjacent public right of way or public open spaces	733 square feet		0.2	147
4	Landscaping in food cultivation	0 square feet		0.1	0
	Green Factor numerator =	5,753			

*** Do not count public rights-of-way in parcel size calculation.**

**** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards Director's Rule (DR XX-2020).**

REVISED 07-07-2020

Green Factor Worksheet

SEATTLE×green factor

Project title:

Landscape Elements	Measurement	Planting Area 1	2	3	4	5	6	7	Total
		Step 1. Enter all values for Green Factor landscape elements here. Values entered here will automatically populate the Score Sheet. Step 2. Go to the Score Sheet and enter the size of the development site. Step 3. Check the Score to make sure your project meets the minimum score for the zone. **Totals on the Green Factor Scoresheet will calculate automatically*							
A1	*square feet*	594	384						**978**
A2	*square feet*	0	147						**147**
B1	*square feet*	594	531						**1125**
B2	*# of plants*	209	140						**349**
B3	*# of plants*								**0**
B4	*# of trees*		2						**2**
B5	*# of trees*								**0**
B6	*# of trees*	9							**9**
B7	*# of trees*								**0**
B8	*Inches DBH*								**0**
C1	*square feet*								**0**
C2	*square feet*		1371						**1371**
C3	*square feet*								**0**
D	*square feet*								**0**
E1	*square feet*								**0**
E2	*square feet*								**0**
F	*square feet*	2550							**2550**
G1	*square feet*	594	411						**1005**
G2	*square feet*								**0**
G3	*square feet*	594	139						**733**
G4	*square feet*								**0**

REVISED 07-07-2020

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PROJECT
LITTLE SAIGON LANDMARK

LOCATION
1001 S JACKSON SEATTLE, WA 98104

PREPARED FOR
SCIDpda / FRIENDS OF LITTLE SAIGON

NO. DATE REVISION

PARTNER IN CHARGE
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PROJECT MANAGER
DL
PROJECT LANDSCAPE ARCHITECT
TL
PROJECT TEAM MEMBERS

CHECK

TITLE
GREEN FACTOR SITE PLAN WORKSHEET AND SCORESHEET

PROJECT NO.
2324000
DATE
02/07/2025

SHEET NUMBER
L6.02
90% CD SET

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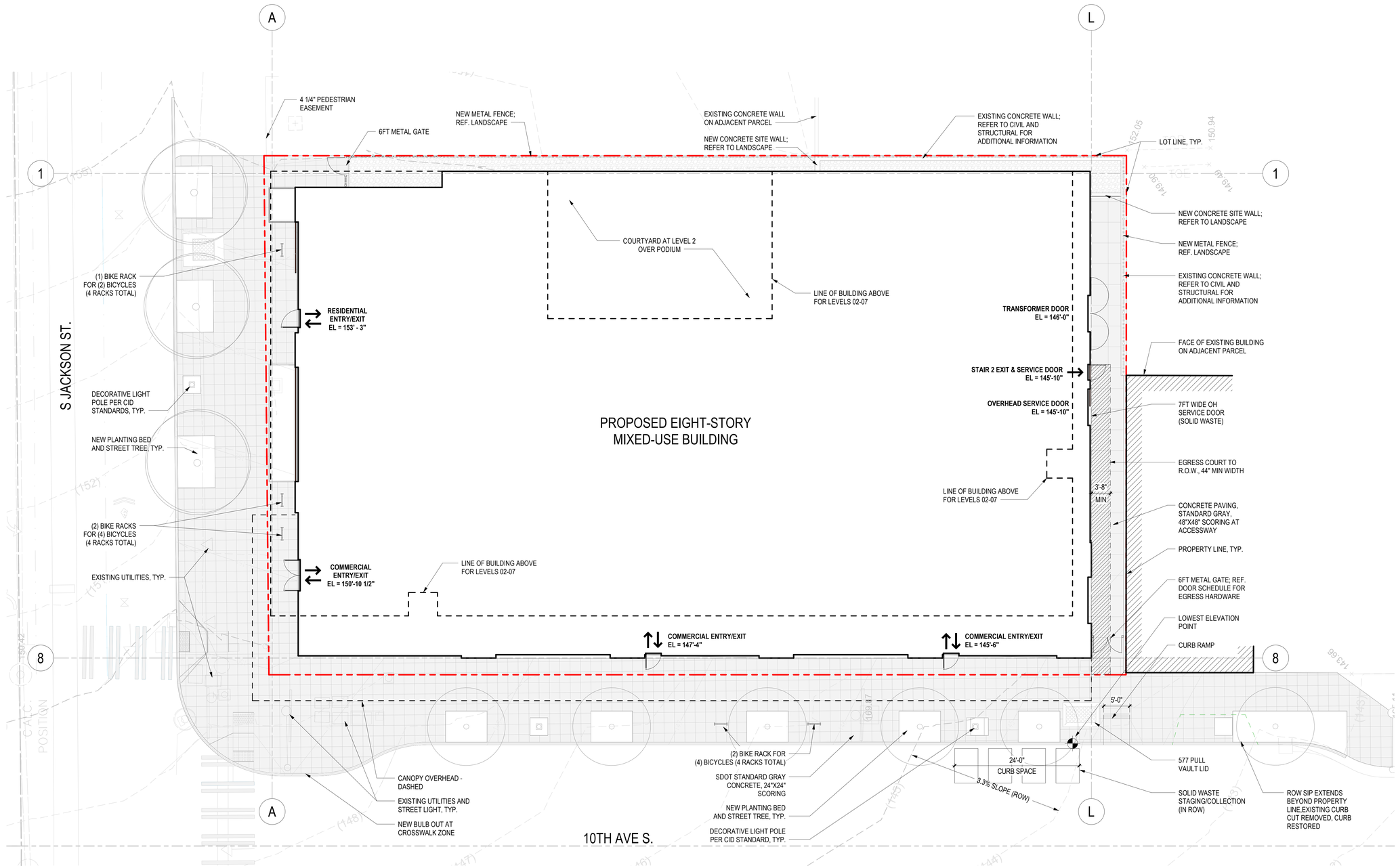

1 SITE PLAN
1/8" = 1'-0"

N

SITE PLAN NOTES

1. ALL WORK DONE IN RIGHT OF WAY REQUIRES SDOT APPROVALS

2. ALL EXISITNG STRUCTURES, SLABS, FENCES, PAVING ON SITE TO BE REMOVED. REFERENCE SURVEY FOR SIZE AND LOCATIONS OF EXISTING SITE FEATURES.

3. REFERENCE G-SERIES SHEETS DEMONSTRATING COMPLIANCE WITH LAND USE CODE DEVELOPMENT STANDARDS.

4. REFERENCE SURVEY FOR EXISTING TOPOGRAPHIC, SITE UTILITIES AND OTHER EXISTING CONDITIONS.

5. REFERENCE LANDSCAPING PLAN FOR LANDSCAPING INCLUDING PLANTING STRIP WIDTH, STREET TREES IN ROW.

6. REFERENCE STORM DRAINAGE PLAN AND GRADING AND TESC PLAN FOR DRAINAGE CONTROL, TEMPORARY EROSION AND SEDIMENTATION CONTROL.

7. REFERENCE CIVIL DRAWINGS FOR FRONTAGE IMPROVEMENT PLANS FOR STREET AND SIDEWALK IMPROVEMENTS.

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
SITE PLAN

PROJECT NO
2324000
DATE
10/29/24
SHEET NUMBER
A1.01

90% CD SET

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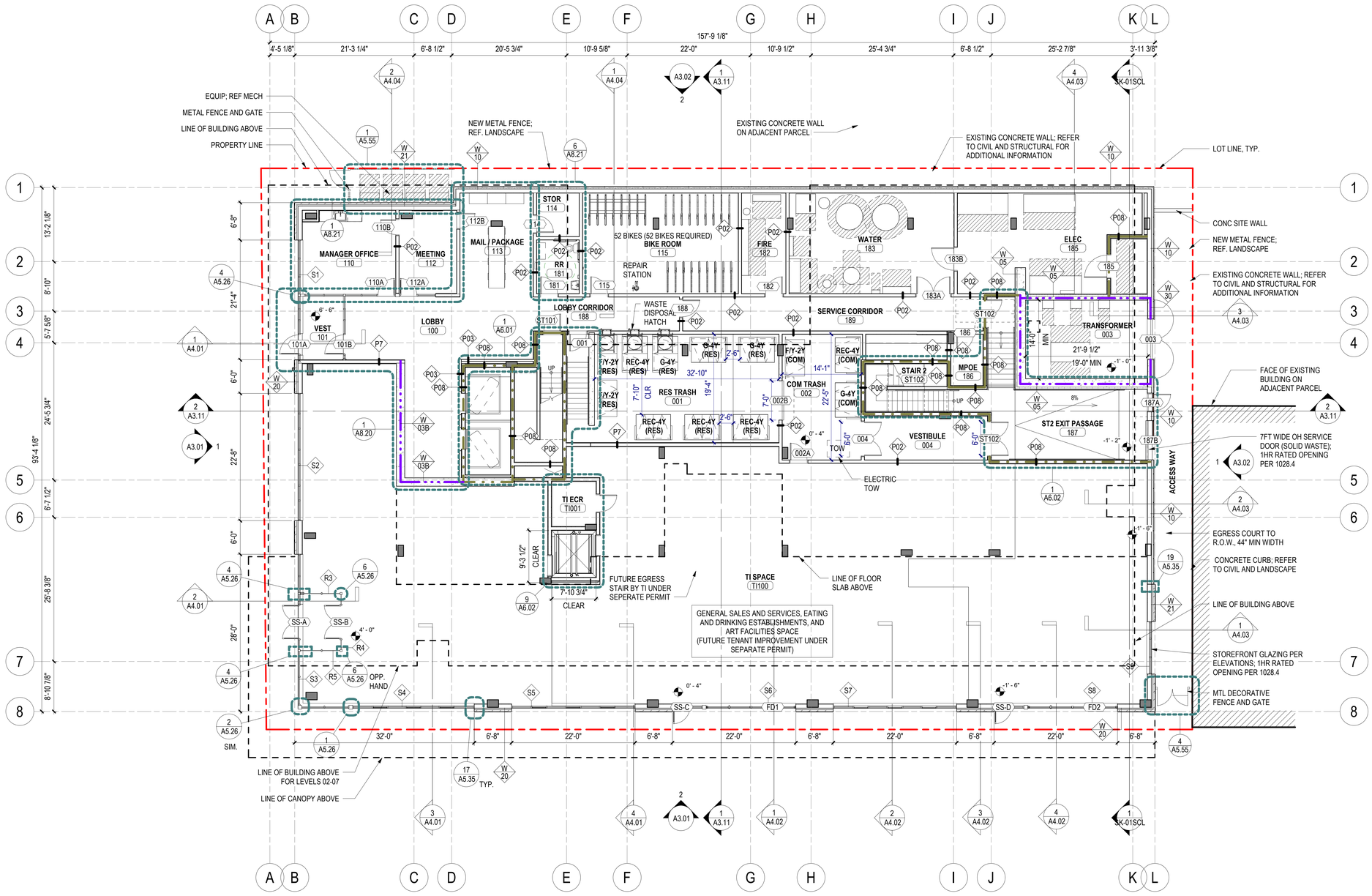
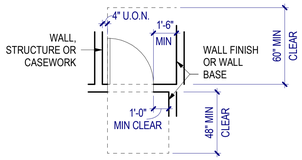


1 LEVEL 01
1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



FLOOR PLAN NOTES

1. ALL RESIDENTIAL UNIT WALLS, PARTITIONS, AND FLOOR/CEILING ASSEMBLIES SEPARATING UNITS FROM EACH OTHER OR FROM PUBLIC OR SERVICE AREAS SHALL HAVE A SOUND TRANMISSION CLASS (STC) RATING OF NOT LESS THAN 50 (45 IF FIELD-TESTED) IN ACCORDANCE WITH THE SEATTLE BULDING CODE.

2. SHAFTS INCLUDING MECHANICAL, STAIR AND ELEVATOR ARE TWO-HOUR RATED FIRE BARRIERS.

3. RESIDENTIAL CORRIDORS AND APARTMENT DEMISING WALLS ARE ONE-HOUR RATED FIRE PARTITIONS.

4. LEVEL 3 BEARING WALLS SUPPORTING LEVEL 4 FLOOR FRAMING ARE TWO-HOUR FIRE RESISTANCE RATED.

5. LEVEL 4 FLOOR FRAMING IS A HORIZTONAL FLOOR/CEILING ASSEMBLY WITH A TWO-HOUR FIRE RESISTANCE RATING.

6. ALL EXTERIOR WALLS ARE NON-COMBUSTIBLE.

7. ALL EXTERIOR BEARING WALLS ARE TWO-HOUR FIRE RESISTANCE RATED. ALL INTERIOR BEARING WALLS ARE ONE-HOUR FIRE RESISTANCE RATED MINIMUM.

8. PRIMARY ELEVATOR RECALL IS AT LEVEL 1. SECONDARY ELEVATOR RECALL IS AT LEVEL 3

9. LEVEL 3 THROUGH 8 DIMENSIONS.
FLOOR PLANS WALLS ARE DIMENSIONED TO GRIDLINE OR CENTERLINE OF WOOD FRAMING ELEMENT, UNLESS NOTED OTHERWISE.
A. GRIDLINES ARE LOCATED AT FACE OF EXTERIOR SHEATHIGN PANEL AT EXTERIOR WALLS.
B. GRIDLINES ARE LOCATED AT CENTERLINE OF WOOD FRAMING AT UNIT DEMISING WALLS AND CORRIDOR WALLS.

10. UNCONDITIONED SPACES OUTSIDE OF THE AIR BARRIER ARE TO BE PROTECTED BY A DRY SPRINKLER SYSTEM. REFER TO AIR BARRIER DIAGRAMS ON G3.40.

11. EXTERIOR CANOPY TO BE PROTECTED BY A DRY SPRINKLER SYSTEM. REFER TO ENLARGED CANOPY PLAN IN THE ARCHITECTURAL DETAILS FOR PROPOSED ROUTING.

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
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PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

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PROJECT MANAGER
DL
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MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
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CHECK
PC

TITLE
LEVEL 01 FLOOR PLAN

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
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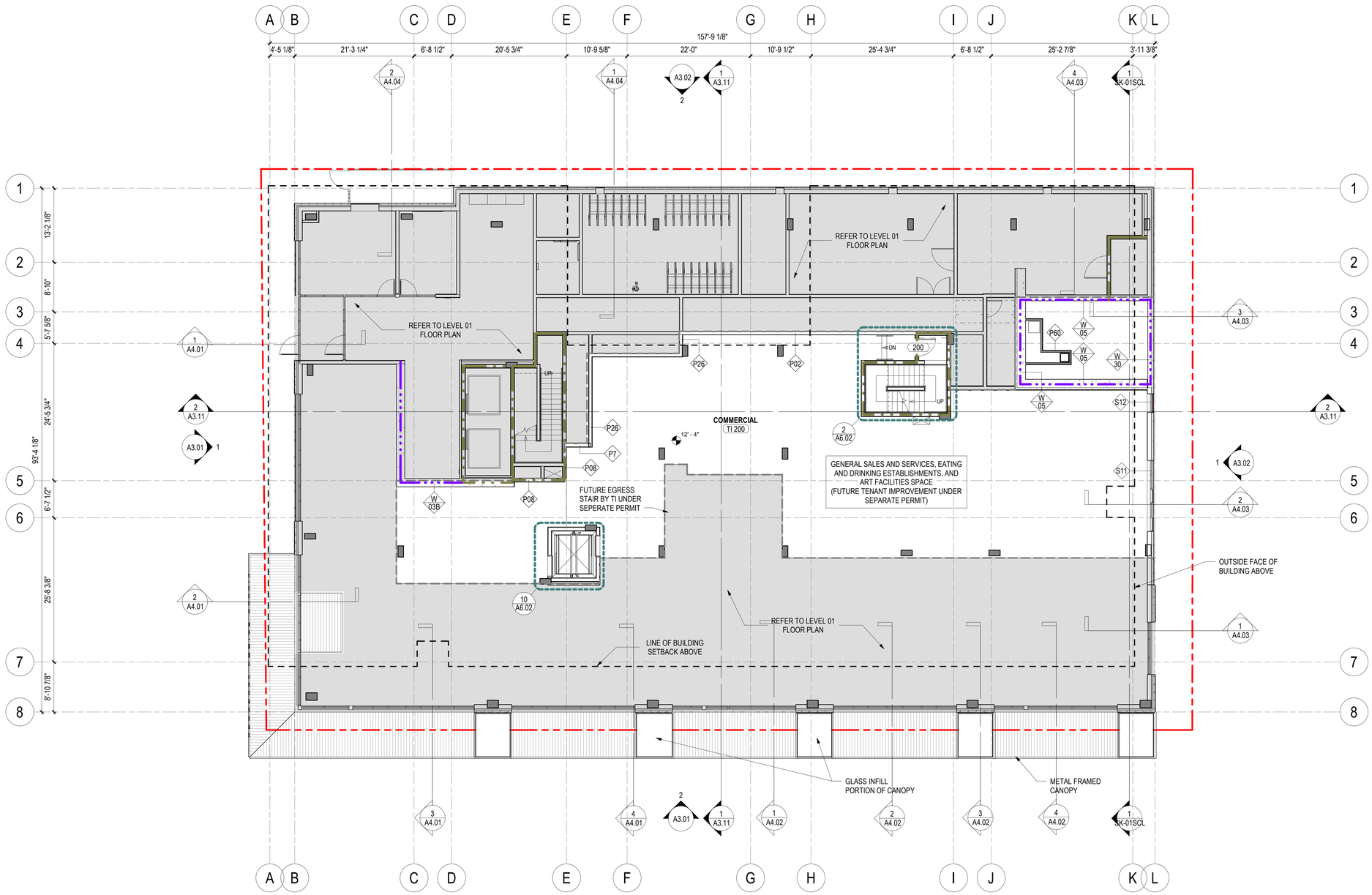
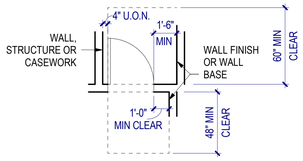


1 LEVEL 02
1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



FLOOR PLAN NOTES

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2. SHAFTS INCLUDING MECHANICAL, STAIR AND ELEVATOR ARE TWO-HOUR RATED FIRE BARRIERS.

3. RESIDENTIAL CORRIDORS AND APARTMENT DEMISING WALLS ARE ONE-HOUR RATED FIRE PARTITIONS.

4. LEVEL 3 BEARING WALLS SUPPORTING LEVEL 4 FLOOR FRAMING ARE TWO-HOUR FIRE RESISTANCE RATED.

5. LEVEL 4 FLOOR FRAMING IS A HORIZTONAL FLOOR/CEILING ASSEMBLY WITH A TWO-HOUR FIRE RESISTANCE RATING.

6. ALL EXTERIOR WALLS ARE NON-COMBUSTIBLE.

7. ALL EXTERIOR BEARING WALLS ARE TWO-HOUR FIRE RESISTANCE RATED. ALL INTERIOR BEARING WALLS ARE ONE-HOUR FIRE RESISTANCE RATED MINIMUM.

8. PRIMARY ELEVATOR RECALL IS AT LEVEL 1. SECONDARY ELEVATOR RECALL IS AT LEVEL 3

9. LEVEL 3 THROUGH 8 DIMENSIONS.
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B. GRIDLINES ARE LOCATED AT CENTERLINE OF WOOD FRAMING AT UNIT DEMISING WALLS AND CORRIDOR WALLS.

10. UNCONDITIONED SPACES OUTSIDE OF THE AIR BARRIER ARE TO BE PROTECTED BY A DRY SPRINKLER SYSTEM. REFER TO AIR BARRIER DIAGRAMS ON G3.40.

11. EXTERIOR CANOPY TO BE PROTECTED BY A DRY SPRINKLER SYSTEM. REFER TO ENLARGED CANOPY PLAN IN THE ARCHITECTURAL DETAILS FOR PROPOSED ROUTING.

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
LEVEL 02 FLOOR PLAN

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A2.02

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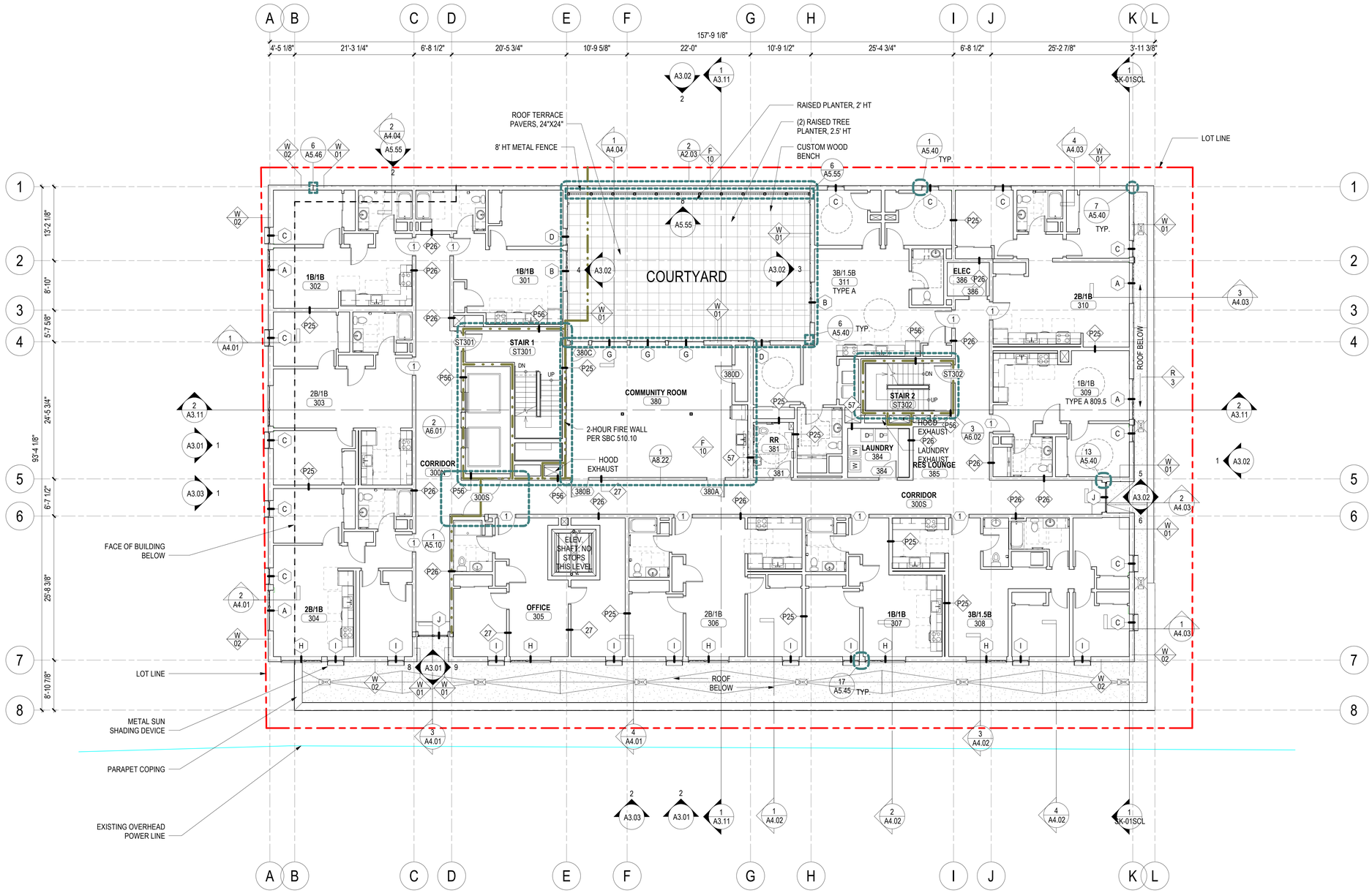
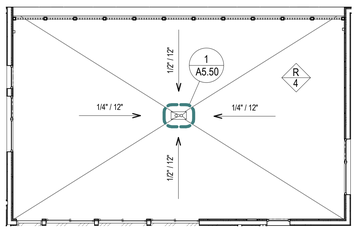


1 LEVEL 03

1/8" = 1'-0"

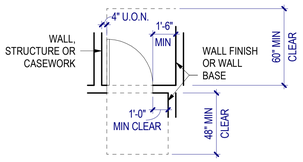
N



2 COURTYARD DRAINAGE PLAN

1/8" = 1'-0" | 1/00-PRES_05

DOOR LAYOUT - CLEARANCES



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PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
LEVEL 03 FLOOR PLAN

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
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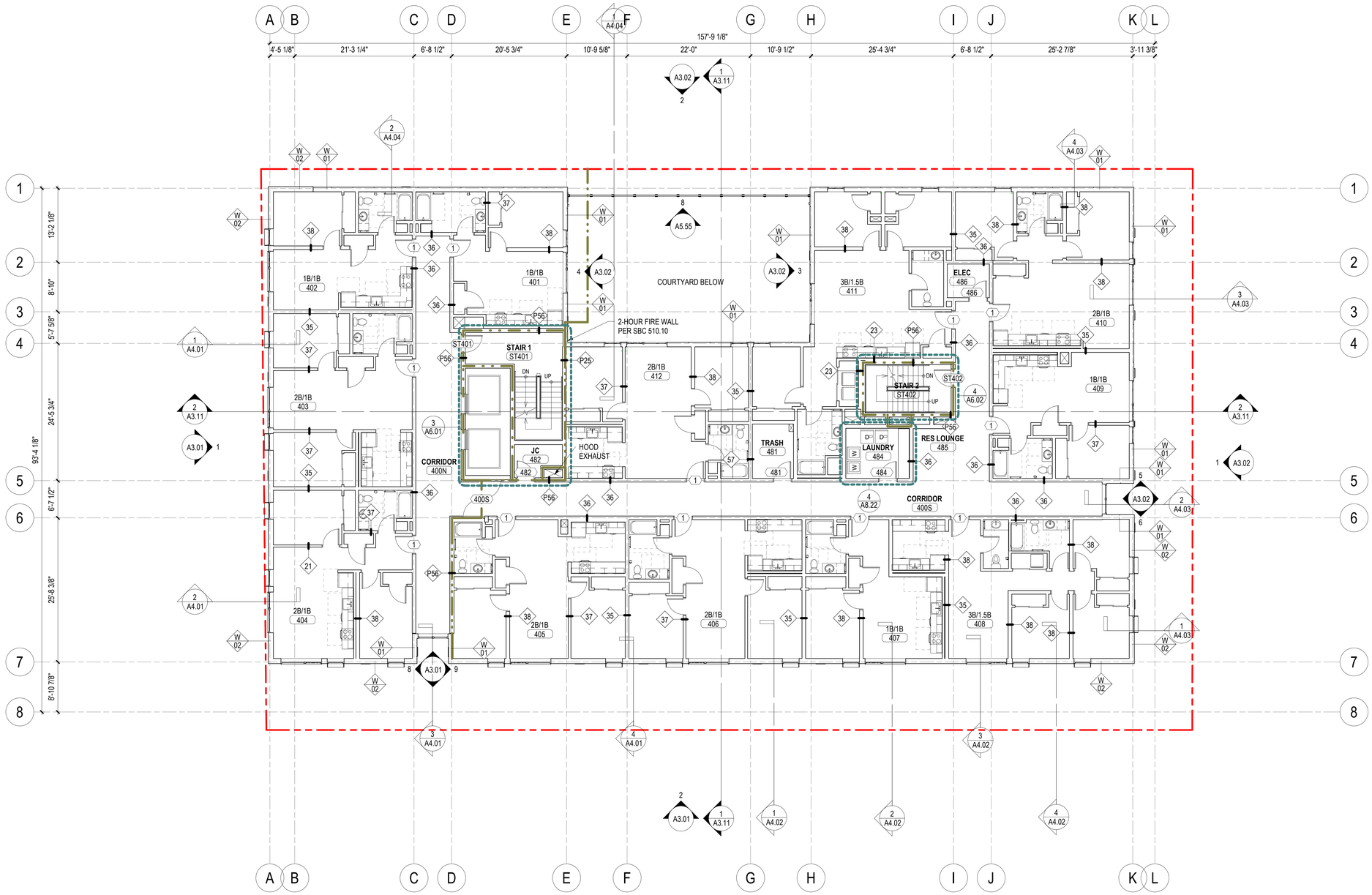
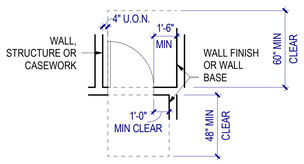


1 LEVEL 04
1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



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PROJECT
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PREPARED FOR
SCIDpda / Friends of Little Saigon

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PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
LEVEL 04 FLOOR PLAN

PROJECT NO.
2324000
DATE
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SHEET NUMBER
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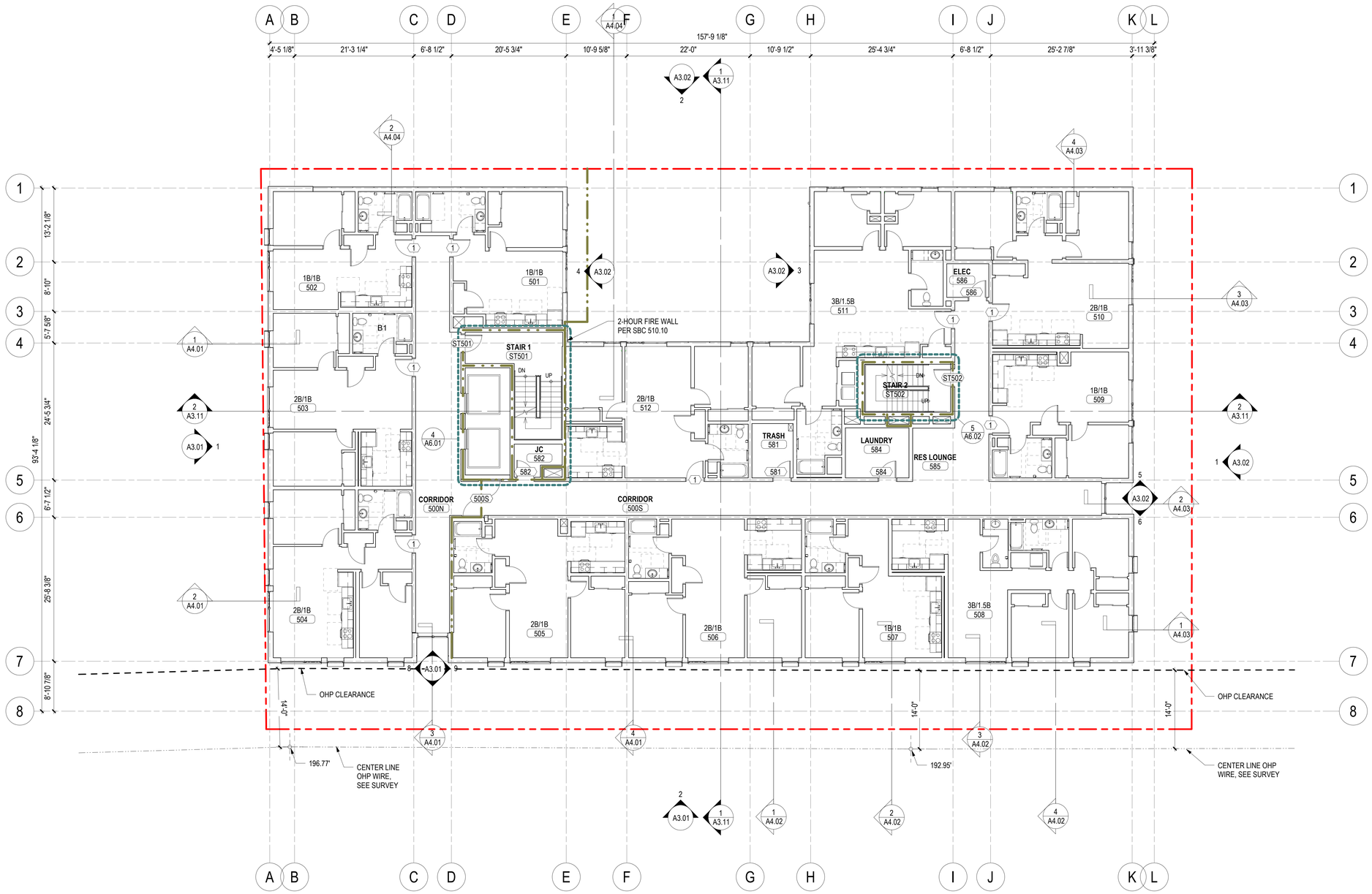
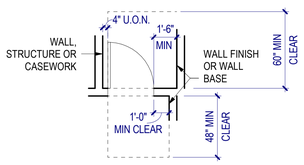


1 LEVEL 05

1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



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LEVEL 05 FLOOR PLAN

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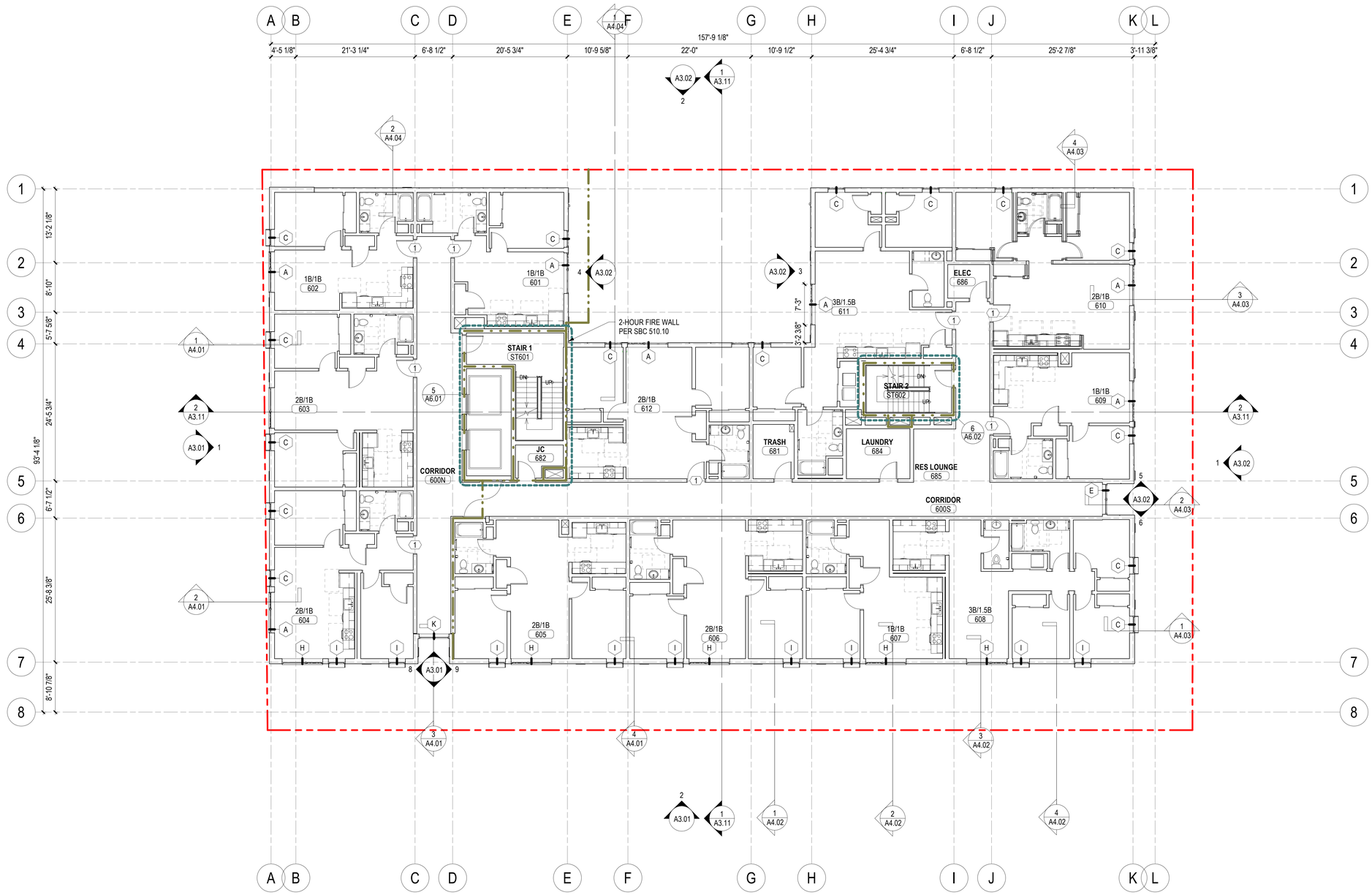

1 LEVEL 06
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N

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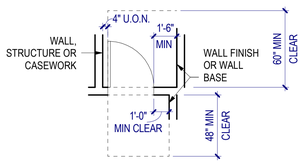

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11. EXTERIOR CANOPY TO BE PROTECTED BY A DRY SPRINKLER SYSTEM. REFER TO ENLARGED CANOPY PLAN IN THE ARCHITECTURAL DETAILS FOR PROPOSED ROUTING.

0 4' 8' 16' 24'
1/8" = 1' - 0"

ORIGINAL SHEET SIZE 30" x 42"

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California, CA 94105 / 415.956.0688

LOS ANGELES / 5837 Adams Blvd
Culver City, CA 90232 / 323.937.2150

mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
LEVEL 06 FLOOR PLAN

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A2.06

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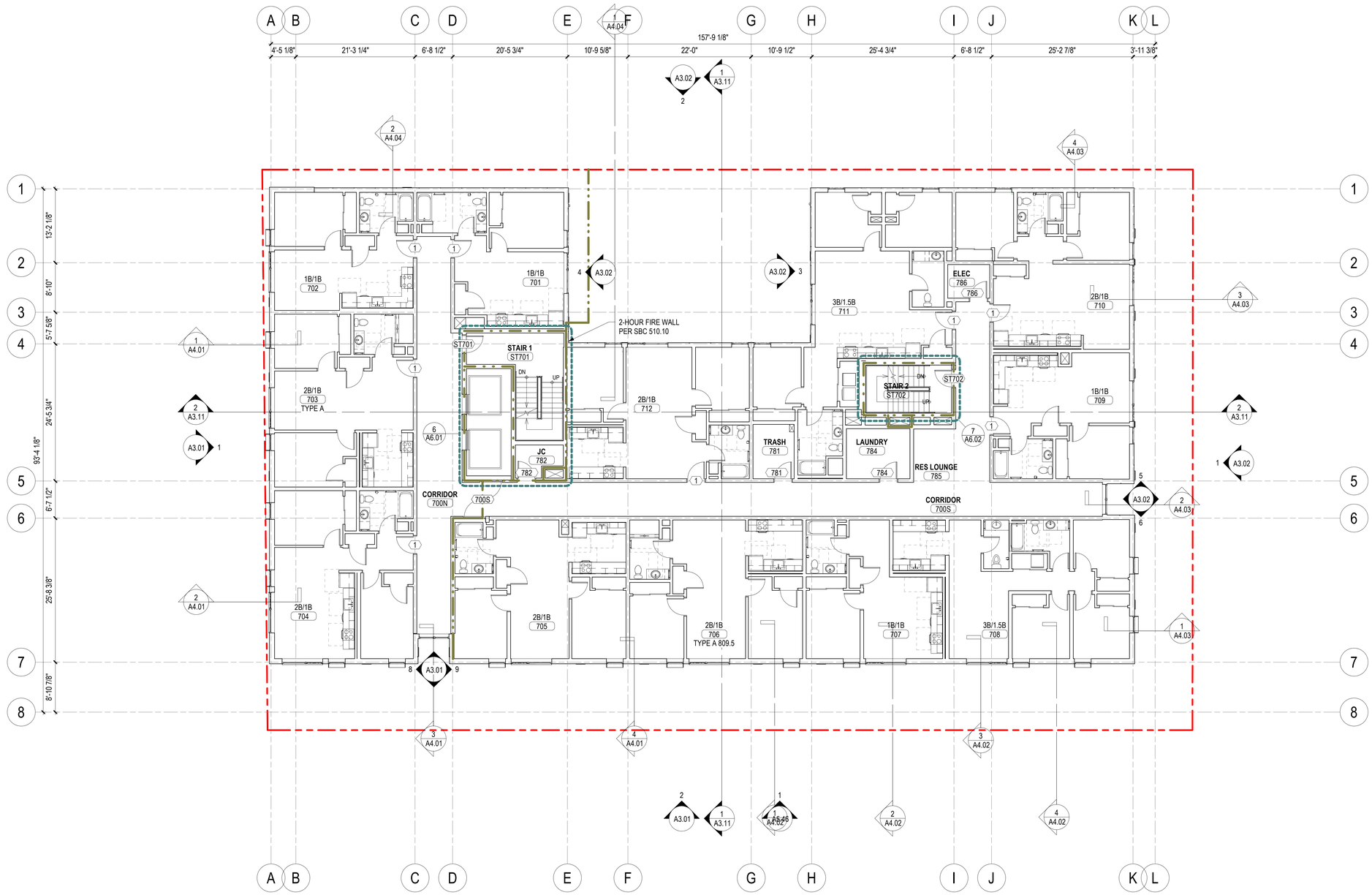
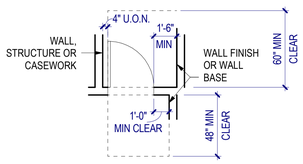


1 LEVEL 07

1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



FLOOR PLAN NOTES

1. ALL RESIDENTIAL UNIT WALLS, PARTITIONS, AND FLOOR/CEILING ASSEMBLIES SEPARATING UNITS FROM EACH OTHER OR FROM PUBLIC OR SERVICE AREAS SHALL HAVE A SOUND TRANMISSION CLASS (STC) RATING OF NOT LESS THAN 50 (45 IF FIELD-TESTED) IN ACCORDANCE WITH THE SEATTLE BULDING CODE.

2. SHAFTS INCLUDING MECHANICAL, STAIR AND ELEVATOR ARE TWO-HOUR RATED FIRE BARRIERS.

3. RESIDENTIAL CORRIDORS AND APARTMENT DEMISING WALLS ARE ONE-HOUR RATED FIRE PARTITIONS.

4. LEVEL 3 BEARING WALLS SUPPORTING LEVEL 4 FLOOR FRAMING ARE TWO-HOUR FIRE RESISTANCE RATED.

.

5. LEVEL 4 FLOOR FRAMING IS A HORIZTONAL FLOOR/CEILING ASSEMBLY WITH A TWO-HOUR FIRE RESISTANCE RATING.

6. ALL EXTERIOR WALLS ARE NON-COMBUSTIBLE.

7. ALL EXTERIOR BEARING WALLS ARE TWO-HOUR FIRE RESISTANCE RATED. ALL INTERIOR BEARING WALLS ARE ONE-HOUR FIRE RESISTANCE RATED MINIMUM.

8. PRIMARY ELEVATOR RECALL IS AT LEVEL 1. SECONDARY ELEVATOR RECALL IS AT LEVEL 3

9. LEVEL 3 THROUGH 8 DIMENSIONS. FLOOR PLANS WALLS ARE DIMENSIONED TO GRIDLINE OR CENTERLINE OF WOOD FRAMING ELEMENT, UNLESS NOTED OTHERWISE.
A. GRIDLINES ARE LOCATED AT FACE OF EXTERIOR SHEATHIGN PANEL AT EXTERIOR WALLS.
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ORIGINAL SHEET SIZE 30" x 42"

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LEVEL 07 FLOOR PLAN

PROJECT NO.
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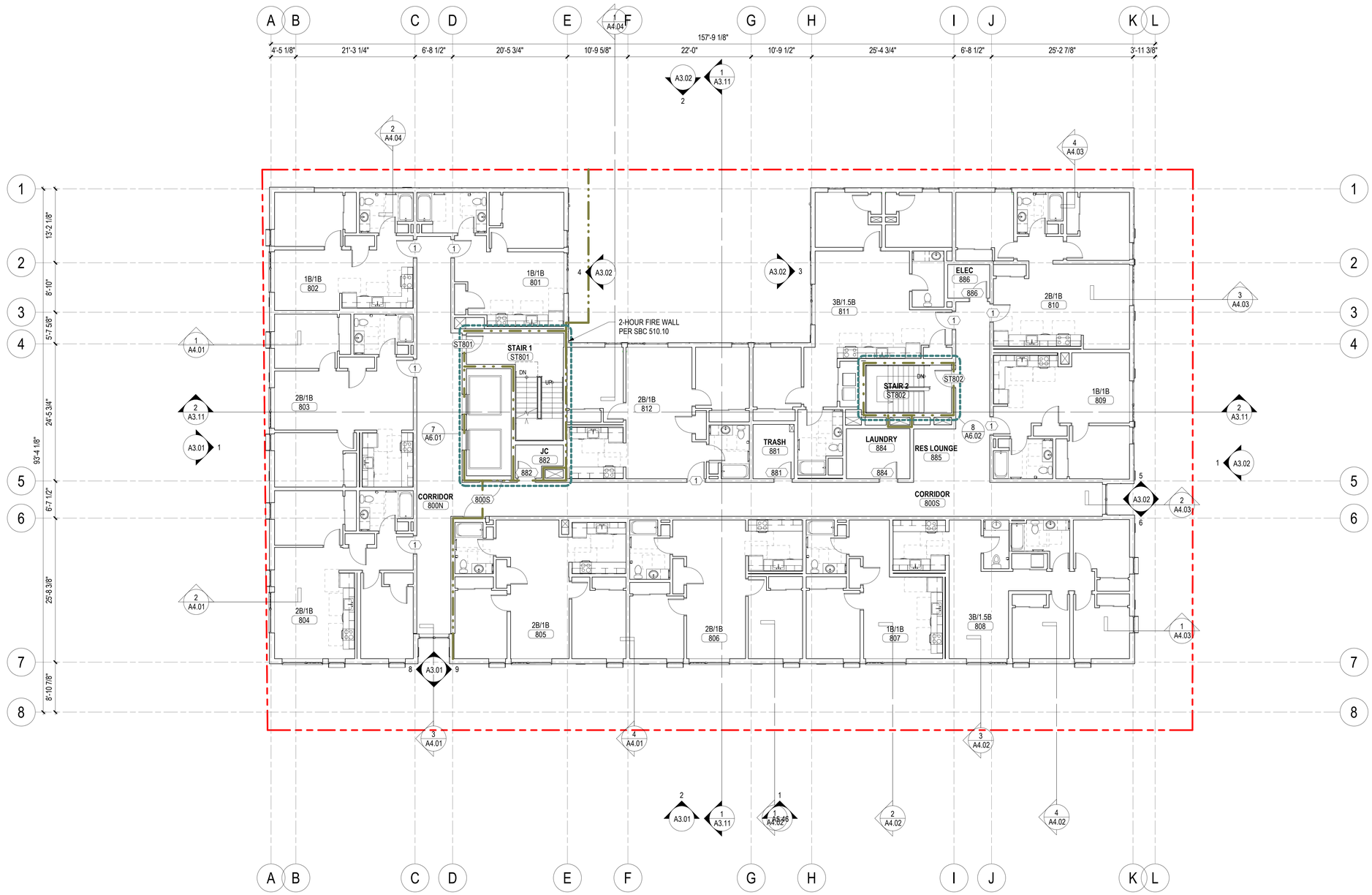
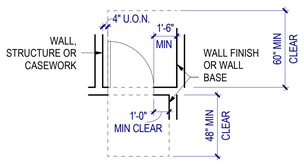


1 LEVEL 08
1/8" = 1'-0"

N

DOOR LAYOUT - CLEARANCES



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TITLE
LEVEL 08 FLOOR PLAN

PROJECT NO.
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DATE
09/10/24
SHEET NUMBER
A2.08

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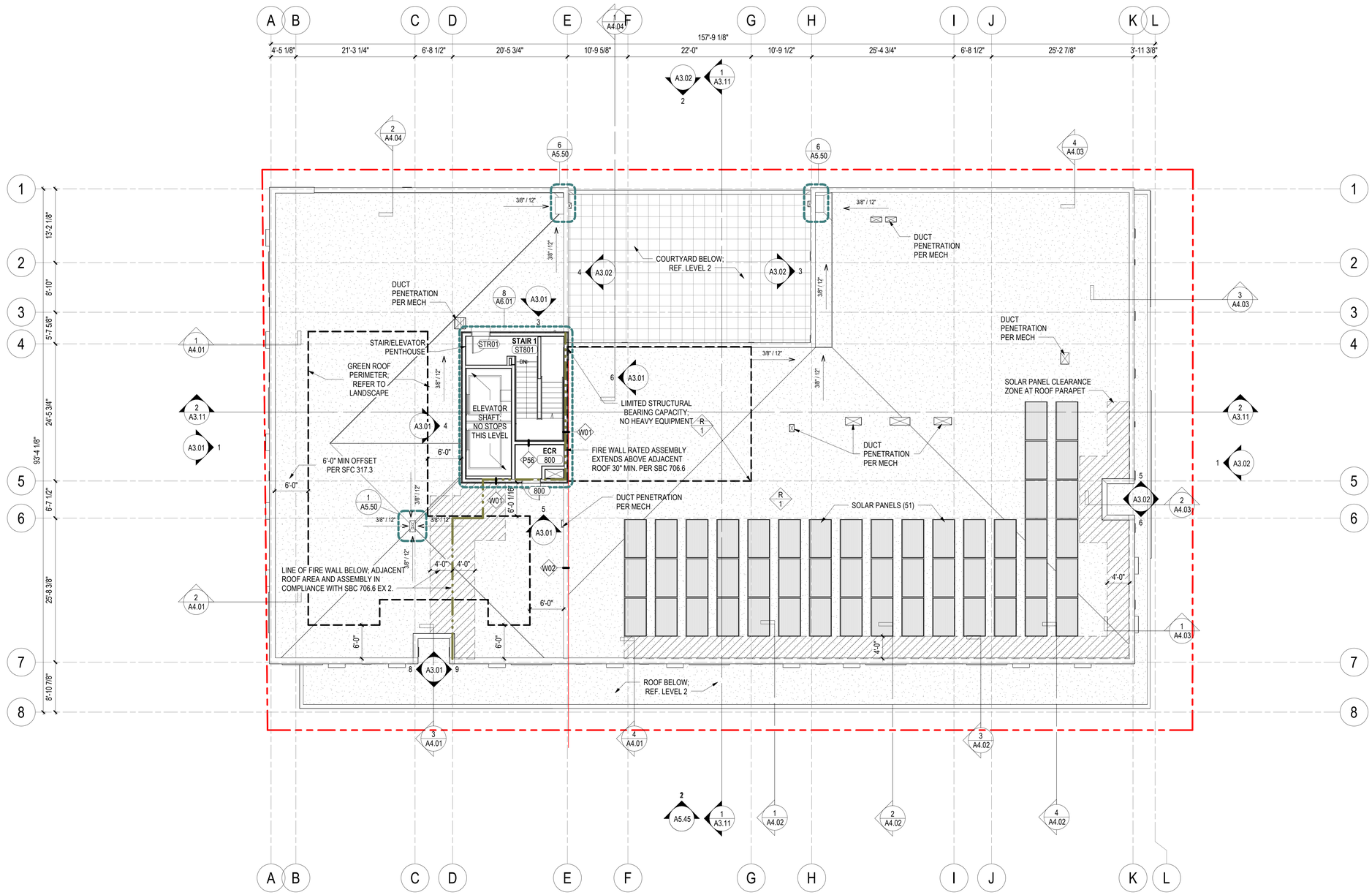
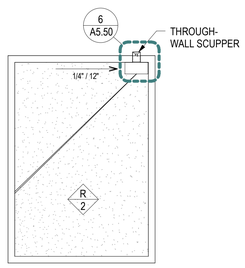
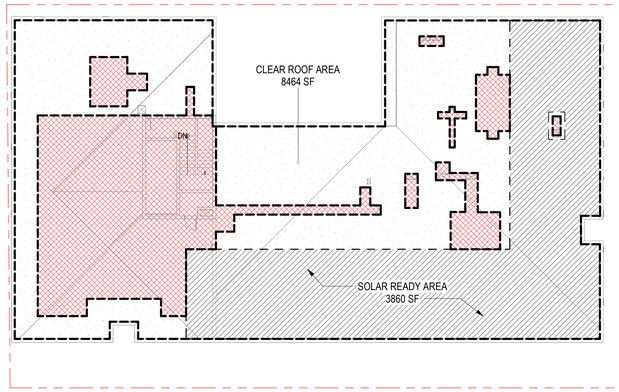


1 ROOF
1/8" = 1'-0"

N



2 ROOF PENTHOUSE
1/8" = 1'-0" | 1/00-PRES_05



PER C411.3.1, 40% OF ROOF AREA SHALL BE DESIGNATED AS SOLAR READY

CLEAR ROOF AREA: 8,464
40% OR CLEAR ROOF AREA: 3,386 SF
AREA PROVIDED AS SOLAR READY: 3,860 SF [COMPLIES]

3 MINIMUM SOLAR-READY AREA DIAGRAM
1/16" = 1'-0" | 1/00-PRES_05

ROOF PLAN NOTES

1. PER SFD; MAINTAIN A MINIMUM 6FT CLEARANCE FROM GREEN ROOF ELEMENTS TO INSIDE FACE OF PARAPET.

2. PER SFD; MAINTAIN A MINIMUM 4FT CLEARANCE FROM SOLAR PANELS TO INSIDE FACE OF PARAPET.

4. SEE MEP DRAWINGS FOR ALL ROOF LOCATED EQUIPMENT AND CURB LOCATIONS.

3. FALL ARREST ANCHORS; LAYOUT AND EGINEERING IS DELEGATED DESIGN. SEE STRUCTURAL DRAWINGS FOR ANCHOR ATTACHEMENT REQUIREMENTS.

4. PHOTOVOLTAIC ARRAY SYSTEM AS REQUIRED TO MEET SEATTLE ENERGY CODE AND WASHINGTON STATE ESDS REQUIRMENTS. REFER TO ENERGY CODE CALCULATIONS ON G3.31.

0 4' 8' 16' 24'
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TITLE
ROOF PLAN

PROJECT NO.
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DATE
09/10/24
SHEET NUMBER
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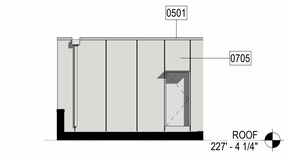
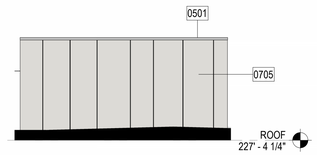
1 NORTH ELEVATION
1/8" = 1'-0" | 1/A2.01

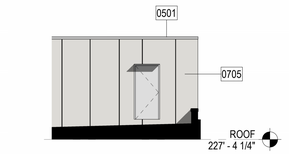
2 WEST ELEVATION
1/8" = 1'-0" | 1/A2.01



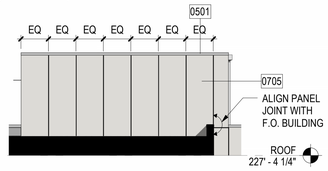
3 PH ELEVATION - EAST
1/8" = 1'-0" | 1/A2.09



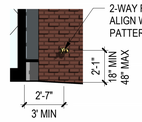
4 PH ELEVATION - NORTH
1/8" = 1'-0" | 1/A2.09



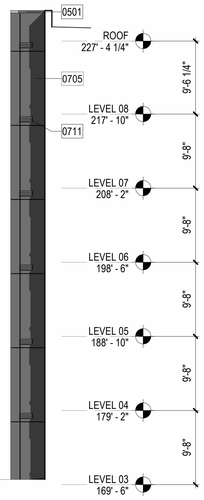
5 PH ELEVATION - WEST
1/8" = 1'-0" | 1/A2.09



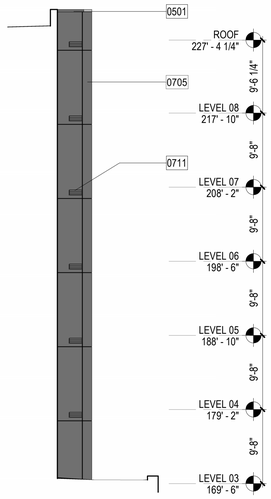
6 PH ELEVATION - SOUTH
1/8" = 1'-0" | 1/A2.09



7 FIRE CONNECTION
1/4" = 1'-0" | 1/A3.01



8 WR ELEVATION - NORTH
1/8" = 1'-0" | 1/A2.03



9 WR ELEVATION - SOUTH
1/8" = 1'-0" | 1/A2.03

FCP COLOR LEGEND

P-1
Sherwin-Williams
Gossamer Veil
SW 9165

P-2
Benjamin Moore
Fresh Clay
2093-20

NO.	DESCRIPTION
0302	CONCRETE STEM WALLS, WITH ELASTOMERIC COATING
0401	BRICK VENEER, TYPICAL
0402	THIN BRICK VENEER, TYPICAL
0408	EXPANSION JOINT AT BRICK VENEER, TYPICAL
0409	EXPANSION JOINT AT THIN BRICK VENEER, TYPICAL
0501	SHEET METAL COPING, PAINTED TO MATCH ADJACENT WALL COLOR
0505	CANOPY ASSEMBLY, PRE-FINISHED CORRUGATED METAL ROOFING WITH STEEL CHANNEL FRAME AND SUPPORT,PAINTED TO MATCH STOREFRONT COLOR, WITH WOOD SOFFIT, STAINED
0702	HORIZONTAL THRU WALL FLASHING, ALIGN WITH WINDOW HEAD FLASHING AT EACH LEVEL
0705	FIBER CEMENT PANEL PAINTED, P-1
0706	FIBER CEMENT PANEL PAINTED, P-2
0711	METAL EXHAUST VENT, PAINTED TO MATCH ADJACENT WALL
0713	SHEET METAL WINDOW TRIM, PAINTED TO MATCH WINDOW COLOR
0714	SHEET METAL WINDOW SHROUD, INSIDE SURFACE PAINTED, TBD; OUTSIDE SURFACE PAINTED TO MATCH WINDOW COLOR
0801	ALUMINUM STOREFRONT SYSTEM, TYPICAL
0803	VINYL WINDOW, TYPICAL
0808	WOOD EXTERIOR DOOR, STAINED
0814	ALUMINUM OPERABLE WINDOW, PRE-FINISHED
0817	ALUMINUM BI-FOLDING DOOR SYSTEM, PRE-FINISHED
0818	PRE-FINISHED ALUMINUM LOUVER, COLOR TO MATCH STOREFRONT
1001	SIGNAGE: BUILDING NAME
1002	SIGNAGE: BUILDING ADDRESS
2101	2-WAY FIRE DEPARTMENT CONNECTION

ORIGINAL SHEET SIZE 30" x 42"

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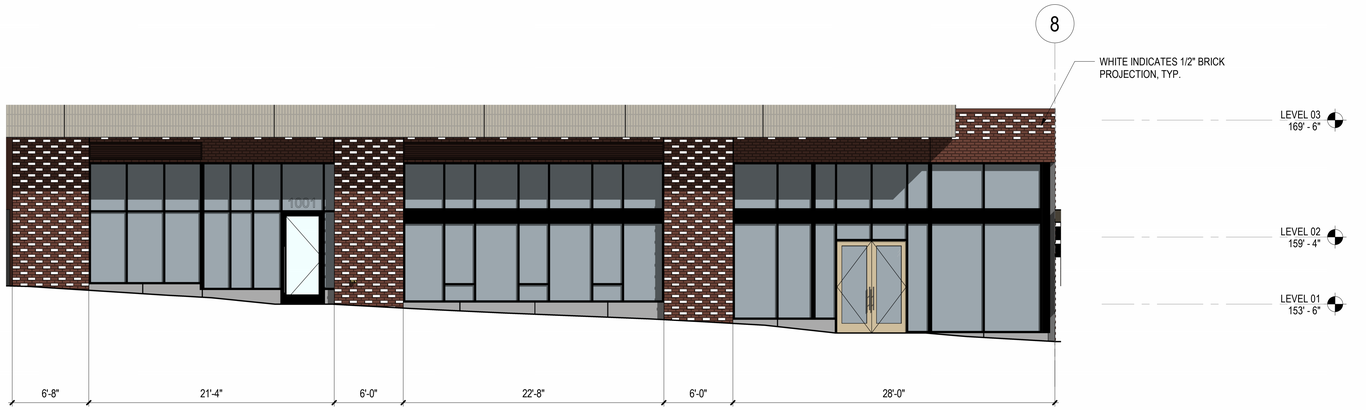
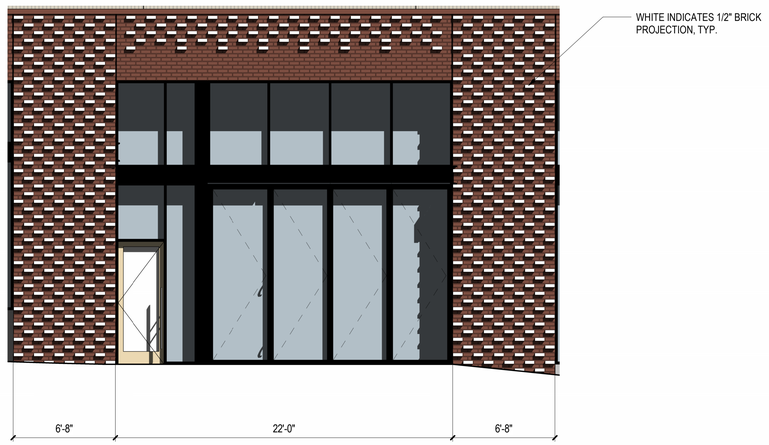


1 ENLARGED BRICK PATTER - NORTH OVERALL

3/16" = 1'-0" | 1/A2.03

2 ENLARGED BRICK PATTERN - WEST OVERALL

3/16" = 1'-0" | 1/A2.03



3 ENLARGED BRICK PATTERN - TYPICAL BETWEEN PILASTERS

1/4" = 1'-0" | 1/A201

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
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PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
ENLARGED ELEVATIONS

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
A3.03

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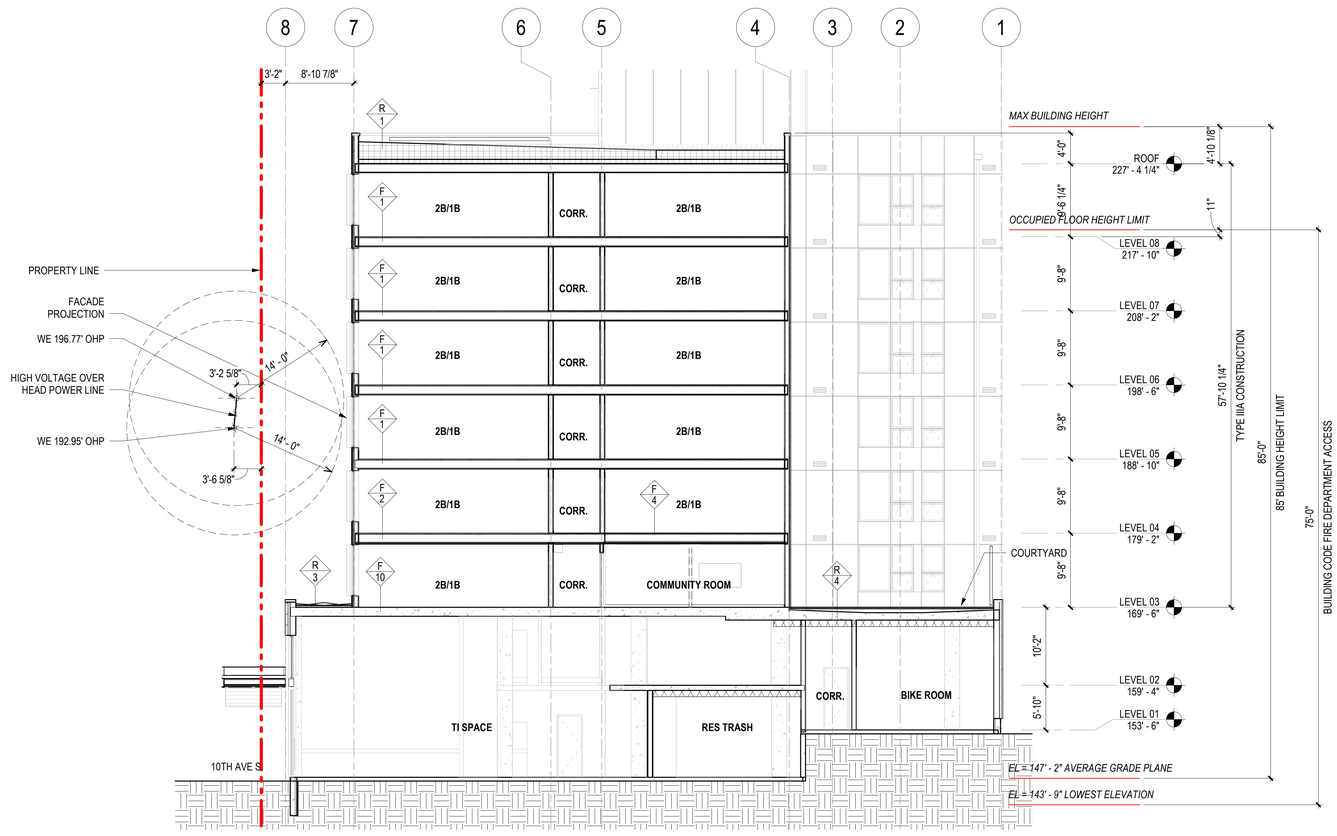
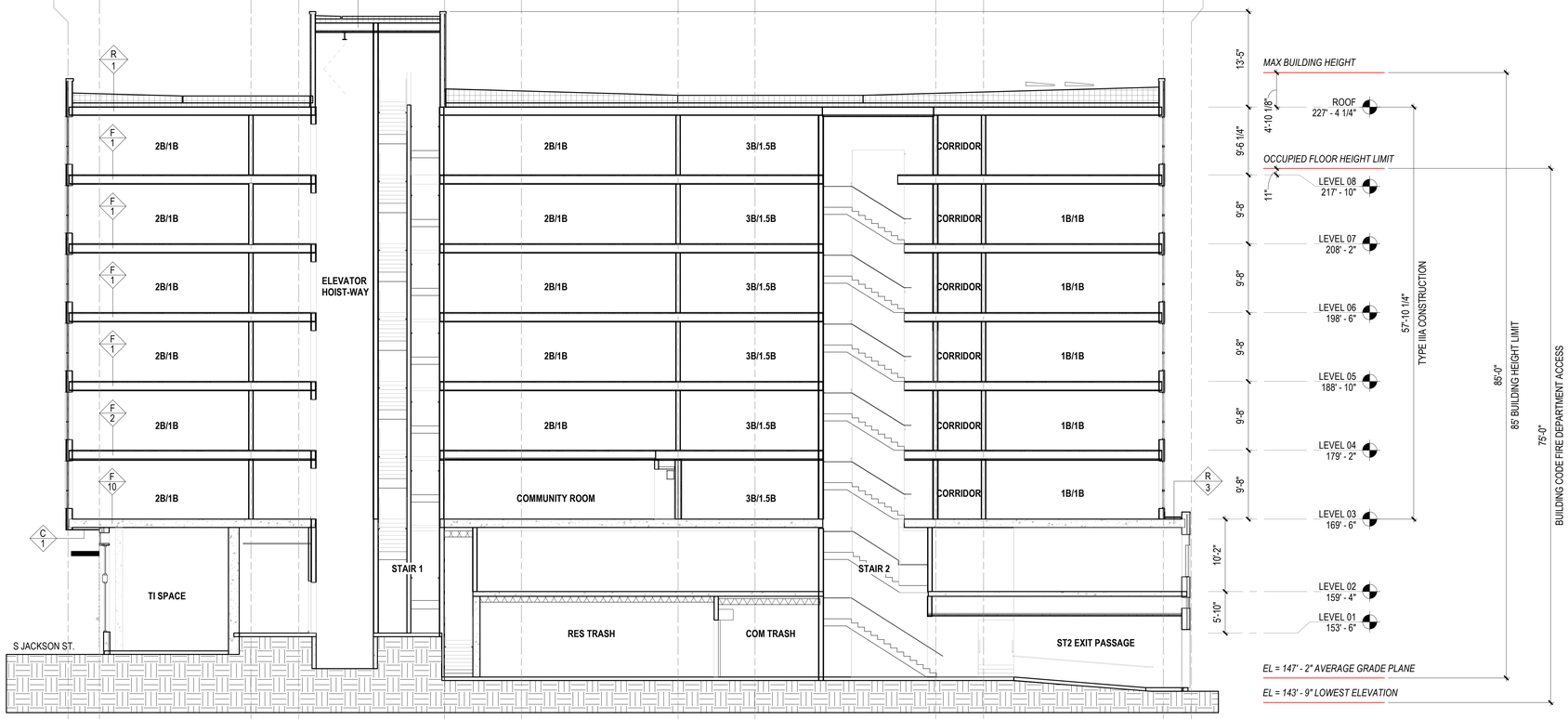


1 BUILDING SECTION 1 - NORTH
1/8" = 1'-0" | 1/A2.01



2 BUILDING SECTION 2 - EAST
1/8" = 1'-0" | 1/A2.01

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LOCATION
1001 S Jackson
Seattle, Washington
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SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

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TITLE
BUILDING SECTIONS

PROJECT NO.
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SHEET NUMBER
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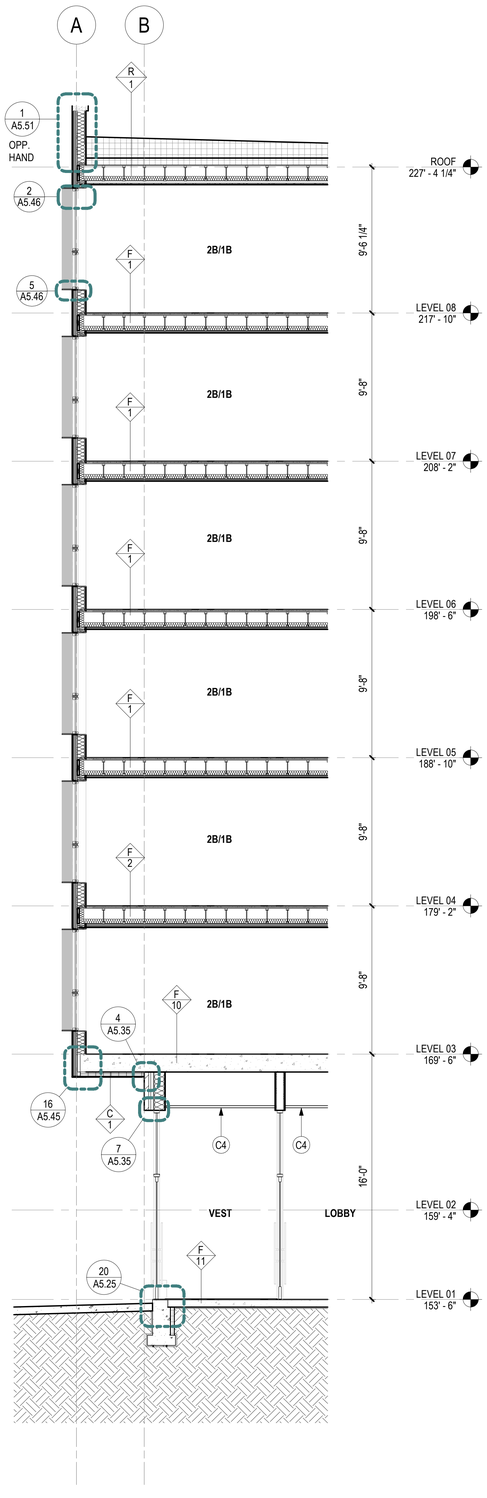
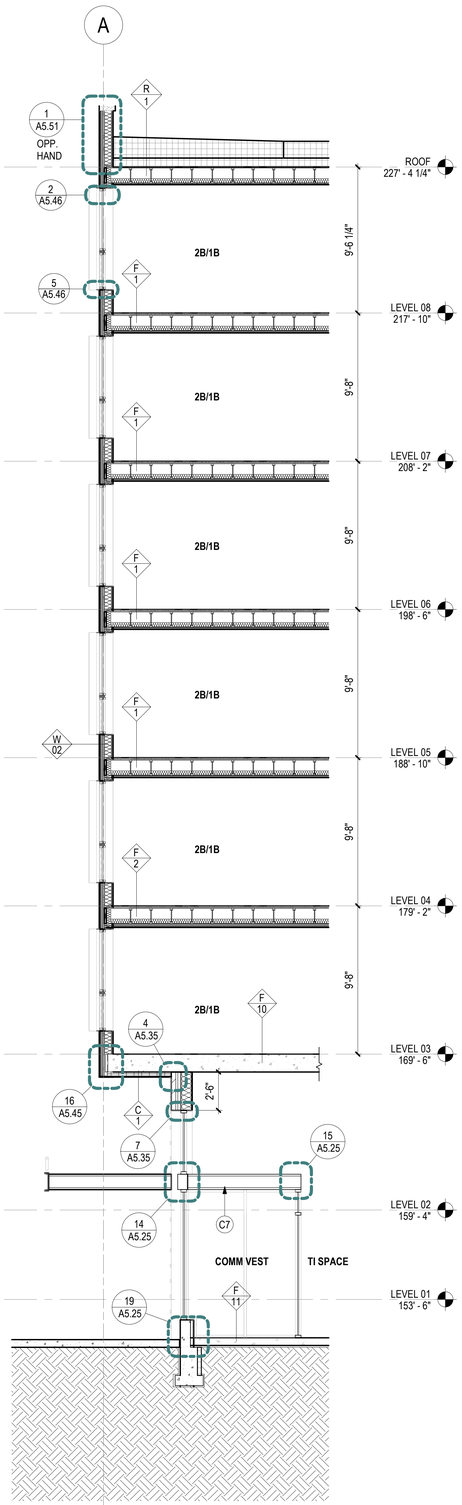
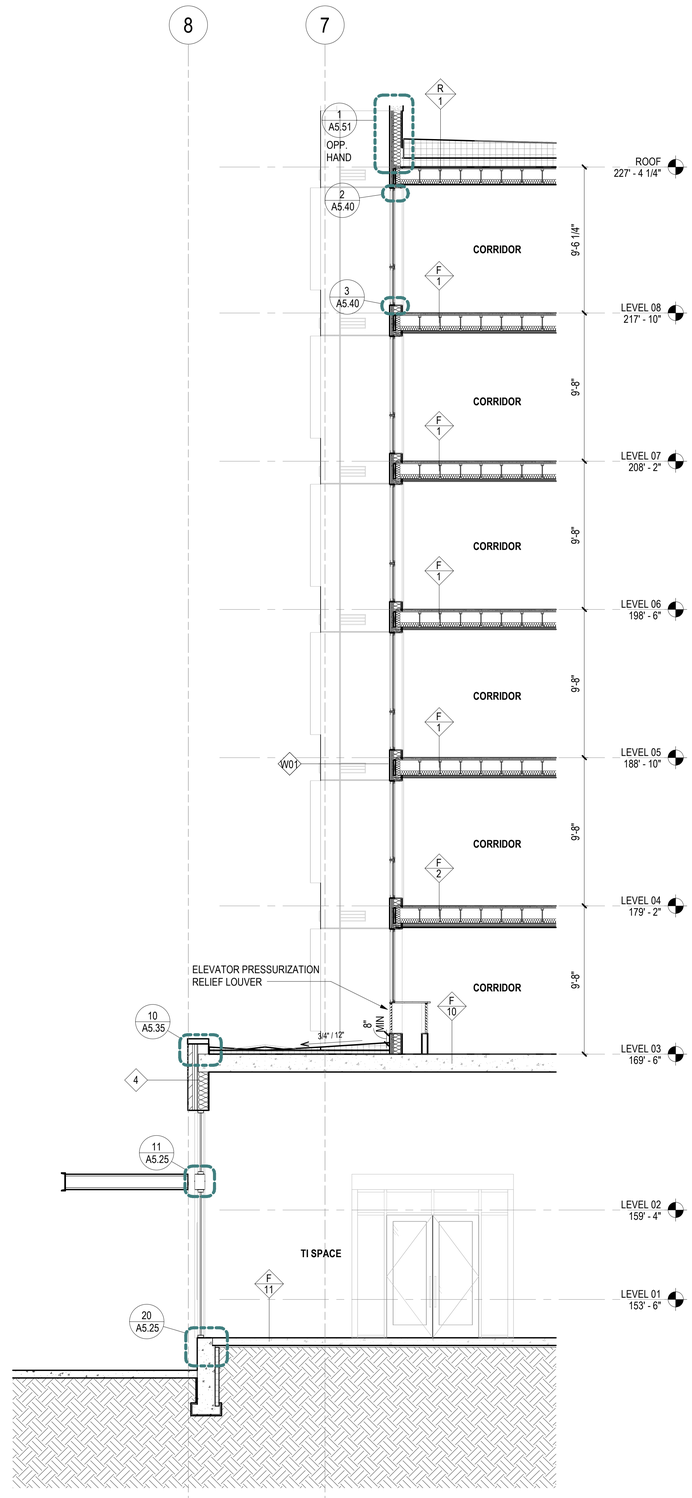


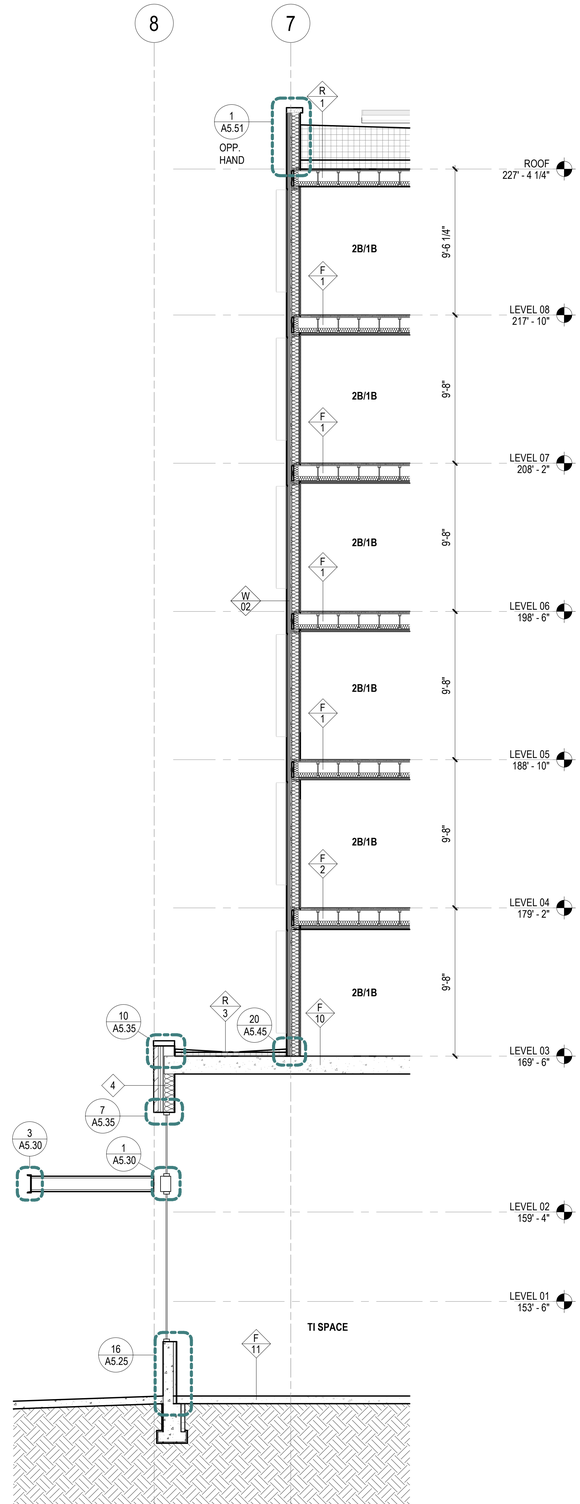
1 WALL SECTION 1
1/4" = 1'-0" | 1/A2.01



2 WALL SECTION 2
1/4" = 1'-0" | 1/A2.01



3 WALL SECTION 3
1/4" = 1'-0" | 1/A2.01



4 WALL SECTION 4
1/4" = 1'-0" | 1/A2.01

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LOCATION
1001 S Jackson
Seattle, Washington
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PREPARED FOR
SCIDpda / Friends of Little Saigon

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WALL SECTIONS

PROJECT NO.
2324000
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09/10/24
SHEET NUMBER
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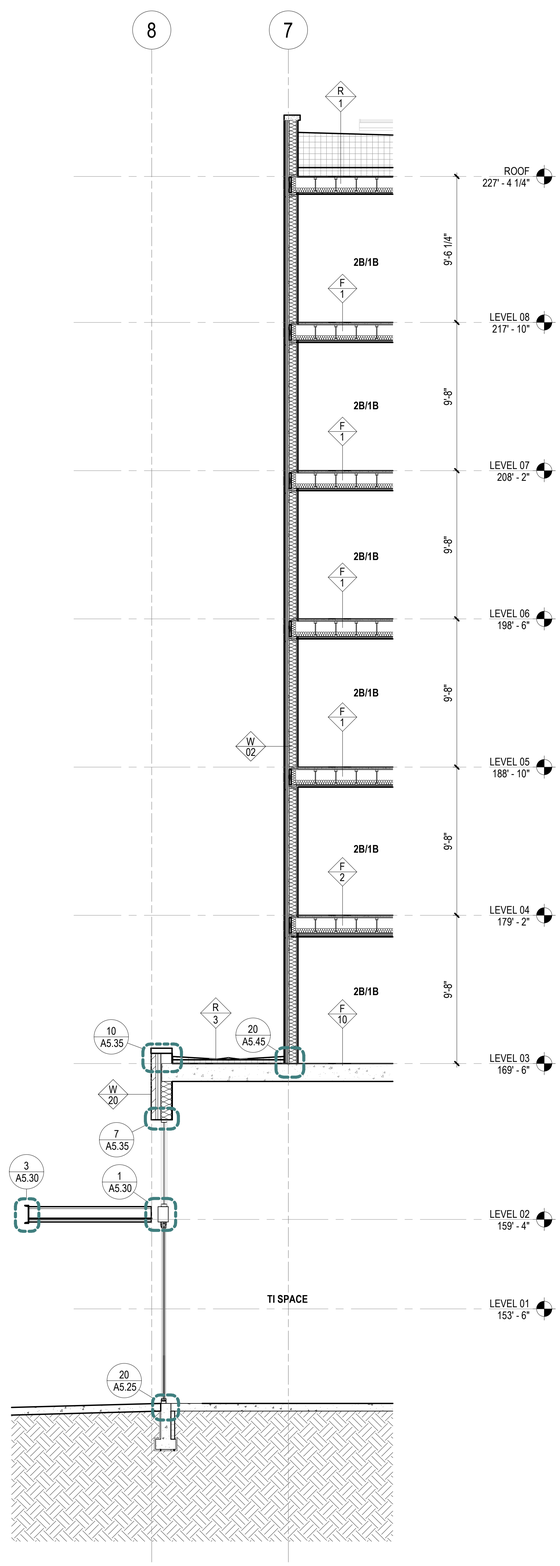
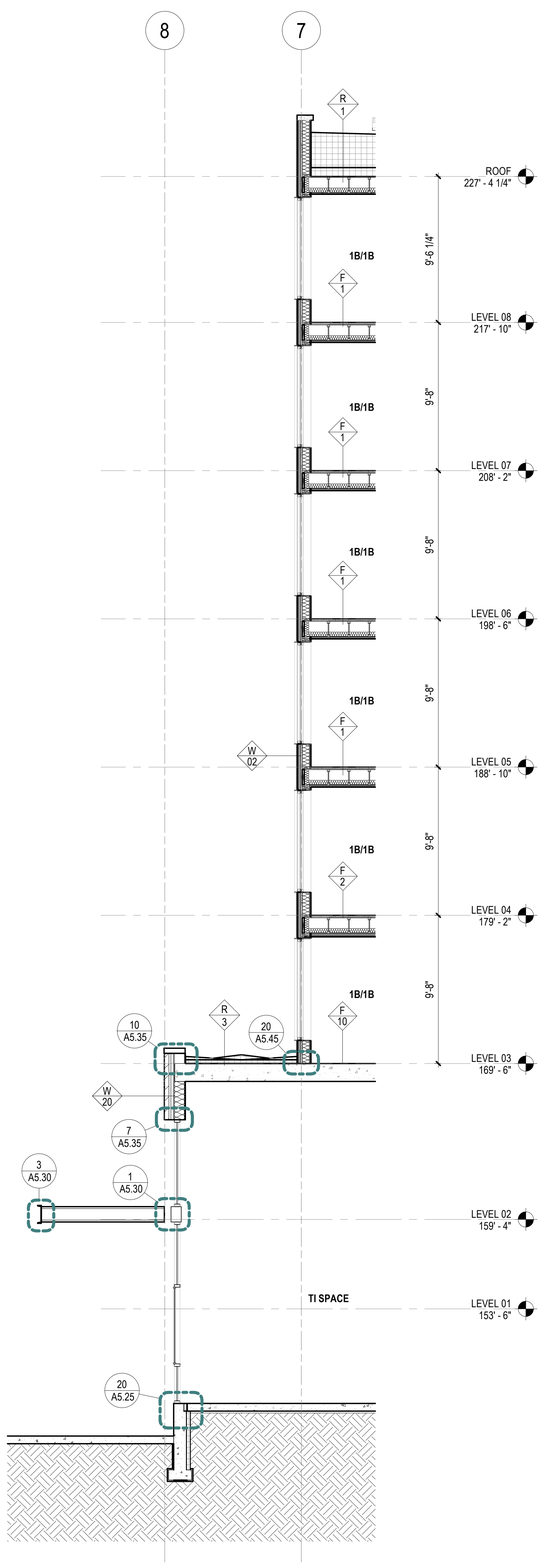
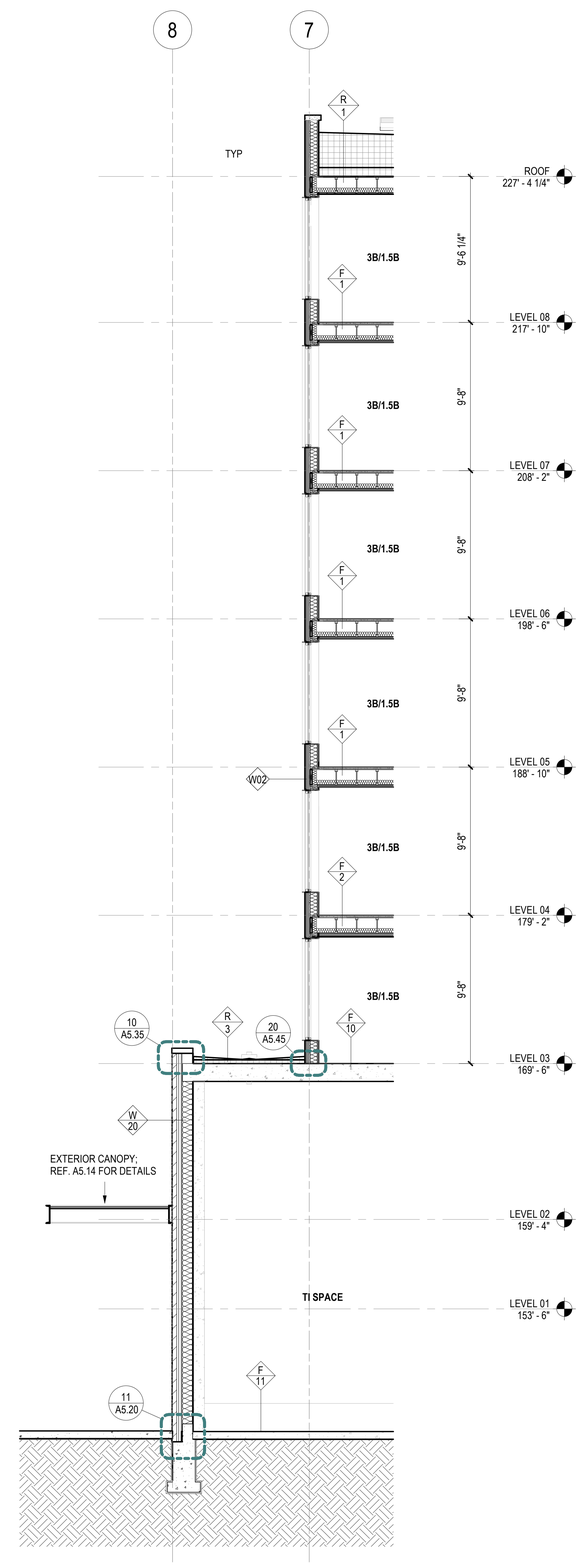


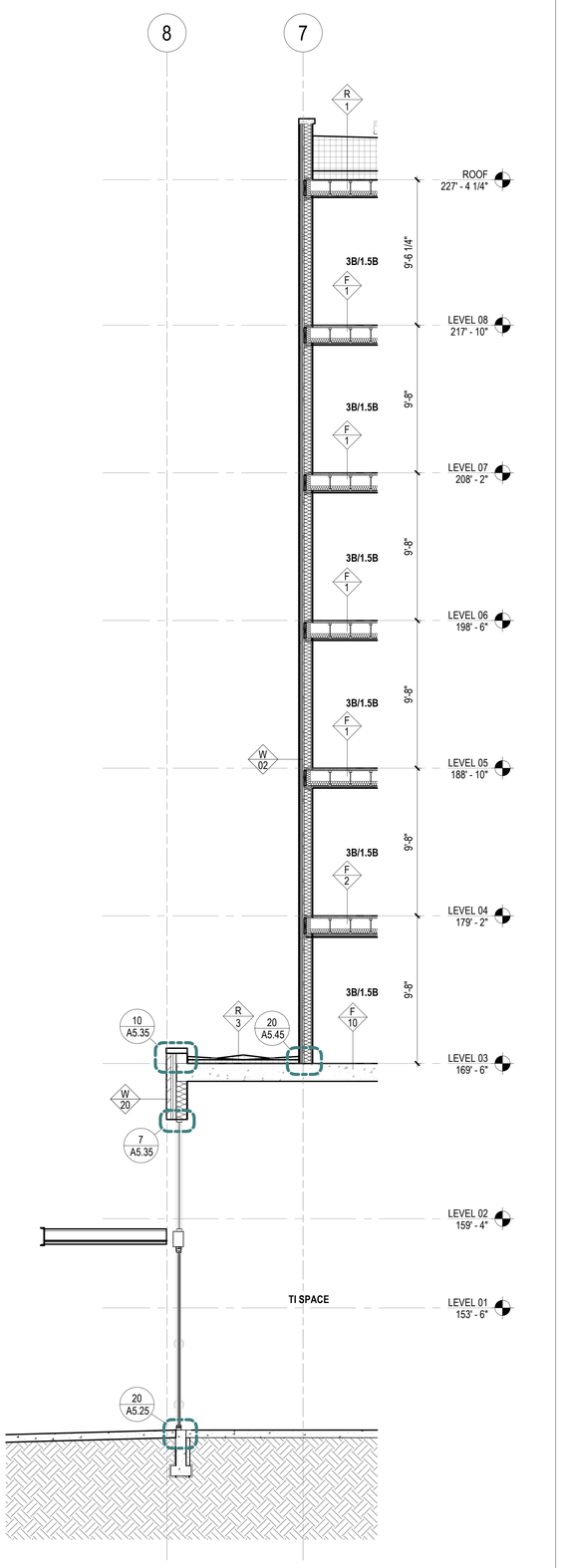
1 WALL SECTION 5
1/4" = 1'-0" | 1/A2.01



2 WALL SECTION 7
1/4" = 1'-0" | 1/A2.01



3 WALL SECTION 6
1/4" = 1'-0" | 1/A2.01



4 WALL SECTION 8
1/4" = 1'-0" | 1/A2.01

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PROJECT
Little Saigon Landmark

LOCATION
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Seattle, Washington
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SCIDpda / Friends of Little Saigon

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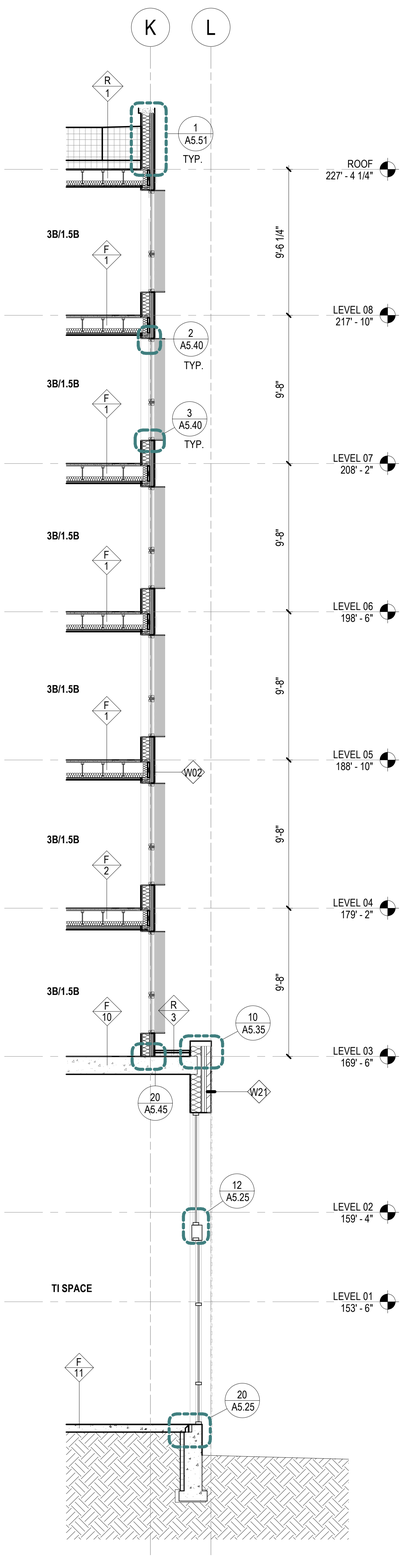
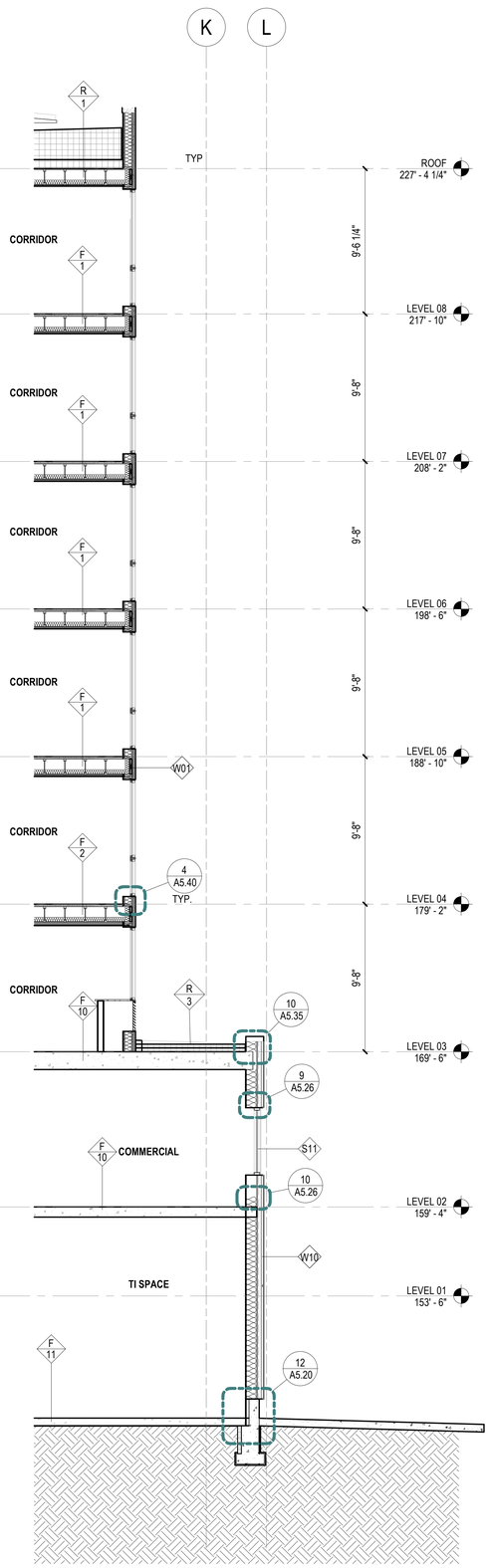
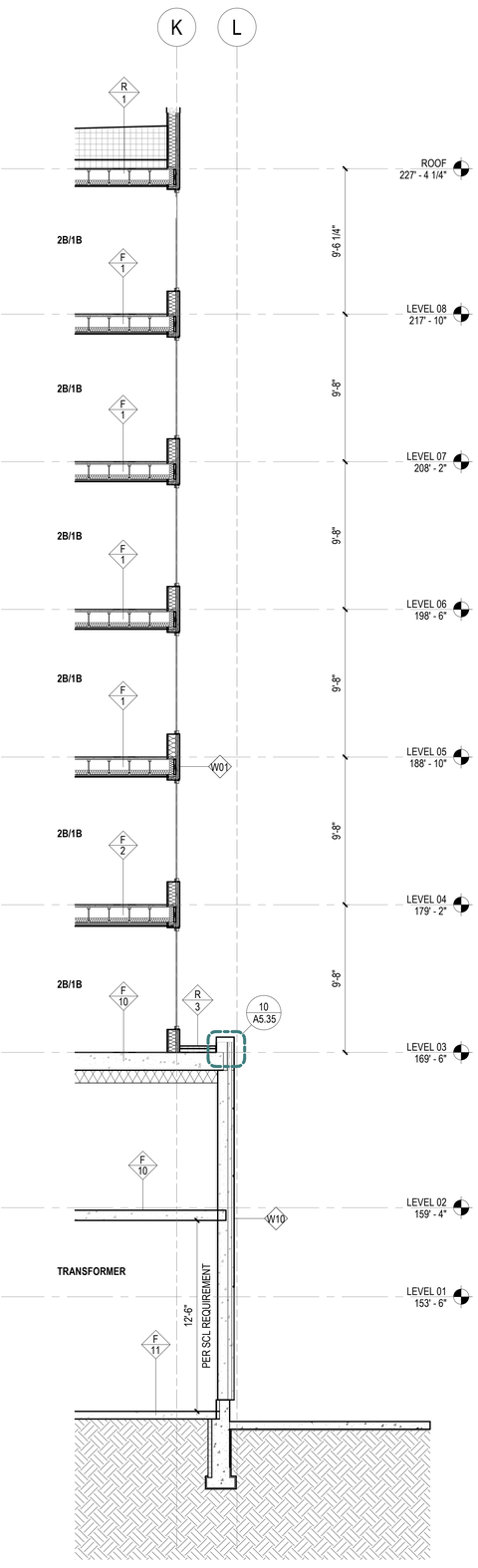


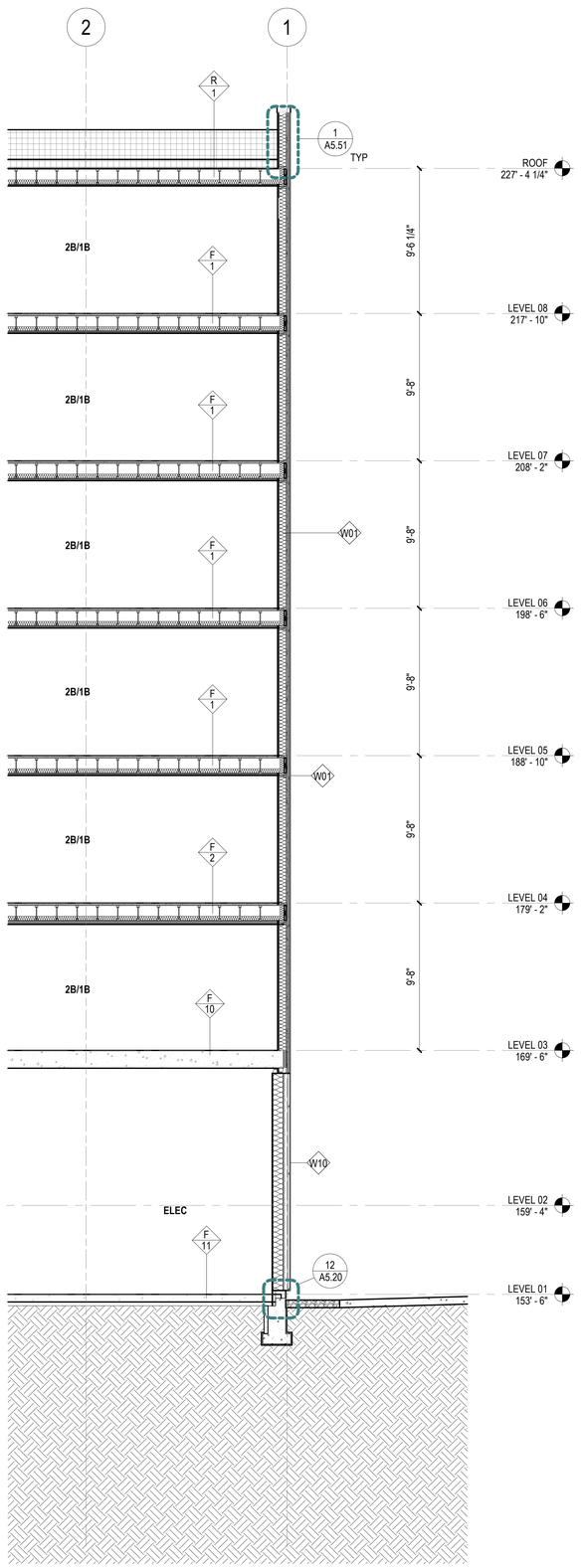
1 WALL SECTION 9
1/4" = 1'-0" | 1/A2.01



2 WALL SECTION 10
1/4" = 1'-0" | 1/A2.01



3 WALL SECTION 11
1/4" = 1'-0" | 1/A2.01



4 WALL SECTION 12
1/4" = 1'-0" | 1/A2.01

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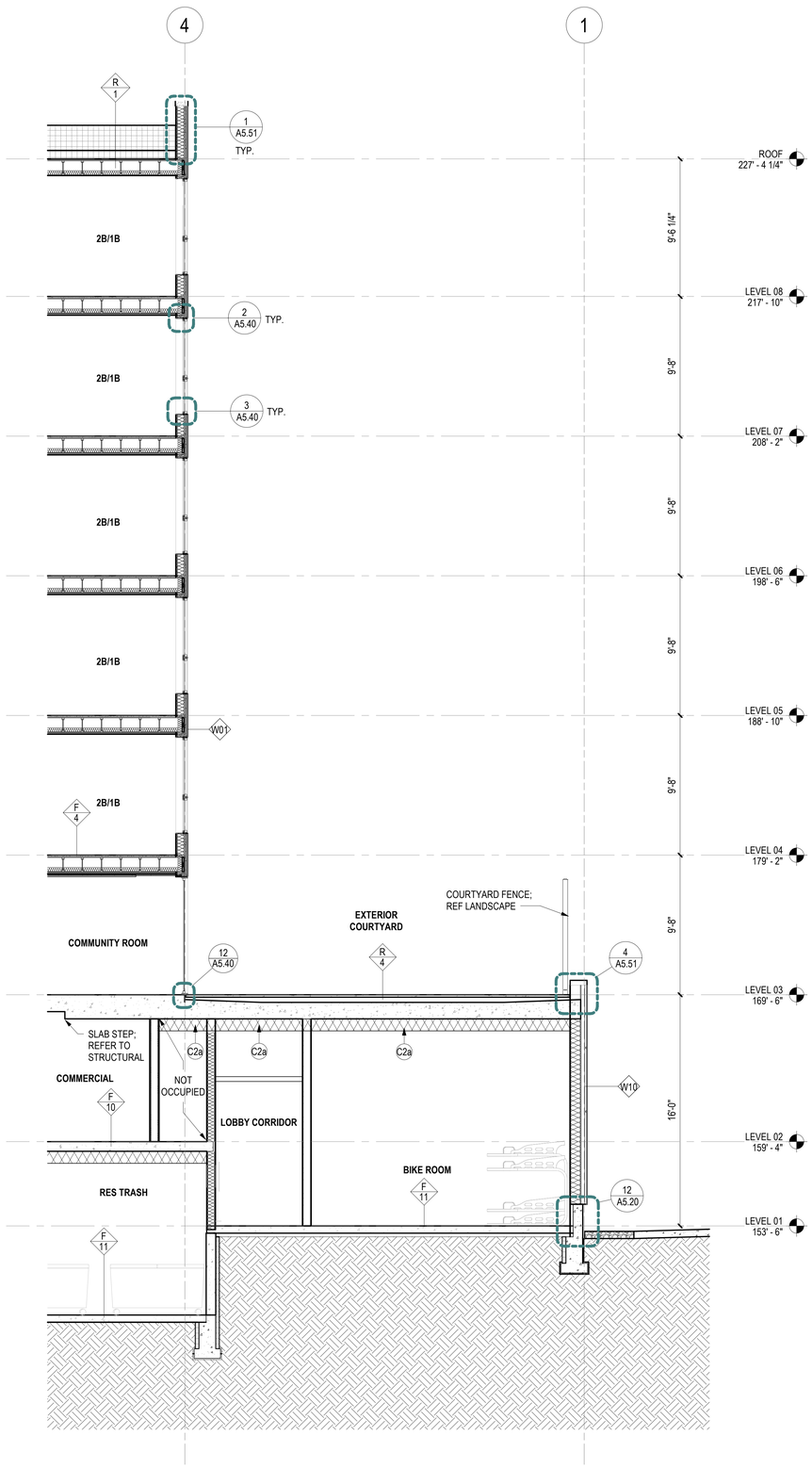
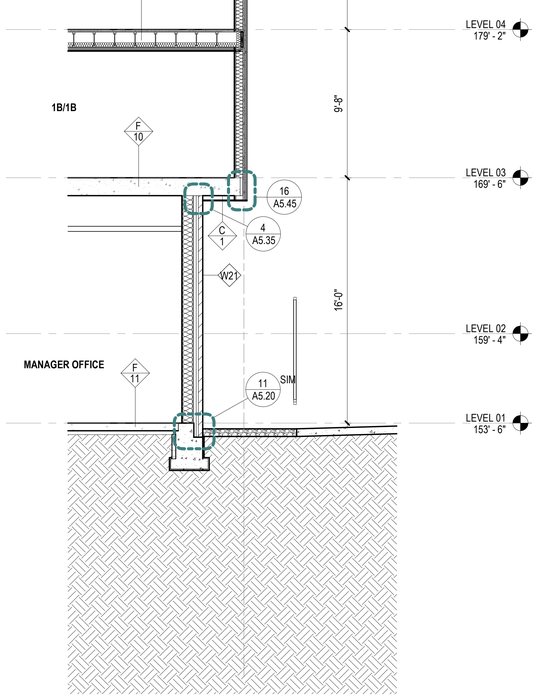


1 WALL SECTION 13
1/4" = 1'-0" | 1/A2.01



2 WALL SECTION 14
1/4" = 1'-0" | 1/A2.01

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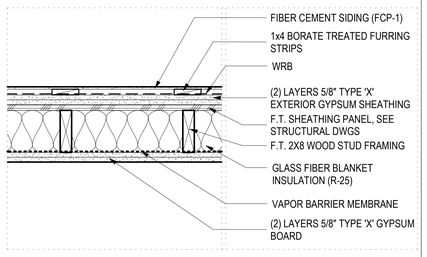
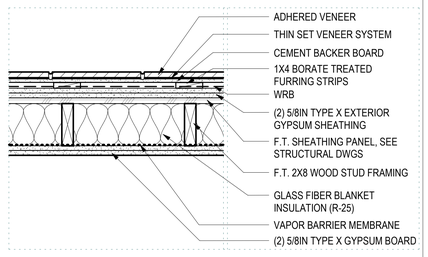
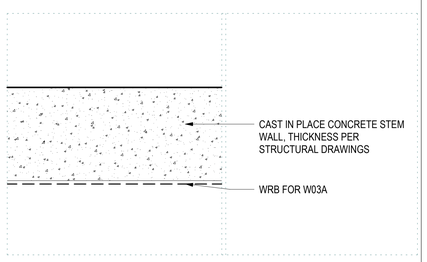


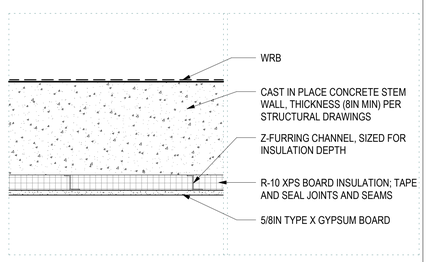
FCP CLADDING ON WOOD FRAMING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W01	R25		2HR	GA WP-8105



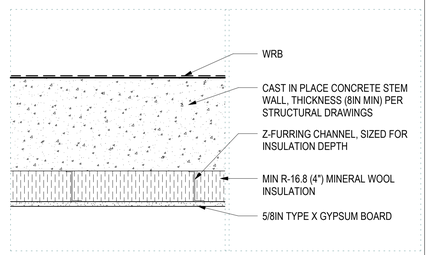
THIN BRICK CLADDING ON WOOD FRAMING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W02	R25		2HR	GA WP-8105



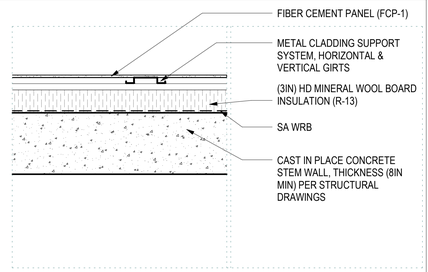
CONCRETE STEM WALL	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W03A & W03B	0		4HR	IBC 722.2.1.1



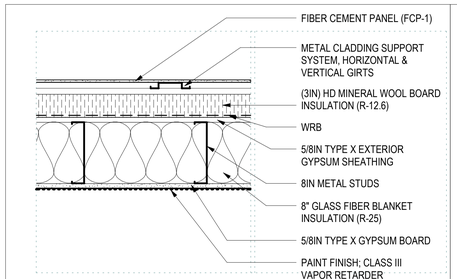
CONCRETE STEM WALL - INSULATED	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W04	R10		4HR	IBC 722.2.1.1



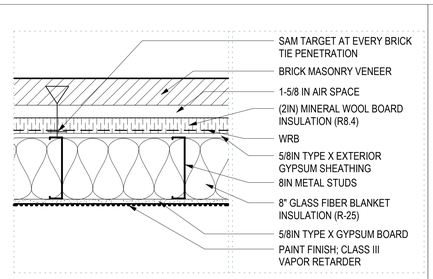
CONCRETE STEM WALL - INSULATED	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W05	R10		4HR	IBC 722.2.1.1



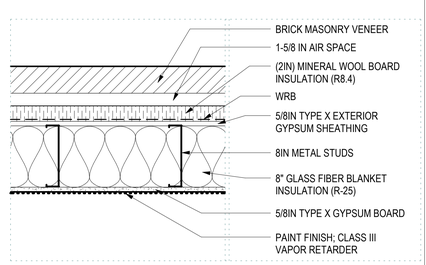
FCP CLADDING ON CONCRETE	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W30			4HR	IBC 722.2.1.1



FCP CLADDING ON METAL FRAMING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W10	R37		1HR	GA WP 8005



BRICK CLADDING ON METAL FRAMING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W20	R33		NR	UL V454



BRICK CLADDING ON METAL FRAMING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
W21	R33		1HR	UL V454

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17. AIR BARRIER: SEAL PLYWOOD AND GYPSUM SHEATHING JOINTS AND PENETRATIONS.

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mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
BUILDING ASSEMBLIES - EXTERIOR WALLS

PROJECT NO.
2324000
DATE
09/17/24
SHEET NUMBER
A5.00

90% CD SET

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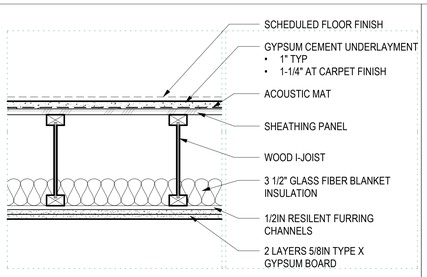
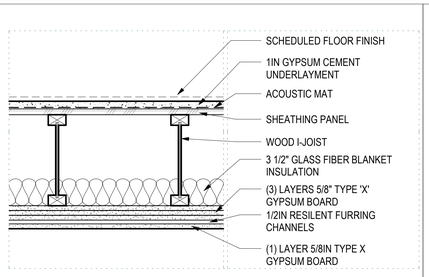
ORIGINAL SHEET SIZE: 30" x 42"

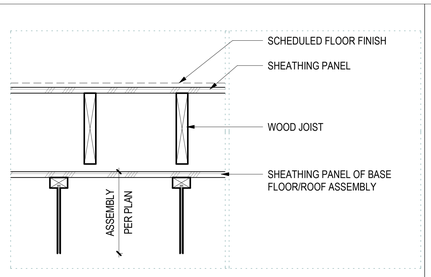
FLOOR ASSEMBLIES



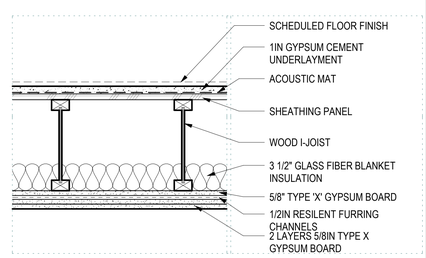
WOOD FRAMED FLOOR/CEILING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
F1	STC-54	EST	1HR	UL L589



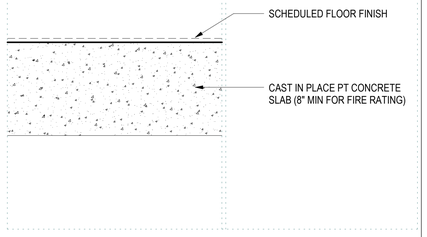
WOOD FRAMED FLOOR/CEILING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
F2	STC-54	EST	2HR	GA FC 5750



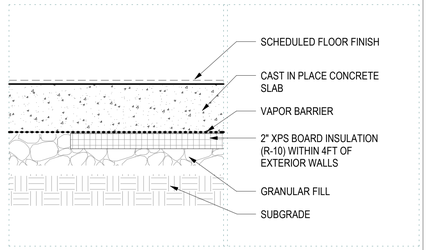
WOOD OVER-FRAMED FLOOR	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
F3	STC-54	EST	2HR	UL L589



WOOD FRAMED FLOOR/CEILING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
F4	STC-54	TL81-143	2HR	UL L538

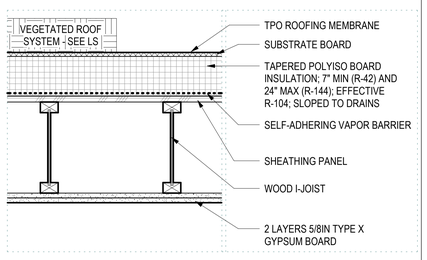


ELEVATED CONCRETE FLOOR/CEILING	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
F10			4HR	IBC 722.2.1.1

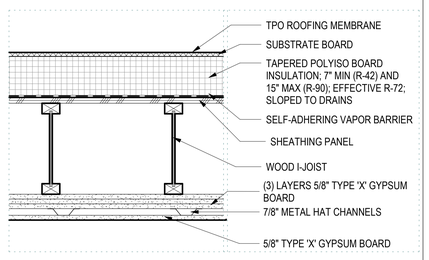


CONCRETE SOG	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
F11	R-10		NR	NA

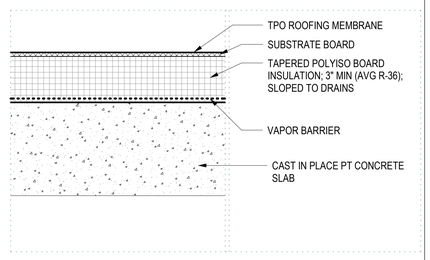
ROOF ASSEMBLIES



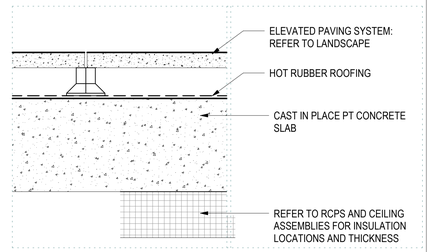
WOOD FRAMED ROOF	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
R1	R-104		1HR	SBC T721.1(3) ITEM 27-1.1



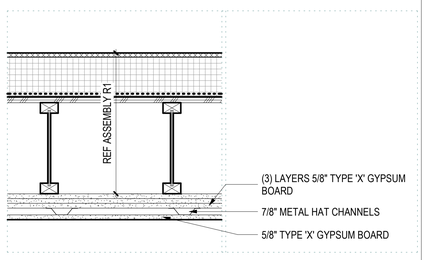
WOOD FRAMED ROOF	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
R2	R-72		2HR	UL L556



ELEVATED CONCRETE ROOF	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
R3	R-36		3HR	SBC T721.1(3) ITEM 4-1.1



ELEVATED CONCRETE ROOF	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
R4	R-45		3HR	SBC T721.1(3) ITEM 4-1.1



WOOD FRAMED ROOF	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
R5	R-104		2HR	UL L556

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California, CA 94105 / 415.956.0688

LOS ANGELES / 5837 Adams Blvd
Culver City, CA 90232 / 323.937.2150

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
A	TBD	Design Revision - A

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
BUILDING ASSEMBLIES - FLOORS & ROOFS

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A5.01

90% CD SET

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ORIGINAL SHEET SIZE: 30" x 42"

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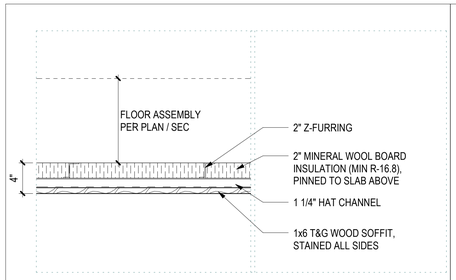
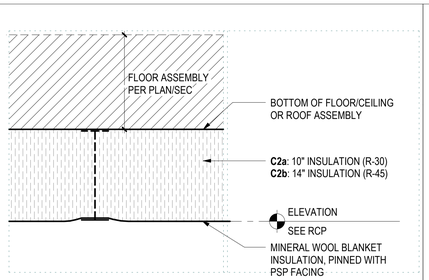
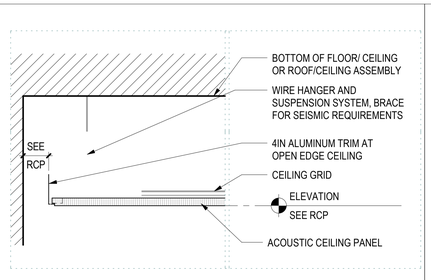
CEILING ASSEMBLIES



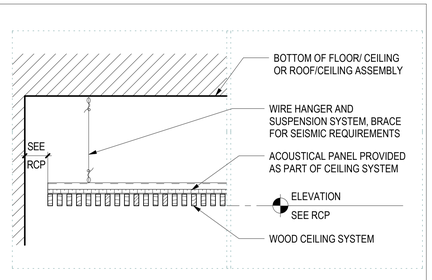
METAL FRAMED SOFFIT	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
C1	R16.8			



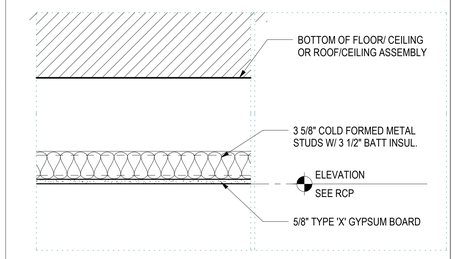
INSULATION	THERMAL		FIRE	
	R-V	U-V	RATING	TEST
C2a & C2b	R-30 R-45		NR	



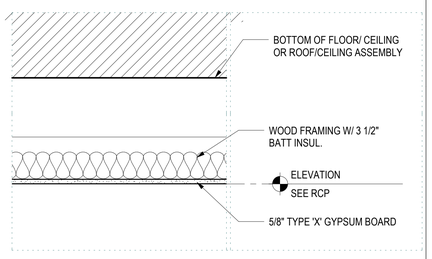
ACOUSTIC CEILING PANEL	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C3			NR	



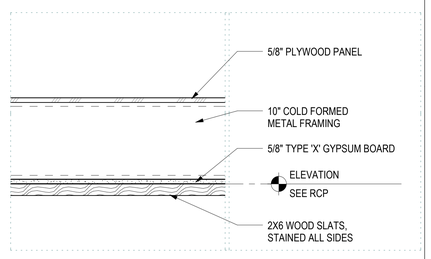
WOOD CEILING SYSTEM	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C4			NR	



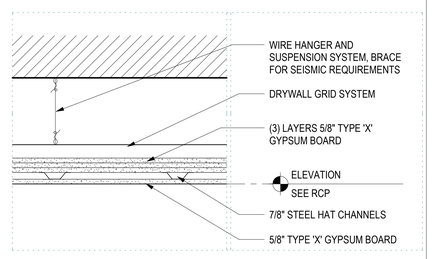
GYPSUM CEILING, METAL FRAMING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C5			NR	



GYPSUM CEILING, WOOD FRAMING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C6			NR	



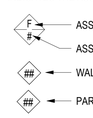
GYPSUM CEILING, METAL FRAMING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C7			NR	



GYPSUM CEILING, METAL FRAMING	STC / ICC		FIRE/ SMOKE	
	RATING	TEST	RATING	TEST
C10			2HR	UL I512

BUILDING ASSEMBLIES NOTES

1. THE BLDG ASSEMBLY SYMBOL CONSISTS OF 2 ELEMENTS: THE TOP ALPHA CHARACTER INDICATES THE TYPE OF ASSEMBLY SYSTEM; THE LOWER NUMBER INDICATES THE ASSEMBLY NUMBER KEYED TO THE ADJACENT SCHEDULE.



2. FIRE RATED ASSEMBLIES ARE BASED ON IBC, UL, OR US GYPSUM ASSOCIATION (GA) TEST DATA AND ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE TESTING AGENCIES. REFER TO SPECIFIC TEST REPORTS INDICATED FOR REQUIRED COMPONENTS AND ASSEMBLY. CONTRACTOR SHALL PROVIDE (2) COPIES OF EACH REFERENCED MANUAL TO THE JOBSITE TO COORDINATE FIRE RESISTIVE ATTACHMENT WITH SHEAR CONNECTORS AND SOUND RATED ASSEMBLIES. GA 600 MANUAL IS ACCEPTED BY 2012 IBC TABLE 720.1(2) NOTE O FOR NON-PROPRIETARY ASSEMBLIES.

3. EXTENTS OF ASSEMBLIES ARE SHOWN ON THE PLANS AND SECTIONS. FIRE RATED WALL ASSEMBLIES FORM A SEPARATION THAT SHALL BE CONTINUOUS FROM FLOOR TO STRUCTURE ABOVE WITH NO BREAKS AT COLUMNS, WALL TRANSITIONS, OR OTHER OBSTRUCTIONS.

4. ALL PENETRATIONS IN FIRE RATED ASSEMBLIES REQUIRED TO HAVE PROTECTED OPENINGS SHALL BE FIRESTOPPED OR PROVIDED WITH APPROVED SMOKE AND/OR FIRE DAMPERS PER CODE REQUIREMENTS.

5. PROVIDE THRU-PENETRATION FIRESTOP SYSTEMS FOR RATED ROOFS, WALLS, AND FLOORS THAT ARE PRODUCED AND INSTALLED TO RESIST THE SPREAD OF FIRE ACCORDING TO REQUIREMENTS INDICATED, RESIST PASSAGE OF SMOKE AND OTHER GASES, AND MAINTAIN ORIGINAL FIRE-RESISTANCE RATING OF THE ASSEMBLY PENETRATED.

6. FIRE RATED WALLS MAY HAVE OPENINGS FOR STEEL ELECTRICAL BOXES NOT TO EXCEED 16 SQUARE INCHES PROVIDED THE AGGREGATE AREA OF ALL BOXES DOES NOT EXCEED 100 SQUARE INCHES FOR ANY 100 SQUARE FEET OF PARTITION.

7. ALL GYPSUM BOARD SHALL BE TYPE "X" UNLESS NOTED OTHERWISE.

8. SUBSTITUTE TYPE "X" MOLD AND WATER RESISTANT GYPSUM BOARD AT TOILET, SHOWER, JANITOR, AND KITCHEN ROOMS, KITCHENETTE, AND SIMILAR "WET" USES.

9. PROVIDE TILE BACKER BOARD AT TILE FINISHES. DO NOT REDUCE REQUIRED FIRE-RESISTANCE RATING OF WALL ASSEMBLY.

10. PROVIDE BLOCKING AT THE FOLLOWING LOCATIONS: CASEWORK, SHELVING, AND PANELING; ACCESSORIES AND EQUIPMENT; DOOR HARDWARE; TOILET PARTITIONS AND ACCESSORIES; ACOUSTICAL PANELS; AND OTHER LOCATIONS WHERE REQUIRED PER MANUFACTURER'S RECOMMENDATIONS OR INDUSTRY STANDARDS.

11. FIREBLOCK IN ACCORDANCE WITH 2018 IBC SECTION 717 AT THE FOLLOWING CONCEALED DRAFT LOCATIONS: IN CONCEALED WALL SPACES AT 10' O.C. EACH WAY AND AT CEILING / FLOOR LEVELS.
A. AT INTERCONNECTIONS OF CONCEALED SOFFITS, DROPPED CEILINGS AND COVES
B. IN OPENINGS AROUND VENTS, PIPES, DUCTS AT CEILING / FLOOR LEVELS.
C. AT OPENINGS BETWEEN ATTIC SPACES AND MANUFACTURED CHIMNEY CHASES.

12. TJI JOISTS ARE BY TRUS-JOIST MACMILLAN CORP., BOISE IDAHO 83707. SUBSTITUTIONS MUST PROVIDE EQUIVALENT FIRE TESTED ASSEMBLIES WITH EQUAL OR BETTER ACOUSTICAL PERFORMANCE.

13. FOR PROPERTIES OF COOLER OR WALLBOARD NAILS, SEE ASTM C 514, ASTM C 547 OR ASTM F 1667.

14. THESE DETAILS REPRESENT MINIMUM ARCHITECTURAL REQUIREMENTS. IN SOME CASES THE STRUCTURAL DRAWINGS WILL DETERMINE THE ACTUAL DIMENSIONS AND CONNECTION METHODS, AND IN THOSE CASES WILL GOVERN. COORDINATE BETWEEN SCOPE SHOWN BY THE STRUCTURAL DRAWINGS AND INDICATED MINIMUM ARCHITECTURAL ASSEMBLIES.

15. DRAFTSTOPPING IS NOT REQUIRED IN FLOOR/CEILING SPACES PER IBC SECTION 717.3.2, EXCEPTION 1. THE BUILDING WILL BE EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.3.1.1 (NFPA 13).

16. DRAFTSTOPPING IN ATTICS IS NOT REQUIRED PER IBC SECTION 717.4.2, EXCEPTION 2. THE BUILDING WILL BE EQUIPPED THROUGHOUT WITH AN AUTOMATIC SPRINKLER SYSTEM IN ACCORDANCE WITH SECTION 903.3.1.1 (NFPA 13).

17. AIR BARRIER: SEAL PLYWOOD AND GYPSUM SHEATHING JOINTS AND PENETRATIONS.

ORIGINAL SHEET SIZE 30" x 42"

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California, CA 94105 / 415.956.0688

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Culver City, CA 90232 / 323.937.2150

mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
BUILDING ASSEMBLIES - CEILINGS

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
A5.02

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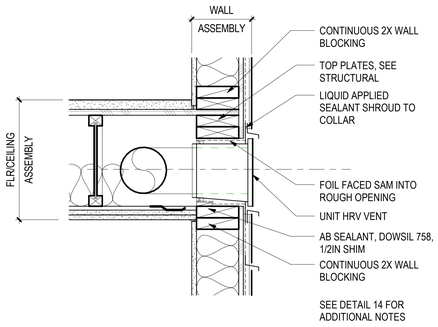
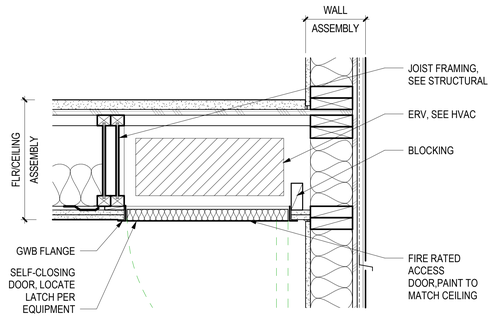


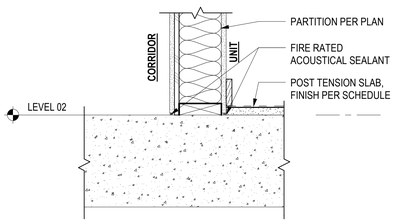
1 EXTERIOR WALL AT ERV

1 1/2" = 1'-0"



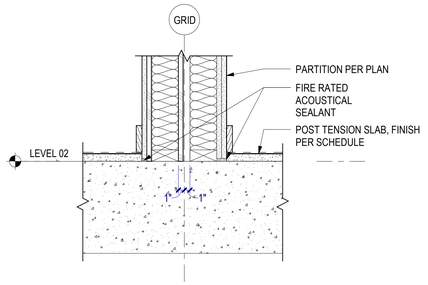
2 FIRE RATED ACCESS DOOR

1 1/2" = 1'-0"



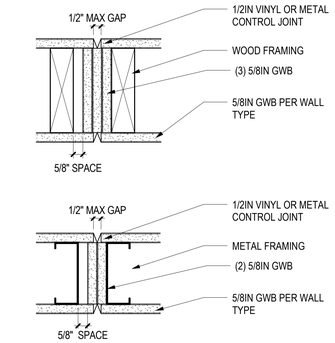
6 UNIT / CORRIDOR AT CONC FLOOR (SIM)

1 1/2" = 1'-0"



7 UNIT DEMISING AT CONC FLOOR (SIM)

1 1/2" = 1'-0"



8 FR GWB CONTROL JOINT

3" = 1'-0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
ASSEMBLY DETAILS

PROJECT NO
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DATE
02/03/25
SHEET NUMBER
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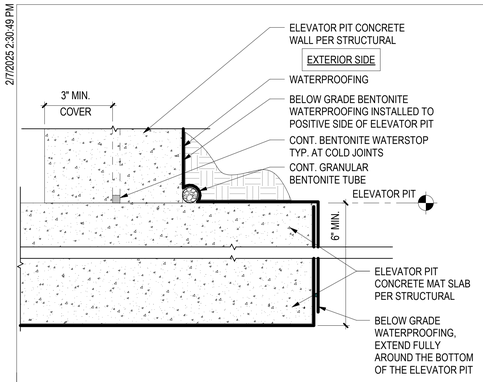
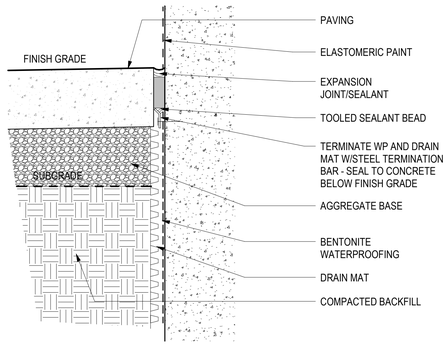
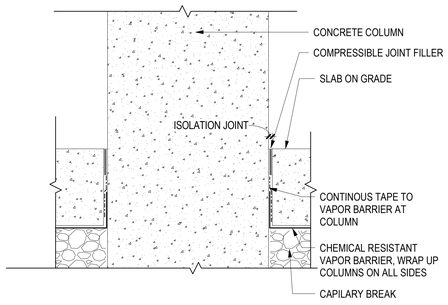


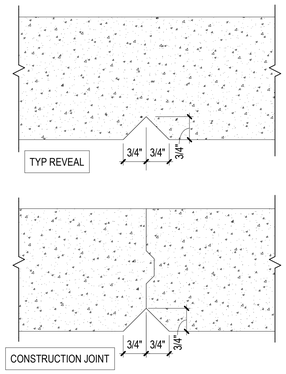
1 WATERPROOFING AT ELEVATOR PIT
1 1/2" = 1'-0"



2 BELOW GRADE WP MEMBRANE AT PAVING
3" = 1'-0" | 16/A5.25



3 WATERPROOFING AT INTERIOR COLUMNS
1 1/2" = 1'-0"



4 TYP. CONCRETE REVEAL & JOINT
6" = 1'-0"

11 FOUNDATION @ BRICK WALL
3" = 1'-0" | 3/A4.02

12 FCP BASE AT CONC CURB / WALL
3" = 1'-0" | 2/A4.03

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CH
PROJECT TEAM MEMBERS
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CHECK
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EXTERIOR DETAILS - FOUNDATION

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2324000
DATE
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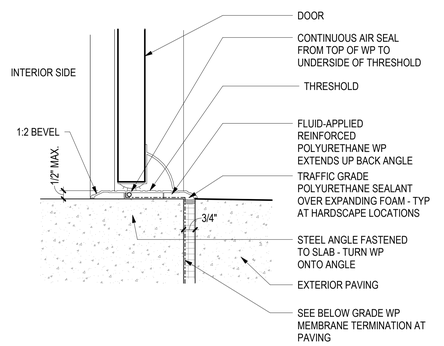
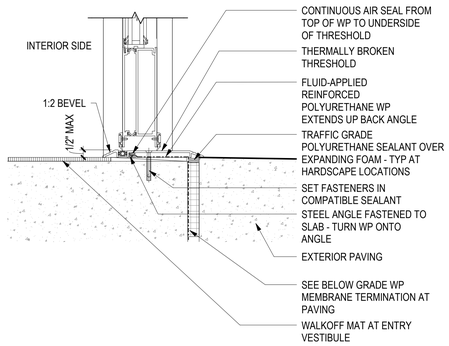
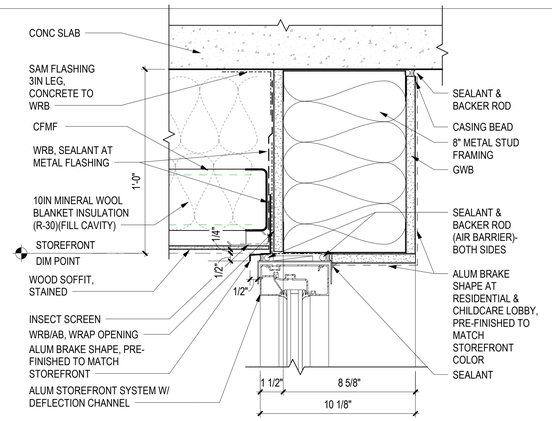


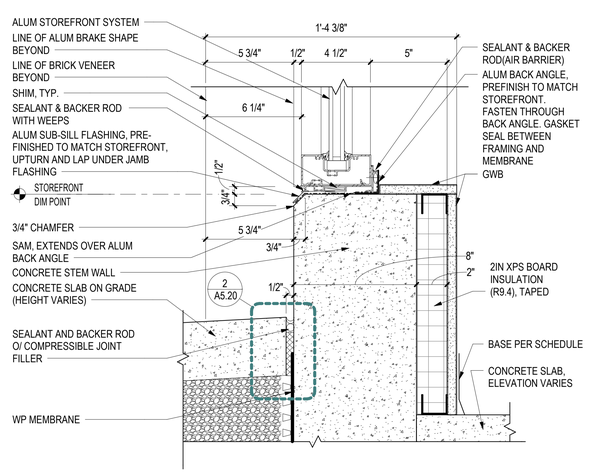
1 HM DOOR SILL AT CONCRETE
3" = 1'-0"



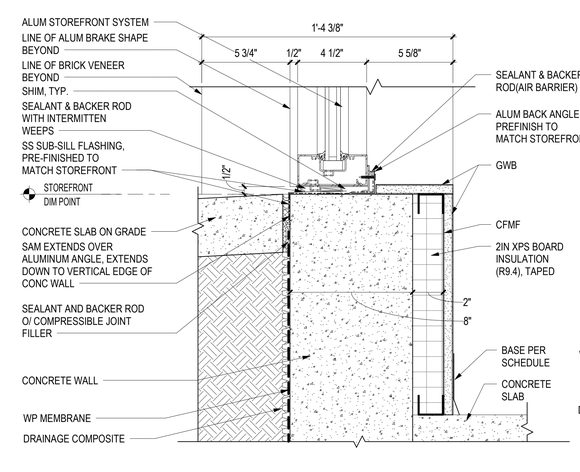
2 TYPICAL THRESHOLD AT STOREFRONT DOOR1
3" = 1'-0"



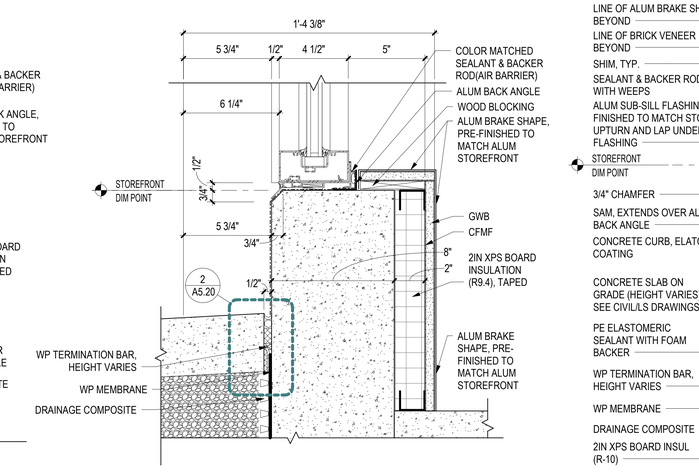
4 STOREFRONT HEAD TO SOFFIT
3" = 1'-0"



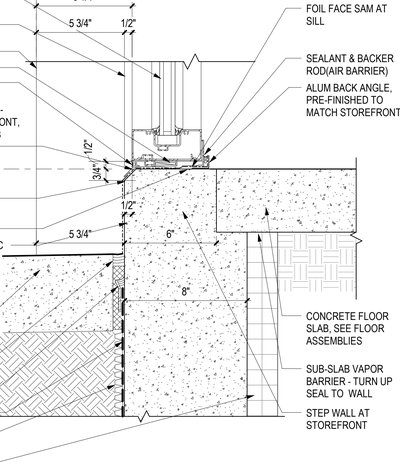
11 STOREFRONT HEAD & SILL AT CANOPY
3" = 1'-0" | 3/A4.01



12 STOREFRONT AT HSS BEAM 1
3" = 1'-0" | 1/A4.03



14 STOREFRONT CFMF BEAM AT VESTIBULE
3" = 1'-0" | 2/A4.01



15 STOREFRONT AT HSS BEAM AT VESTIBULE
3" = 1'-0" | 2/A4.01

16 STOREFRONT SILL 1 AT CONC STEM WALL
3" = 1'-0" | 1/A3.01

17 STOREFRONT SILL 2 AT CONC STEM WALL
3" = 1'-0"

19 STOREFRONT SILL 1 AT TI VESTIBULE
3" = 1'-0" | 2/A4.01

20 STOREFRONT SILL AT CONC SLAB
3" = 1'-0" | 1/A4.01

ORIGINAL SHEET SIZE 30" x 42"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - STOREFRONT

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A5.25

90% CD SET

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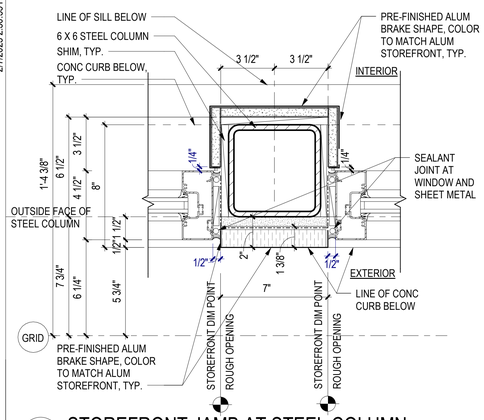
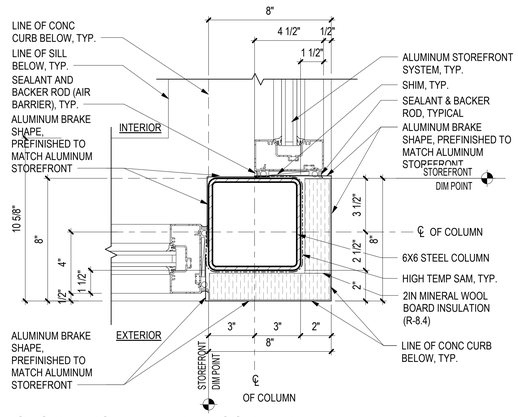
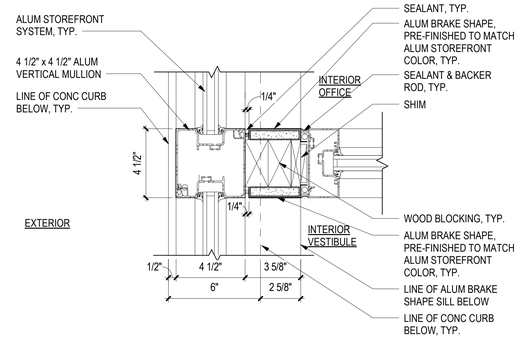


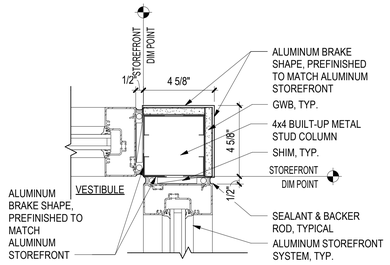
1 STOREFRONT JAMB AT STEEL COLUMN
3" = 1'-0" | 1/A2.01



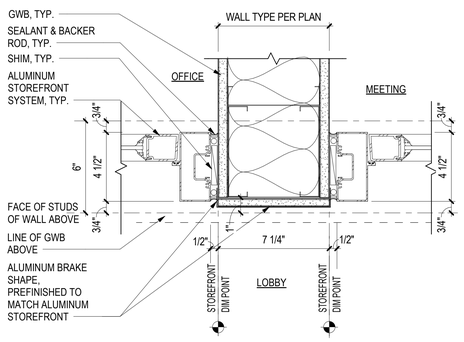
2 STOREFRONT JAMB AT CORNER
3" = 1'-0" | 1/A2.01



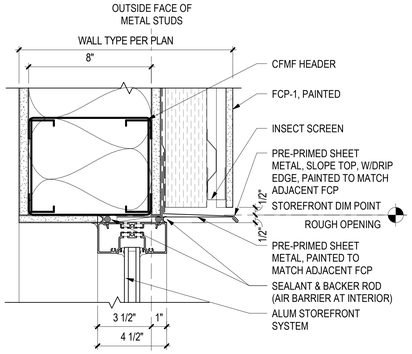
4 STOREFRONT JAMB AT VESTIBULE
3" = 1'-0" | 1/A2.01



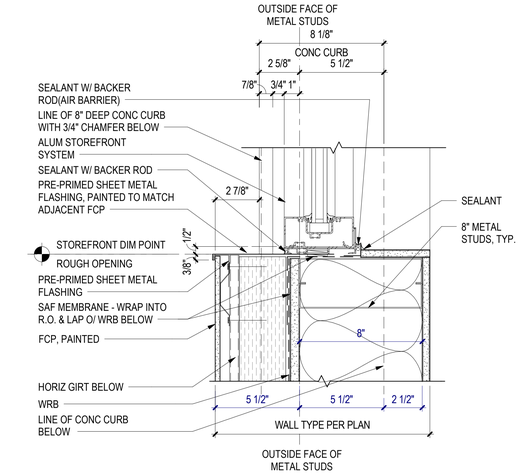
6 STOREFRONT JAMB AT VESTIBULE CORNER
3" = 1'-0" | 1/A2.01



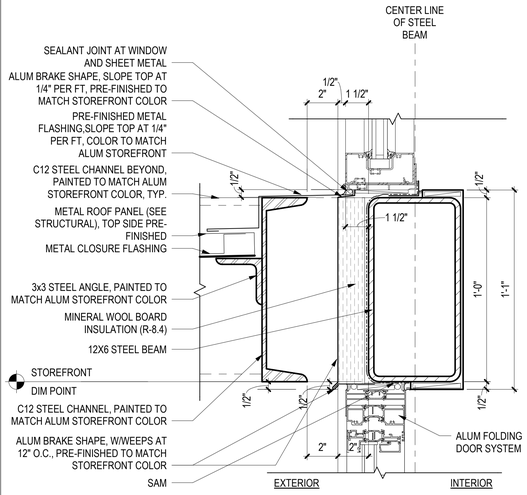
7 STOREFRONT JAMB AT OFFICE
3" = 1'-0" | 1/A8.20



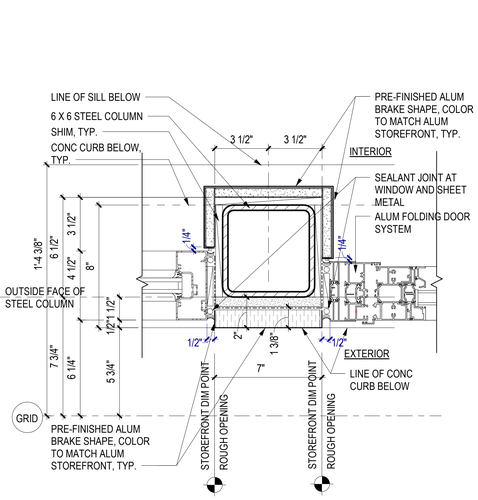
9 ALUM WINDOW HEAD AT FIBER CEMENT PANEL
3" = 1'-0" | 2/A4.03



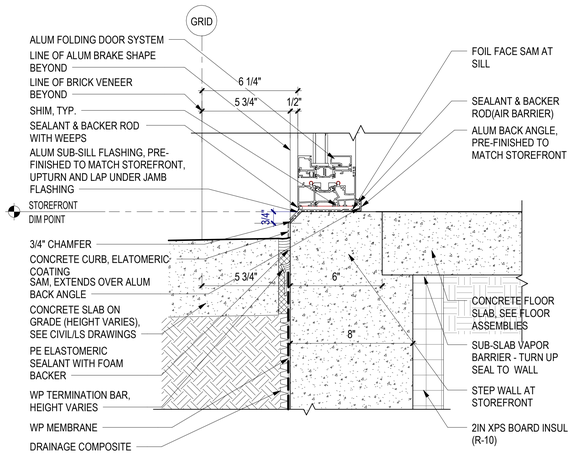
10 ALUM WINDOW SILL AT FIBER CEMENT PANEL
3" = 1'-0" | 2/A4.03



16 ALUM FOLDING DOOR HEAD
3" = 1'-0" | 1/A5.35



17 ALUM FOLDING DOOR LOCKING JAMB
3" = 1'-0" | 1/A5.35



19 ALUM FOLDING DOOR SILL
3" = 1'-0" | 1/A5.35

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CH
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DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - STOREFRONT

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A5.26

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ORIGINAL SHEET SIZE: 30" x 42"

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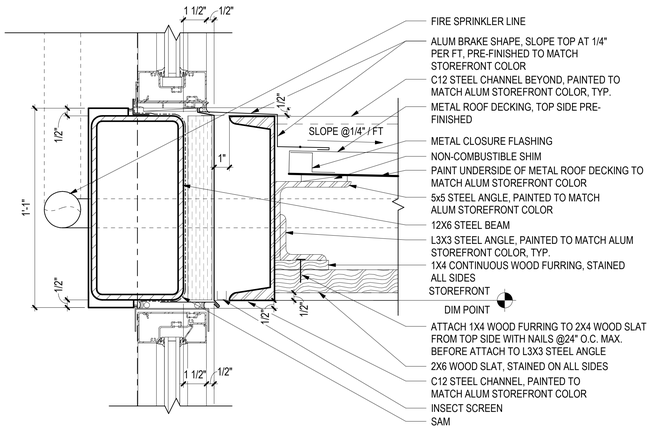
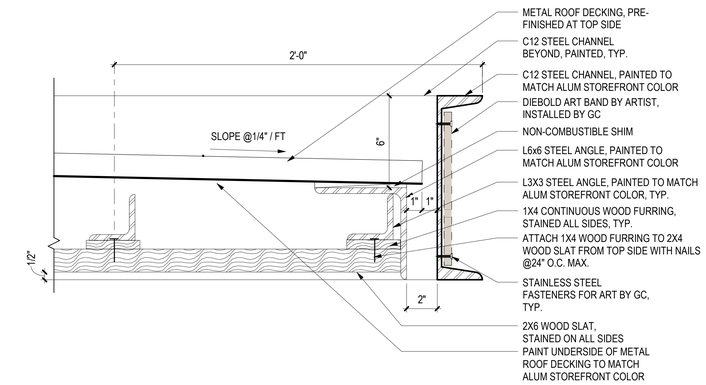
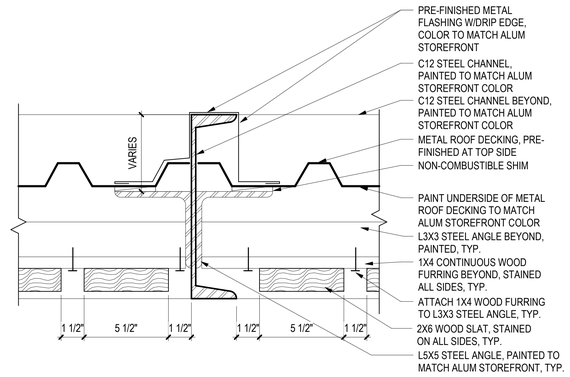


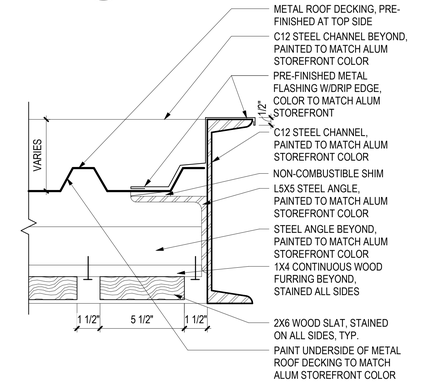
1 STEEL/WOOD CANOPY BACK EDGE
3" = 1'-0" | 4/A4.01



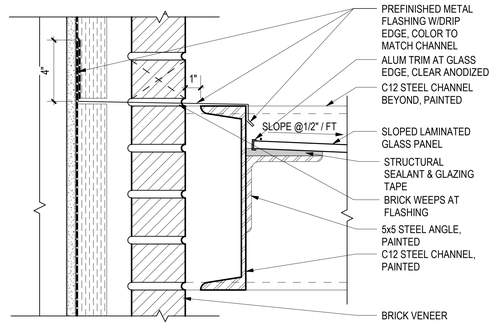
3 STEEL/WOOD CANOPY FRONT EDGE
3" = 1'-0" | 4/A4.01



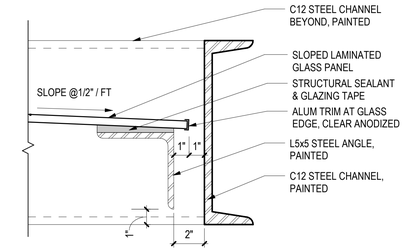
6 STEEL/WOOD CANOPY INTERMEDIATE SUPPORT
3" = 1'-0"



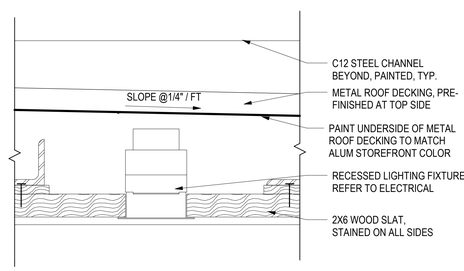
8 STEEL/WOOD CANOPY SIDE EDGE
3" = 1'-0" | 2/A5.30



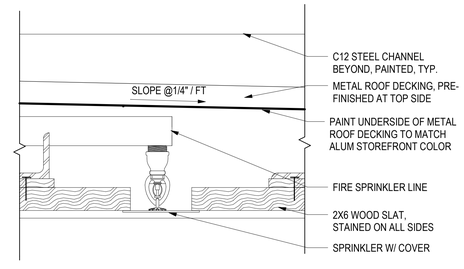
9 GLASS CANOPY BACK EDGE
3" = 1'-0" | 2/A5.30



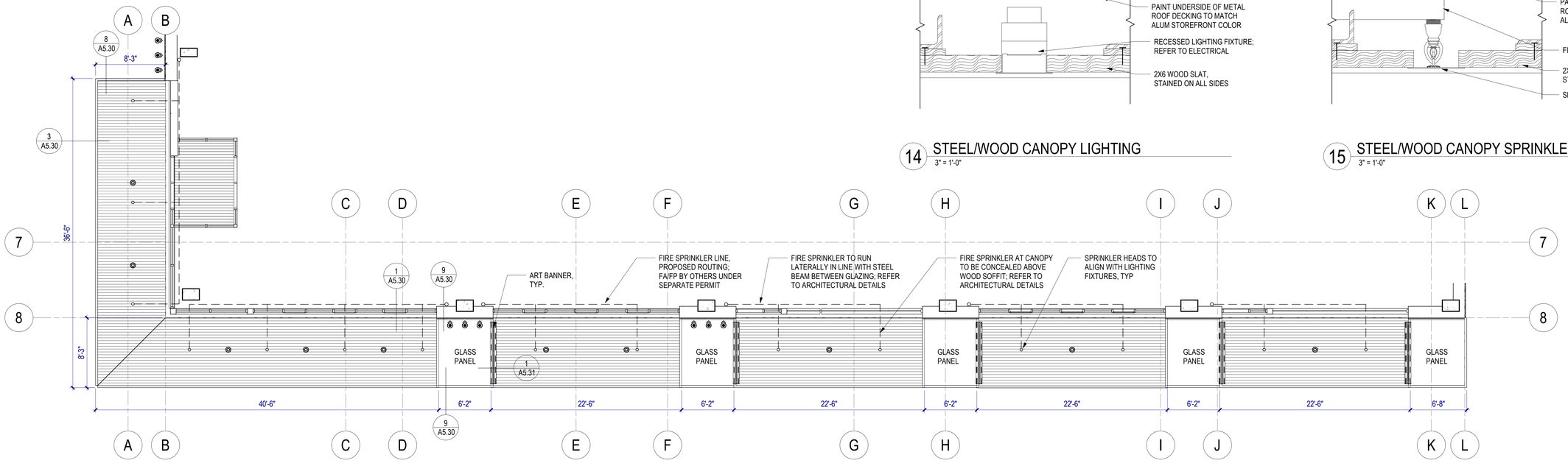
10 GLASS CANOPY FRONT EDGE
3" = 1'-0"



14 STEEL/WOOD CANOPY LIGHTING
3" = 1'-0"



15 STEEL/WOOD CANOPY SPRINKLER
3" = 1'-0"



ENLARGED CANOPY PLAN
3/16" = 1'-0" | 1/00-PRES_05

ORIGINAL SHEET SIZE 30" x 42"

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CH
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PROJECT ARCHITECT
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PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
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PC

TITLE
EXTERIOR DETAILS - CANOPY

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
A5.30

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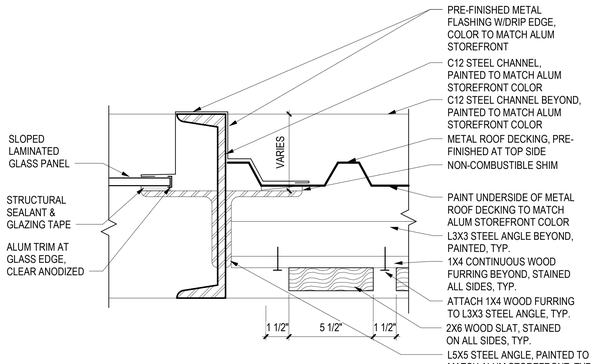
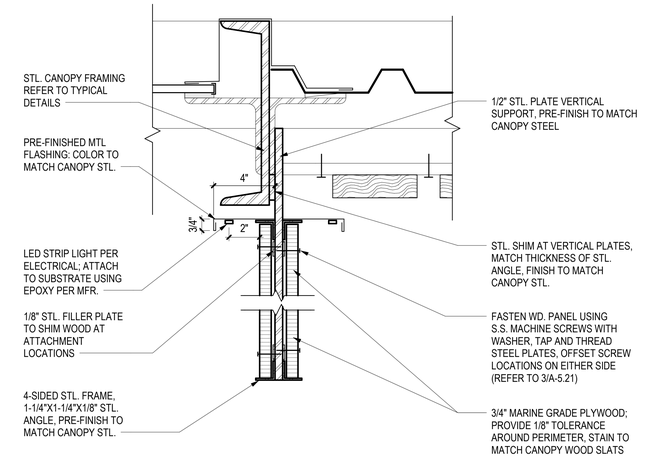
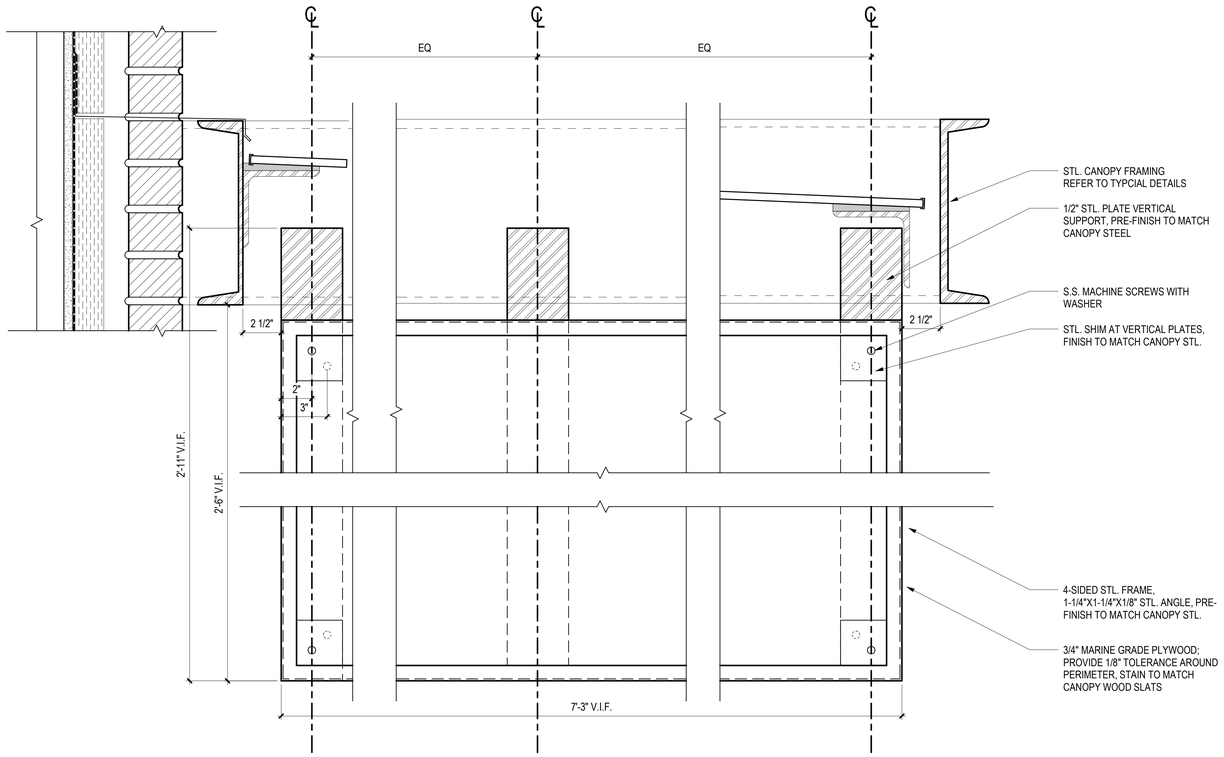


1 GLASS & STEEL/WOOD CANOPY INTERMEDIATE SUPPORT
3" = 1'-0" | 2/A5.30



3 GLASS & STEEL/WOOD CANOPY @ ART BANNER
3" = 1'-0"



6 ART BANNER ELEVATION
3" = 1'-0"

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MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
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TITLE
EXTERIOR DETAILS - CANOPY

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
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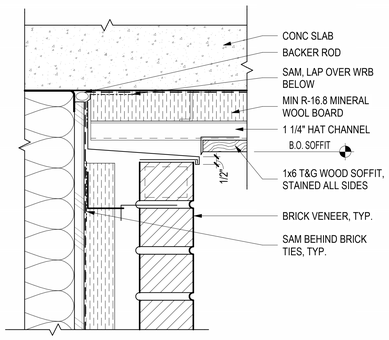
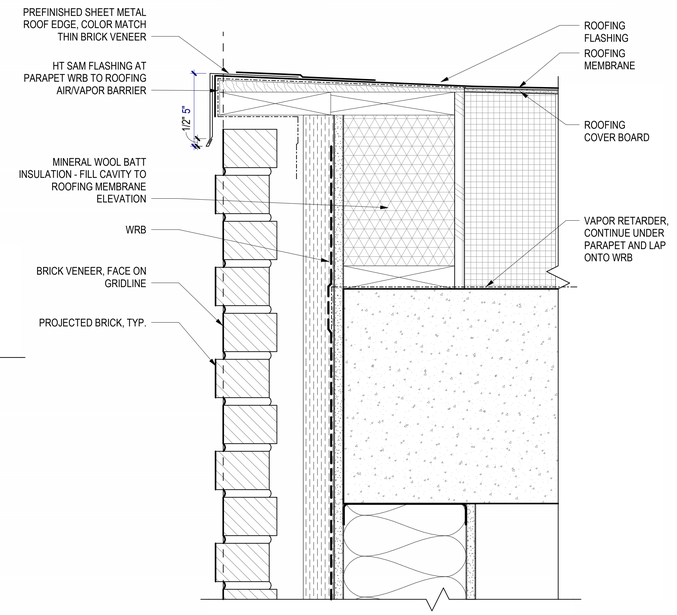


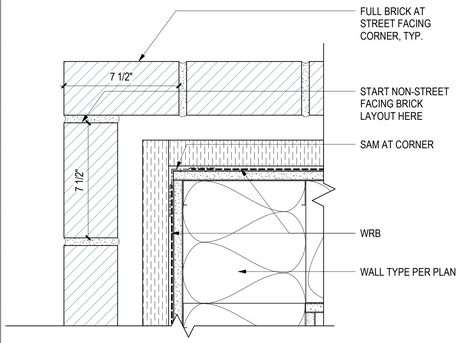
TYPICAL EXTERIOR WALL DETAILS - BASE

1/8" = 1'-0" | 1/A201

4 SOFFIT @ EXT WALL OUTSIDE CORNER

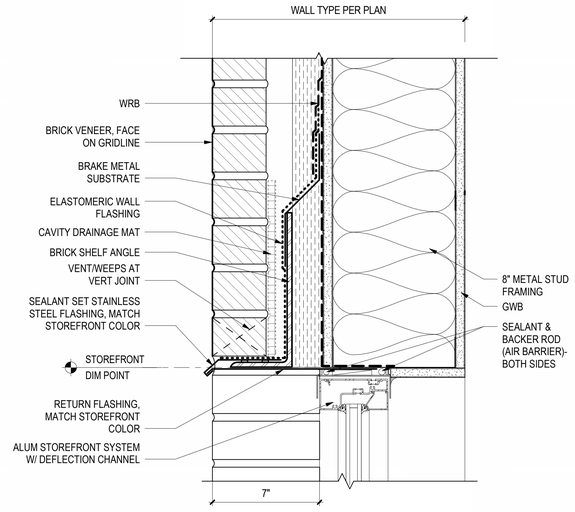
3" = 1'-0" | 1/A4.01





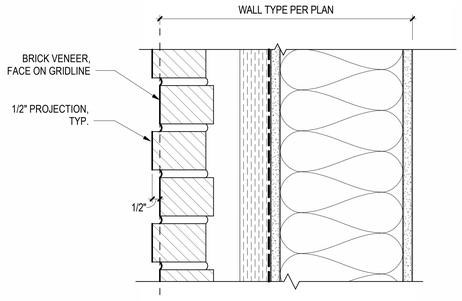
6 TYPICAL CORNER AT BRICK

3" = 1'-0" | 1/A5.35



7 STOREFRONT HEAD AT BRICK

3" = 1'-0" | 1/A4.01

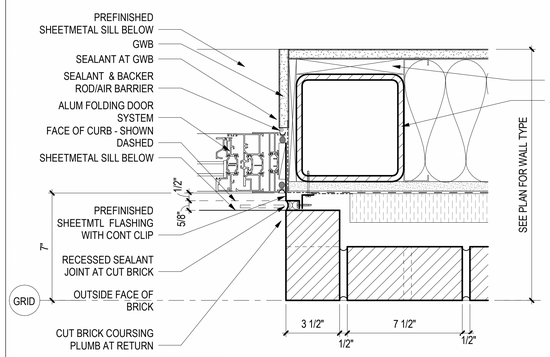


9 BRICK PROJECTION

3" = 1'-0" | 1/A5.35

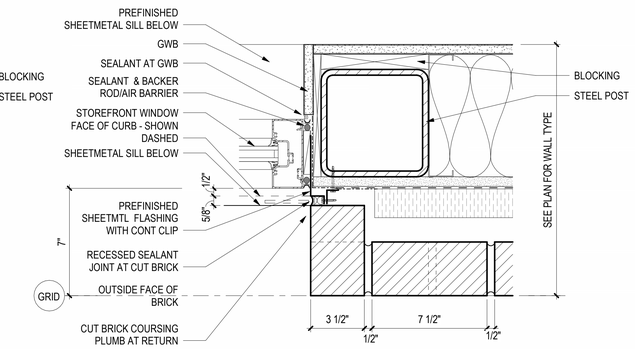
10 PARAPET AT BASE

3" = 1'-0" | 3/A4.01



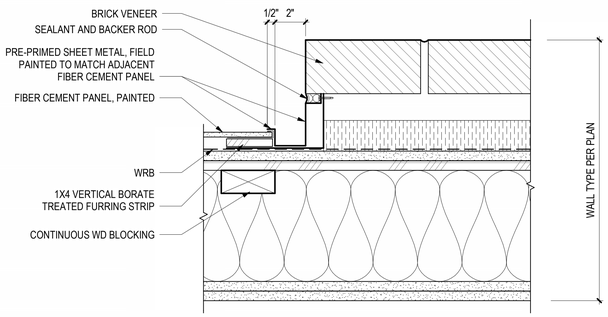
16 ALUM FOLDING DOOR HINGE JAMB

3" = 1'-0" | 1/A5.35



17 STOREFRONT JAMB AT BRICK

3" = 1'-0" | 1/A2.01



19 BRICK TRANSITION TO FCP PLAN DETAIL

3" = 1'-0" | 1/A2.01

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - BRICK

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
A5.35

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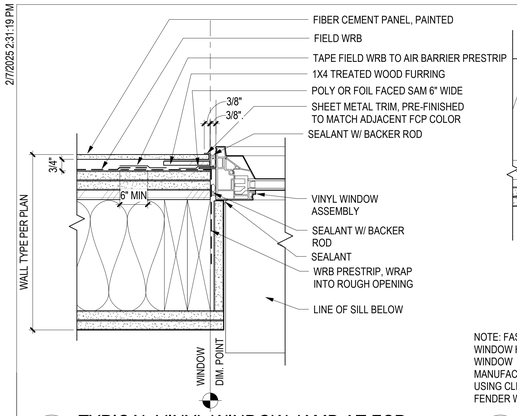
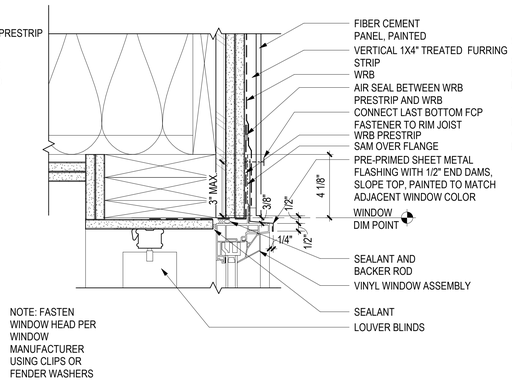
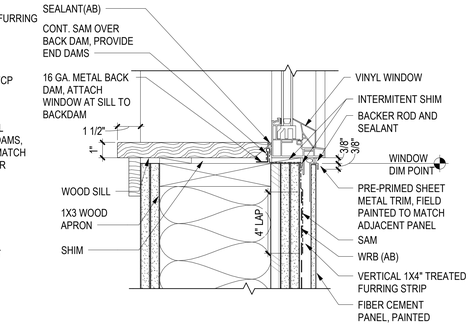


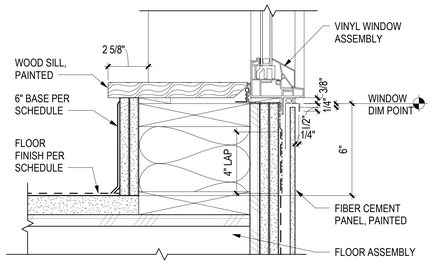
1 TYPICAL VINYL WINDOW JAMB AT FCP
3" = 1'-0" | 1/A2.03



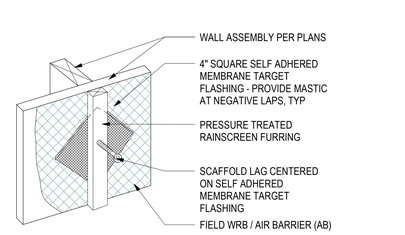
2 TYPICAL VINYL WINDOW HEAD AT FCP
3" = 1'-0" | 3/A4.01



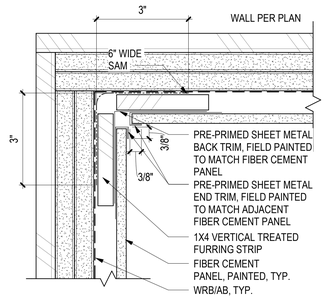
3 TYPICAL VINYL WINDOW SILL AT FCP
3" = 1'-0" | 3/A4.01



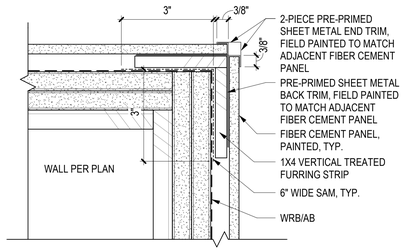
4 TYPICAL VINYL WINDOW SILL 2 AT FCP
3" = 1'-0" | 2/A4.03



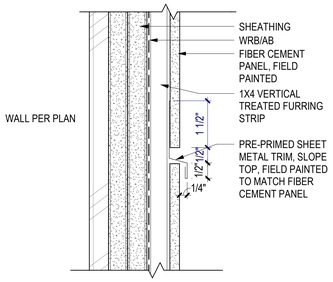
5 SCAFFOLD ANCHOR FLASHING
6" = 1'-0"



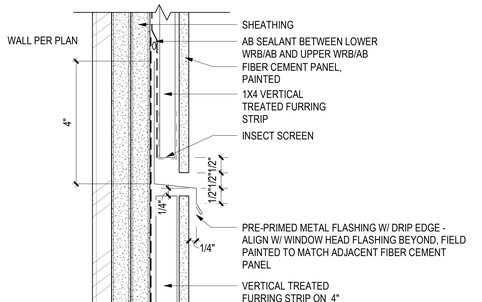
6 TYPICAL INSIDE CORNER AT FCP
6" = 1'-0" | 1/A2.03



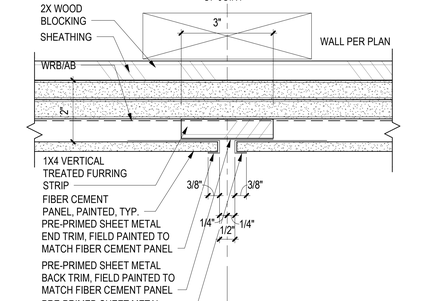
7 TYPICAL OUTSIDE CORNER AT FCP
6" = 1'-0" | 1/A2.03



8 TYP. HORIZONTAL JOINT AT FCP
6" = 1'-0" | 1/A3.02

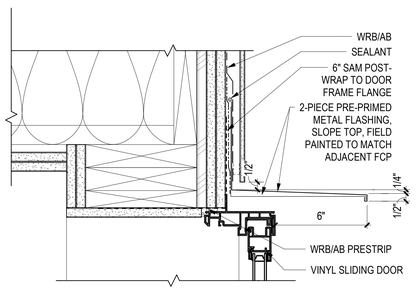


9 THRU WALL FLASHING AT FCP
6" = 1'-0" | 1/A3.01

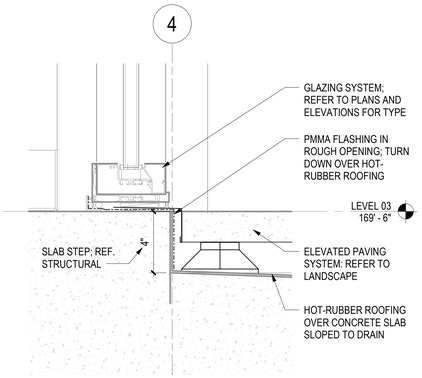


NOTE: FIELD PRIME ALL FIELD CUT FIBER CEMENT PANEL EDGES WITH MANUFACTURER'S RECOMMENDED ALKALI-RESISTANT PRODUCT

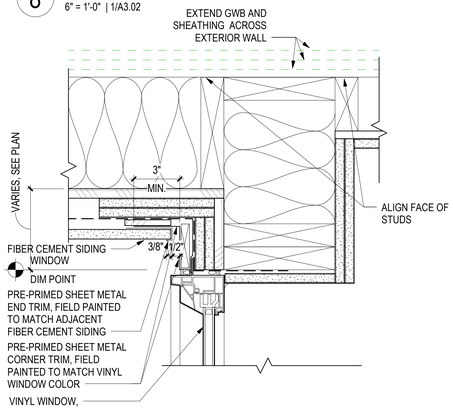
10 VERTICAL JOINT AT FCP
6" = 1'-0" | 1/A3.01



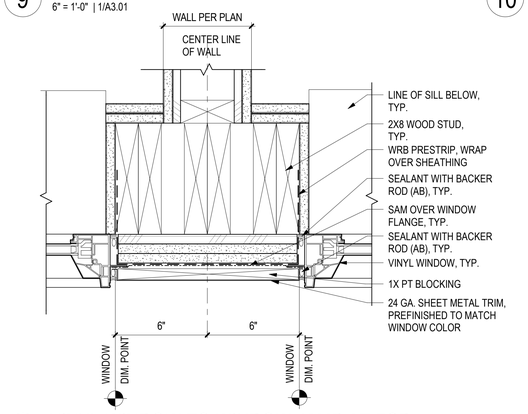
11 VINYL SLIDING DOOR HEAD AT COURTYARD
3" = 1'-0" | 4/A3.02



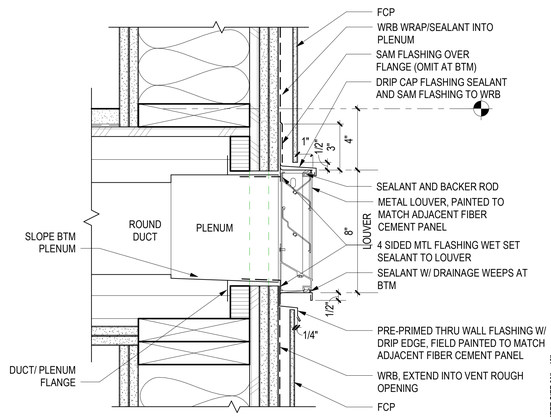
12 VINYL SLIDING DOOR SILL AT COURTYARD
3" = 1'-0" | 4/A3.02



13 VINYL WINDOW JAMB AT INSIDE CORNER
3" = 1'-0" | 1/A2.03



14 VINYL WINDOW TO WINDOW JAMB AT FCP
3" = 1'-0"



20 EXHAUST VENT LOUVER - FLUSH - FCP
3" = 1'-0" | 1/A3.01

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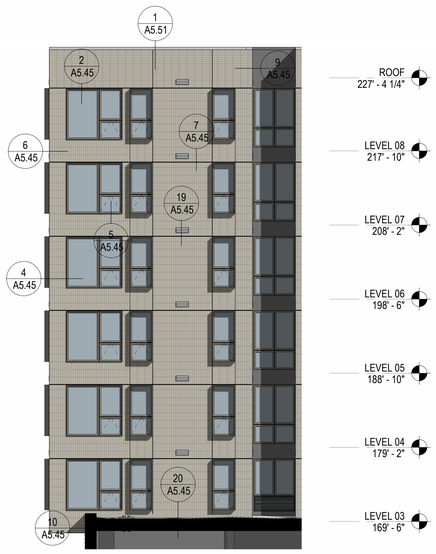
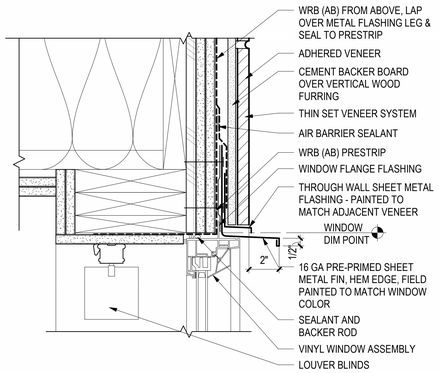
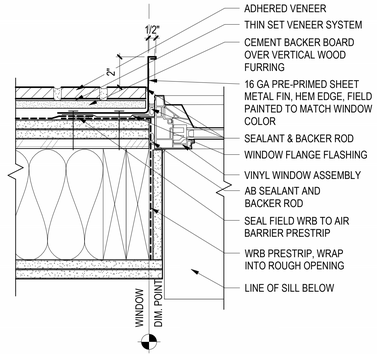
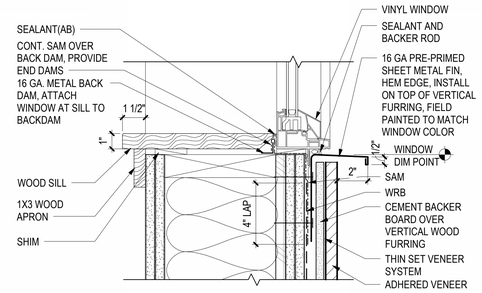




2 TYPICAL VINYL WINDOW HEAD AT THIN BRICK
3" = 1'-0" | 1/A5.45

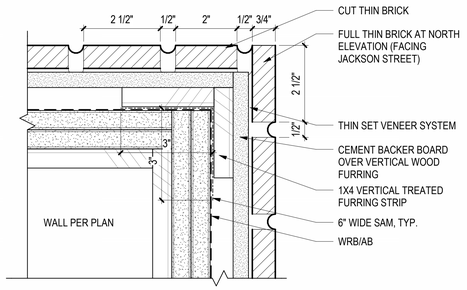


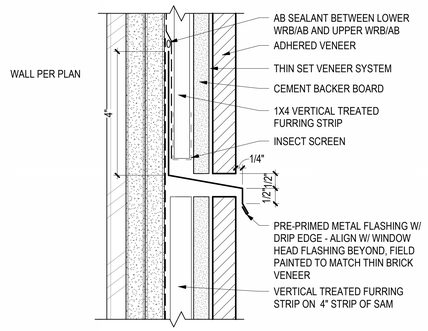
4 TYPICAL VINYL WINDOW JAMB AT THIN BRICK
3" = 1'-0" | 1/A5.45

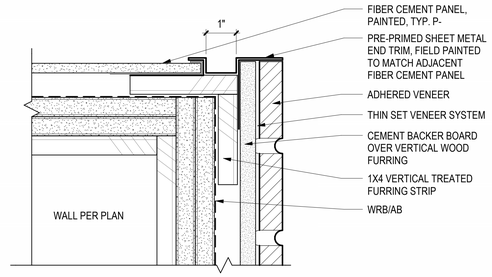


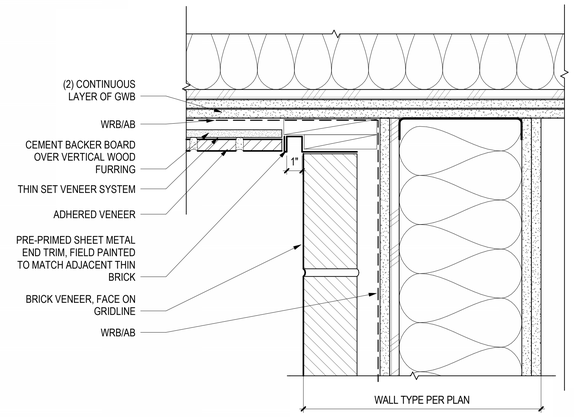
5 TYPICAL VINYL WINDOW SILL AT THIN BRICK
3" = 1'-0" | 1/A5.45

TYPICAL EXTERIOR WALL DETAILS - UPPER
1/8" = 1'-0" | 1/A2.09







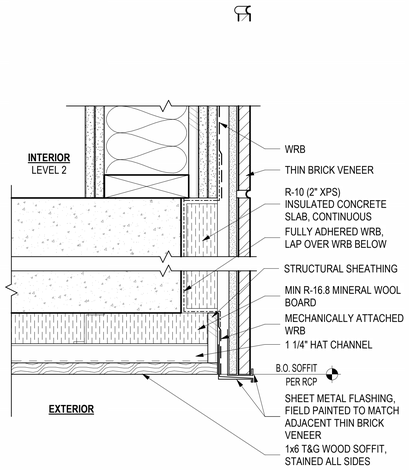


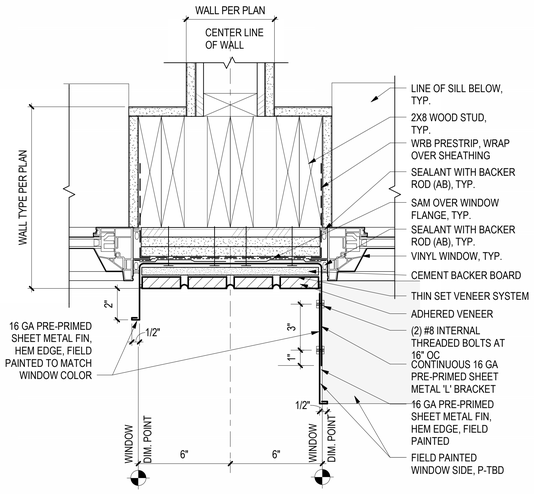
6 TYPICAL CORNER AT THIN BRICK
6" = 1'-0" | 1/A5.45

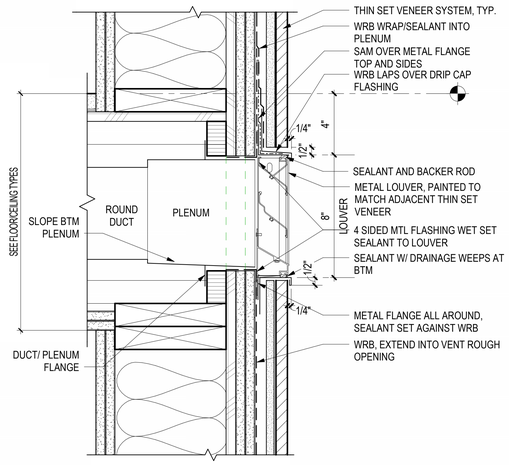
7 THRU WALL FLASHING AT THIN BRICK
6" = 1'-0" | 1/A5.45

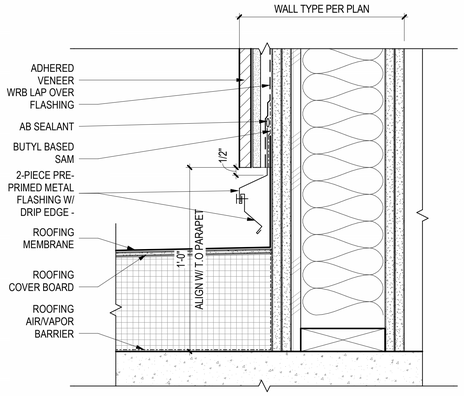
9 THIN BRICK TRANSITION TO FCP WALL
6" = 1'-0" | 1/A5.45

10 THIN BRICK TRANSITION TO BRICK
3" = 1'-0" | 1/A5.45









16 SOFFIT @ EXT WALL INSIDE CORNER
3" = 1'-0" | 1/A4.01

17 TYPICAL VINYL WINDOW TO WINDOW JAMB AT THIN BRICK
3" = 1'-0" | 1/A2.03

19 EXHAUST VENT LOUVER - FLUSH - THIN BRICK
3" = 1'-0" | 1/A5.45

20 B.O THIN BRICK TO ROOF
3" = 1'-0" | 4/A4.01

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CH
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TITLE
EXTERIOR DETAILS - THIN BRICK

PROJECT NO.
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02/07/25

SHEET NUMBER
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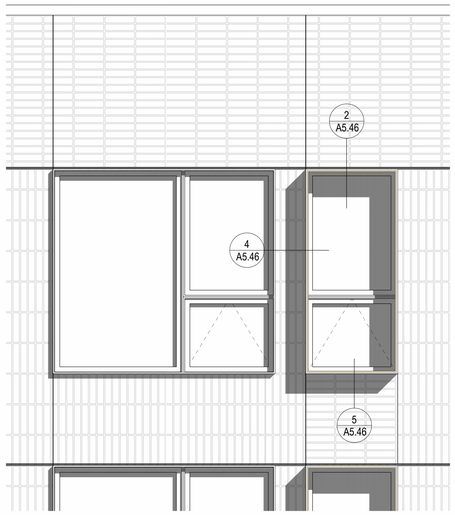
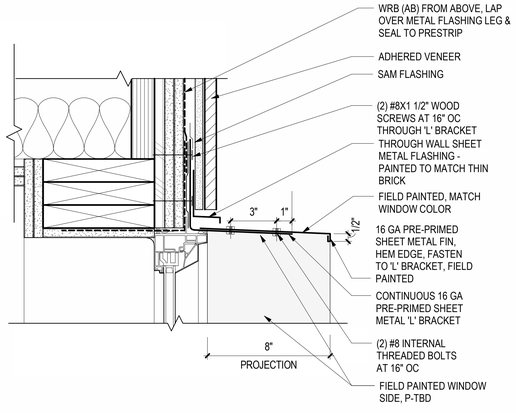


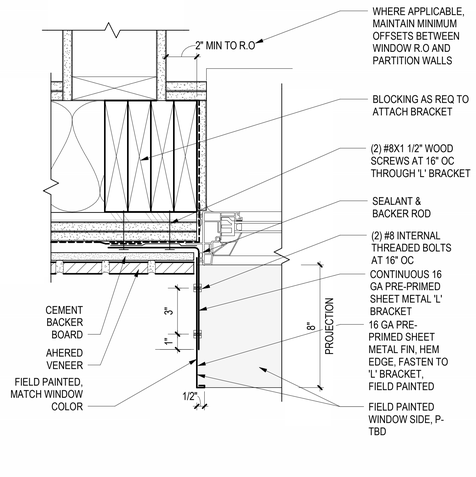
ENLARGED WINDOW SHROUD ELEVATION

1/2" = 1'-0" | 1/A2.07



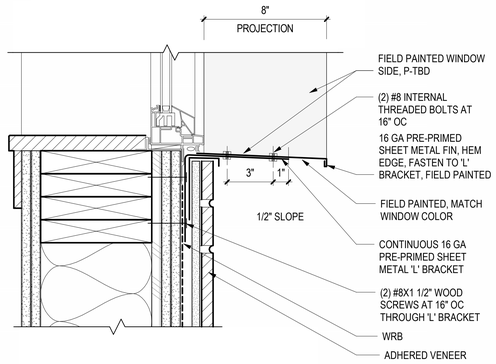
2 TYPICAL VINYL WINDOW HEAD AT WINDOW SHROUD

3" = 1'-0" | 1/A4.01



4 TYPICAL VINYL WINDOW JAMB AT WINDOW SHROUD

3" = 1'-0" | 1/A5.46



5 TYPICAL VINYL WINDOW SILL AT WINDOW SHROUD

3" = 1'-0" | 1/A4.01

6 THIN BRICK TRANSITION TO FCP PLAN DETAIL

3" = 1'-0" | 1/A2.03

7 THIN BRICK EXPANSION JOINT

3" = 1'-0"

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Culver City, CA 90232 / 323.937.2150

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - THIN BRICK

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
A5.46

90% CD SET

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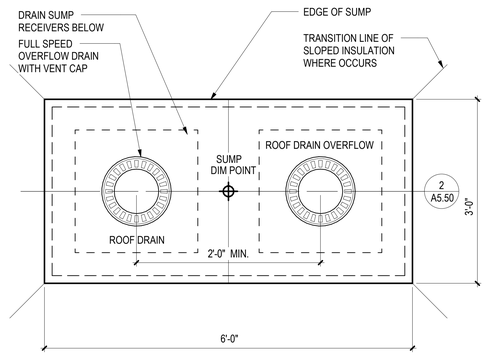
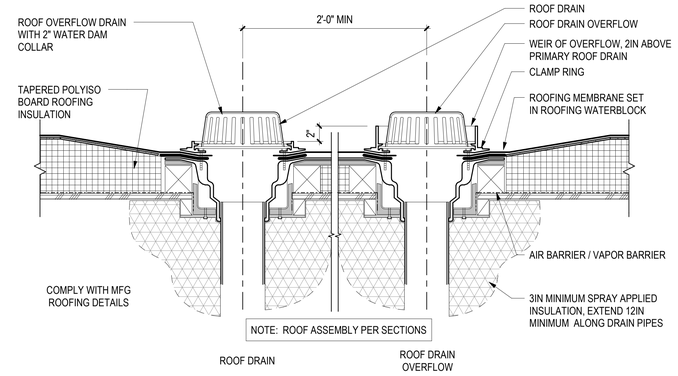
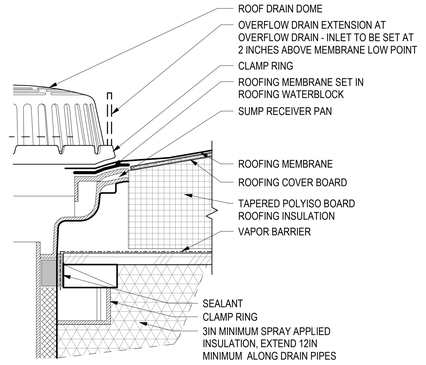
ORIGINAL SHEET SIZE 30" x 42"



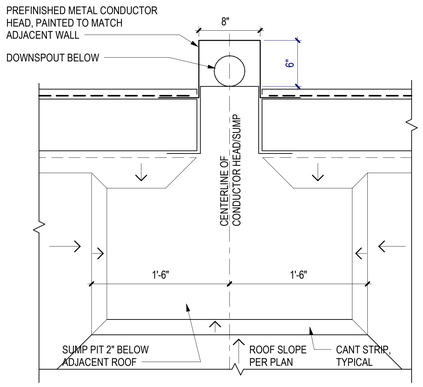
1 ROOF DRAIN - PLAN
1 1/2" = 1'-0" | 2/A2.03



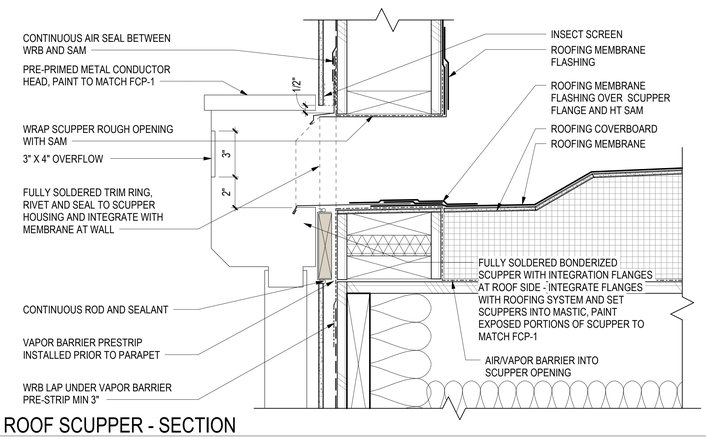
2 ROOF DRAIN - SECTION
1 1/2" = 1'-0" | 1/A5.50



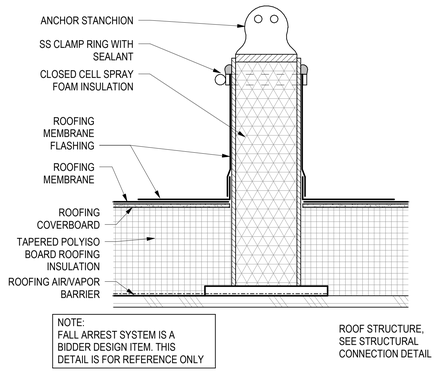
3 ROOF DRAIN - DETAIL
3" = 1'-0"



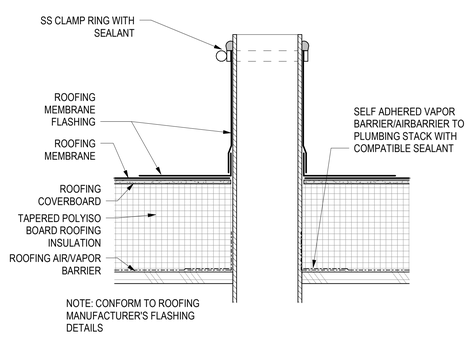
6 ROOF SCUPPER - PLAN
1 1/2" = 1'-0" | 1/A2.09



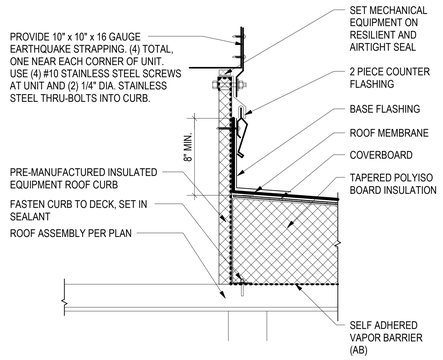
7 ROOF SCUPPER - SECTION
3" = 1'-0"



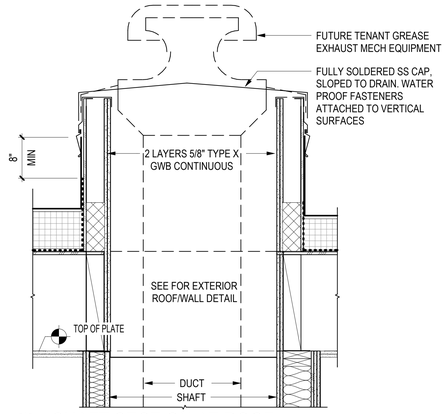
11 FALL ARREST FLAT ROOF
3" = 1'-0"



12 PLUMBING VENT AT ROOF
3" = 1'-0"



13 MECH. EQUIP. SUPPORT CURB
1 1/2" = 1'-0"



14 SHAFT SECTION AT ROOF
1" = 1'-0"

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Culver City, CA 90232 / 323.937.2150

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Little Saigon Landmark

LOCATION
1001 S Jackson
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PREPARED FOR
SCIDpda / Friends of Little Saigon

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PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - ROOF

PROJECT NO.
2324000
DATE
09/10/24

SHEET NUMBER
A5.50

90% CD SET

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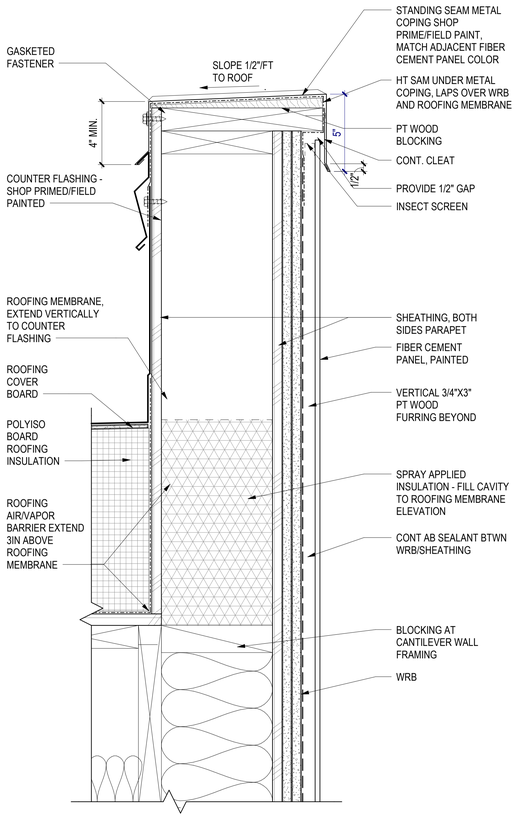
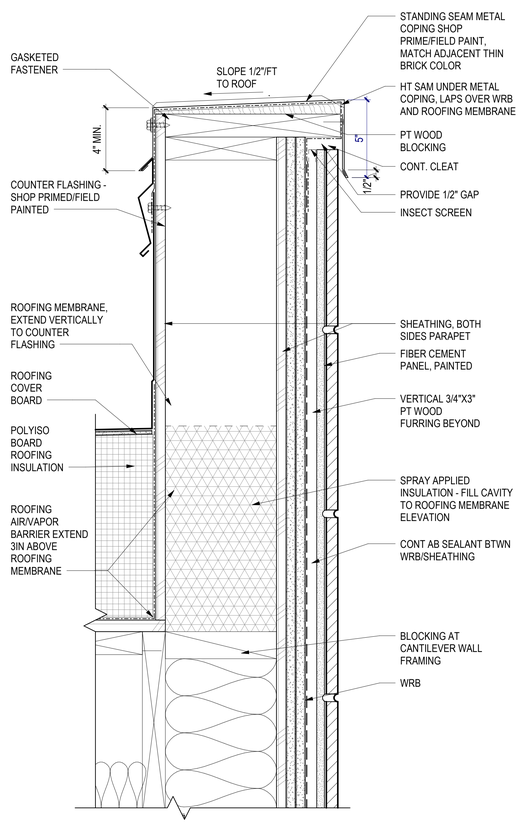
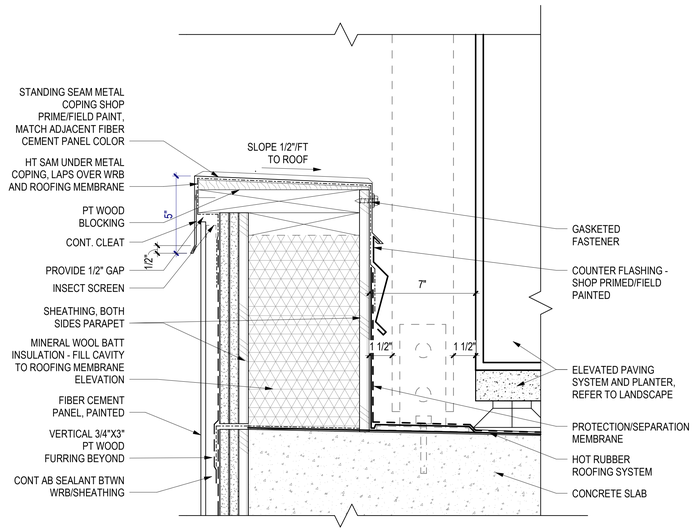
ORIGINAL SHEET SIZE 30" x 42"



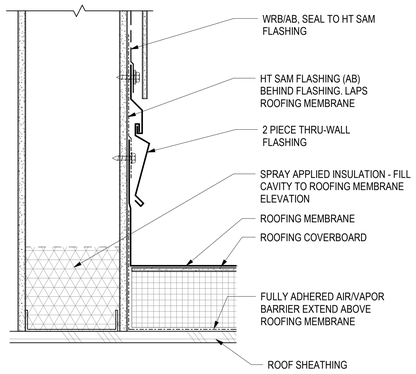
1 TYPICAL ROOF PARAPET - FCP
3" = 1'-0" | 1/A4.01



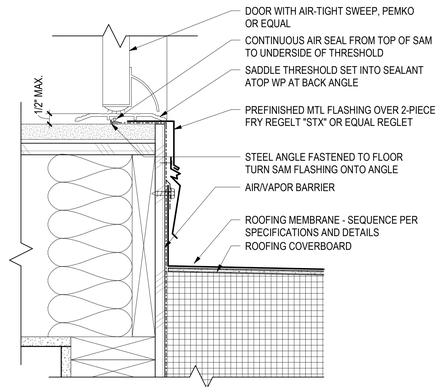
2 TYPICAL ROOF PARAPET - THIN BRICK
3" = 1'-0"



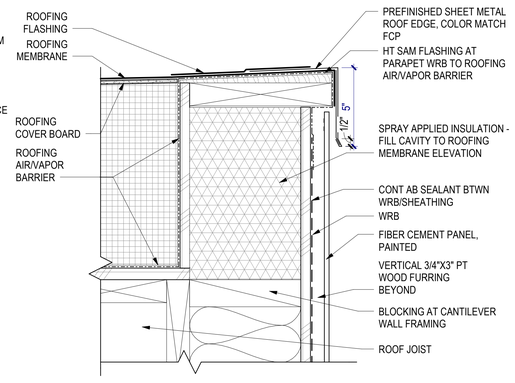
4 ROOF PARAPET AT COURTYARD
3" = 1'-0" | 1/A4.04



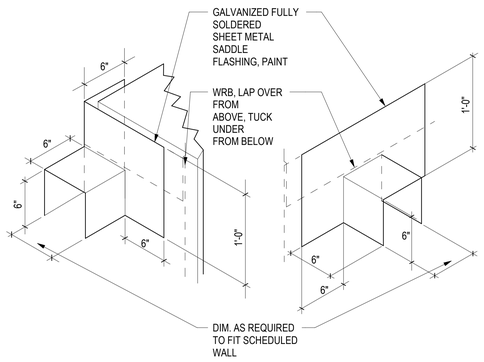
11 BASE OF WALL FLASHING AT ROOF
3" = 1'-0"



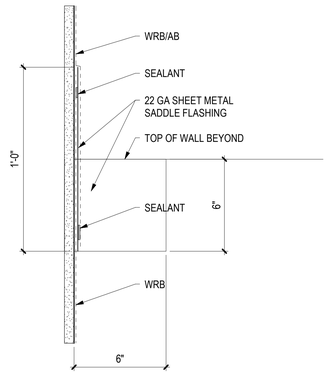
12 HM DOOR SILL AT ROOF
3" = 1'-0"



13 ROOF EDGE
3" = 1'-0"



16 CORNER AND SADDLE FLASHING
1 1/2" = 1'-0"



17 SADDLE FLASHING
3" = 1'-0"

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PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - ROOF

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A5.51

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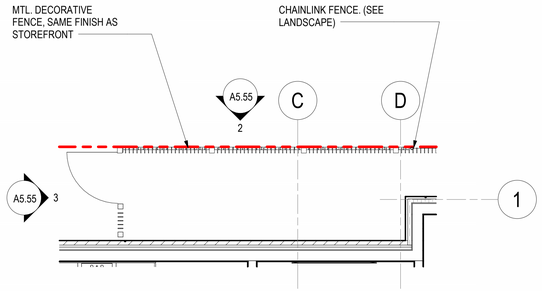
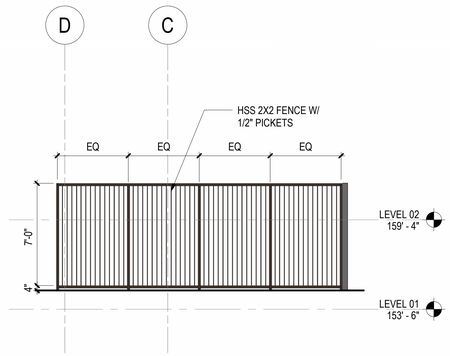
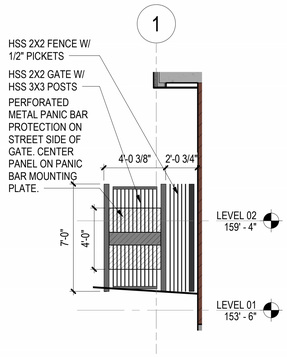


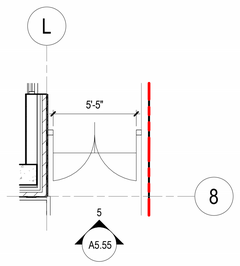
1 ENLARGED GATE - NE
1/4" = 1'-0" | 1/00-PRES_05



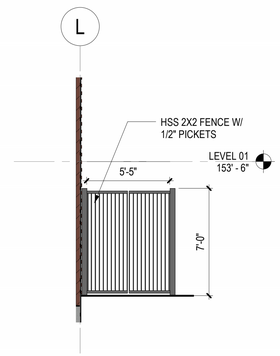
2 NE FENCE ELEVATION
1/4" = 1'-0" | 1/A2.03



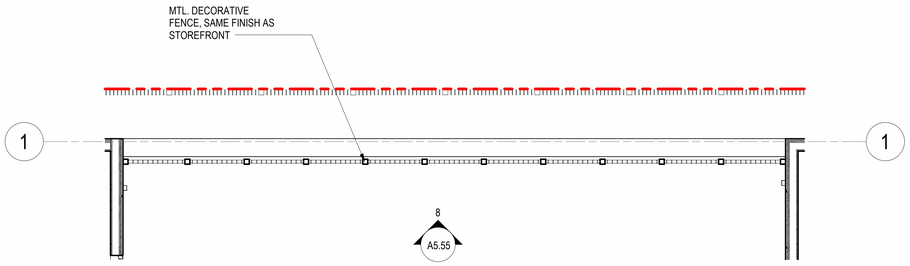
3 NE GATE ELEVATION
1/4" = 1'-0" | 1/A5.55



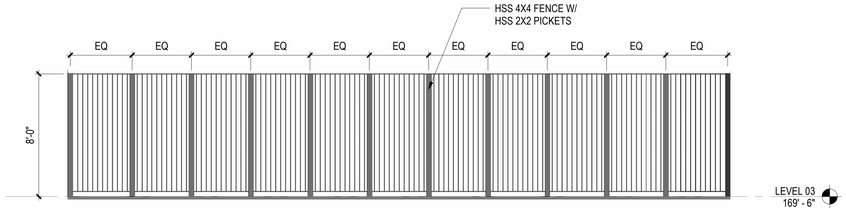
4 ENLARGED GATE - SW
1/4" = 1'-0" | 1/00-PRES_05



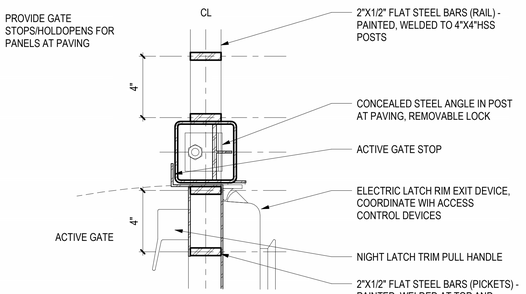
5 SE GATE ELEVATION
1/4" = 1'-0" | 4/A5.55



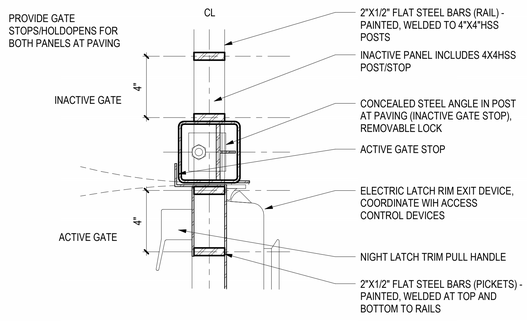
6 ENLARGED COURTYARD FENCE
1/4" = 1'-0" | 1/00-PRES_05



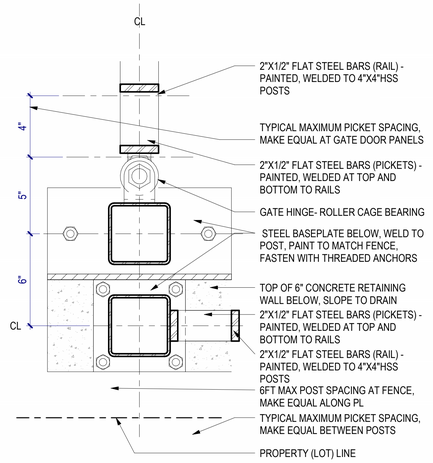
8 COURTYARD FENCE ELEVATION
1/4" = 1'-0" | 1/A2.03



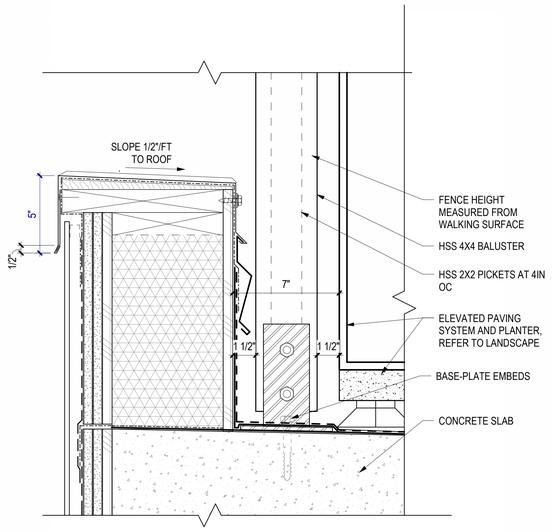
11 SINGLE GATE - PLAN DETAIL AT STRIKE
3" = 1'-0"



12 DOUBLE GATE - PLAN DETAIL AT STRIKE
3" = 1'-0"



14 DOUBLE GATE - PLAN DETAIL
3" = 1'-0"



15 COURTYARD FENCE CONNECTION
3" = 1'-0"

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PROJECT DESIGNER
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PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
EXTERIOR DETAILS - SITE

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
A5.55

90% CD SET

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DOOR SCHEDULE - LEVEL 1

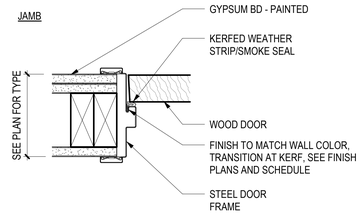
DOOR NUMBER	DOOR TYPE	EXTERIOR	U VALUE	ROOM	FIRE RATING	CLOSER	PANIC HW	ELECTRICAL	OPERATOR	WIDTH	HEIGHT	DOOR MATERIAL	DOOR FINISH	FRAME MATERIAL	FRAME FINISH	DOOR HARDWARE GROUP
001	B			RES TRASH						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	16A
002A	B			COM TRASH						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	01
002B	OD		.125	COM TRASH						7' - 0"	8' - 0"	COILING	PREFINISHED		PREFINISHED	00
003	A			TRANSFORMER	180MIN					7' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	22T
004	A	X		VESTIBULE	45MIN					6' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	23T
101A	B	X		VEST		X	X	X		3' - 6"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	04WT
101B	B	X		VEST		X	X	X	X	3' - 6"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	05WT
106.1	B			TI SPACE						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14C
110A	B			MANAGER OFFICE						3' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	18T
110B	B			MANAGER OFFICE						2' - 8"	8' - 0"	HM	PAINTED	HM	PAINTED	
112A	B			MEETING						3' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	18T
112B	B			MEETING						2' - 8"	8' - 0"	HM	PAINTED	HM	PAINTED	
114	B			STOR						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14A
115	B			BIKE ROOM		X		X	X	3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	
181	B			RR						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	15
182	B			FIRE						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14A
183A	A	X		WATER						6' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	24T
183B	B			WATER		X				4' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	20WT
185	B			ELEC		X				4' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14CWT
186	B			MPOE		X				3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14A
187A	B	X		ST2 EXIT PASSAGE	45MIN	X	X	X		3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	09T
187B	OD	X	.125	ST2 EXIT PASSAGE	45MIN					7' - 0"	8' - 0"	COILING	PREFINISHED		PREFINISHED	00
188	B			LOBBY CORRIDOR						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	14A
FD1	X		0.37	TI SPACE						16' - 0"	11' - 9"	ALUM	PREFINISHED		PREFINISHED	00
FD2	X		0.37	TI SPACE						16' - 0"	11' - 11"	ALUM	PREFINISHED		PREFINISHED	00
G1	GATE					X				3' - 6"	6' - 0"	STEEL	PAINTED	STEEL	PAINTED	25
G2	GATE				NA	X	X	X	X	6' - 0"	6' - 0"	STEEL	PAINTED	STEEL	PAINTED	13
SS-A	SF(B)	X	0.37	COMM VEST		X	X	X	X	6' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	02T
SS-B	SF(B)	X	0.37	COMM VEST		X	X	X	X	6' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	03T
SS-C	SF(A)	X	0.37	TI SPACE		X	X			3' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	21T
SS-D	SF(A)	X	0.37	TI SPACE		X	X			3' - 0"	8' - 0"	ALUM	PREFINISHED	ALUM	PREFINISHED	21T
ST101	B			LOBBY CORRIDOR						3' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	12
ST102	A			ST2 EXIT PASSAGE	90MIN	X	X			6' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	24AT
ST102				STAIR 2	90MIN	X	X	X		5' - 0"	8' - 0"	HM	PAINTED	HM	PAINTED	27T
U86	1									3' - 0"	8' - 0"					

DOOR SCHEDULE - COMMON

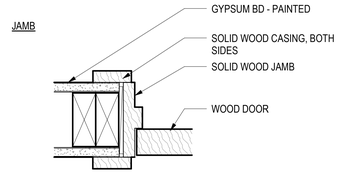
DOOR NUMBER	DOOR TYPE	EXTERIOR	U VALUE	ROOM	FIRE RATING	CLOSER	PANIC HW	ELECTRICAL	OPERATOR	WIDTH	HEIGHT	DOOR MATERIAL	DOOR FINISH	FRAME MATERIAL	FRAME FINISH	DOOR HARDWARE GROUP
LEVEL 03																
300S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
380A	A			COMMUNITY ROOM	20MIN	X	X			3' - 0"	7' - 0"					06
380B	A			COMMUNITY ROOM	20MIN	X	X			3' - 0"	7' - 0"					06
380C		X	0.37	COMMUNITY ROOM	-					3' - 0"	7' - 10"					13T
380D	A			COMMUNITY ROOM	NR					3' - 0"	7' - 0"					14
381	A			RR	20MIN	X				3' - 0"	7' - 0"					15
384	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					16
386	A			ELEC	90MIN	X				3' - 0"	7' - 0"					TBD
ST301	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					08
ST302	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					08
LEVEL 04																
400S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
481	A			TRASH	20MIN	X				3' - 0"	7' - 0"					16
482	A			JC	90MIN	X				3' - 0"	7' - 0"					14B
484	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					16
486	A			ELEC	NR					3' - 0"	7' - 0"					TBD
ST401	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					16A
ST402	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					11
LEVEL 05																
500S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
581	A			TRASH	20MIN	X				3' - 0"	7' - 0"					TBD
582	A			JC	90MIN	X				3' - 0"	7' - 0"					TBD
584	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					TBD
586	A			ELEC	NR					3' - 0"	7' - 0"					TBD
ST501	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					TBD
ST502	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					TBD
LEVEL 06																
600S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
681	A			TRASH	20MIN	X				3' - 0"	7' - 0"					TBD
682	A			JC	90MIN	X				3' - 0"	7' - 0"					TBD
684	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					TBD
686	A			ELEC	NR					3' - 0"	7' - 0"					TBD
ST601	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					TBD
ST602	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					TBD
LEVEL 07																
700S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
781	A			TRASH	20MIN	X				3' - 0"	7' - 0"					TBD
782	A			JC	90MIN	X				3' - 0"	7' - 0"					TBD
784	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					TBD
786	A			ELEC	NR					3' - 0"	7' - 0"					TBD
ST701	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					TBD
ST702	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					TBD
LEVEL 08																
800S				CORRIDOR	90MIN	X	X			6' - 4"	7' - 0"					07
881	A			TRASH	20MIN	X				3' - 0"	7' - 0"					TBD
882	A			JC	90MIN	X				3' - 0"	7' - 0"					TBD
884	A			LAUNDRY	20MIN	X				3' - 0"	7' - 0"					TBD
886	A			ELEC	NR					3' - 0"	7' - 0"					TBD
ST801	A			CORRIDOR	90MIN	X	X			3' - 0"	7' - 0"					TBD
ST802	A			STAIR 2	90MIN	X	X			3' - 0"	7' - 0"					TBD
PH LANDING FLOOR																
STR01	A	X			NR	X				3' - 0"	7' - 0"					26
ECR FLOOR																
800	A	X		ECR	90MIN	X				3' - 0"	7' - 0"					17

DOOR SCHEDULE - UNITS

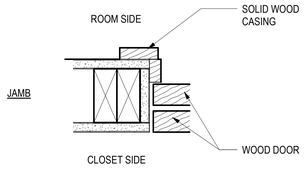
DOOR NUMBER	FUNCTION	DOOR FIRE RATING	WIDTH	HEIGHT	TYPE DOOR MATERIAL	TYPE DOOR FINISH	TYPE FRAME MATERIAL	TYPE FRAME FINISH	DOOR CLOSER	DOOR DETAIL JAMB	DOOR HARDWARE GROUP
1	ENTRY	20MIN	3' - 0"	7' - 0"	SOLID CORE BIRCH	PREFINISHED CLEAR	STEEL	PREFINISHED CUSTOM COLOR	HINGE	9	R01
2	PASSAGE	NR	2' - 10"	6' - 8"	SOLID CORE BIRCH	PREFINISHED CLEAR	WOOD	PREFINISHED CLEAR	NONE	8	R02
2A	PASSAGE TYPE A	NR	3' - 0"	6' - 8"	SOLID CORE BIRCH	PREFINISHED CLEAR	WOOD	PREFINISHED CLEAR	NONE	8	R02
3	CLOSET	NR	3' - 0"	6' - 8"	SOLID CORE BIRCH	PREFINISHED CLEAR	WOOD	PREFINISHED CLEAR	NONE	8	R02
6	CLOSET	NR	5' - 0"	6' - 8"	SOLID CORE BIRCH	PREFINISHED CLEAR	WOOD	PREFINISHED CLEAR	NONE	7	R03
9	CLOSET	NR	6' - 4"	6' - 8"					NONE	7	R03
12	CLOSET	NR	5' - 6"	6' - 8"					NONE	7	R03
13	CLOSET	NR	6' - 0"	6' - 8"					NONE	7	R03



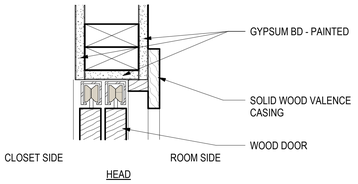
2 ENTRY DOOR - (U1)
3" = 1'-0"

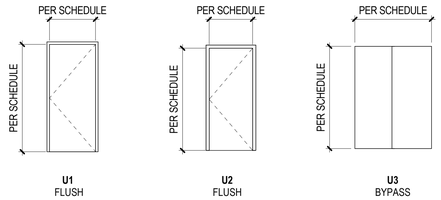


3 PASSAGE DOOR - (U2)1
3" = 1'-0"

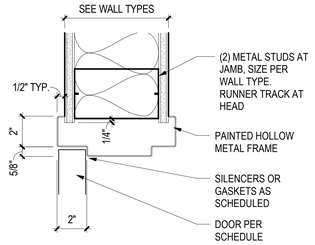


1 BYPASS DOOR (U3)
3" = 1'-0"





UNIT DOOR/FRAME TYPES
1/4" = 1'-0"



HEAD (JAMB SIMILAR)

4 HOLLOW METAL DOOR FRAME
3" = 1'-0"

DOOR SCHEDULE NOTES AND ABBREVIATIONS

A. PROVIDE CARD READER
B. PROVIDE LOCKS
C. PROVIDE KICK PLATE
D. PROVIDE HOLD OPEN
E. PROVIDE PULL AND PUSH PLATE
F. INSULATED DOOR (ALL EXTERIOR DOORS INSULATED)

GLAZING TYPE SCHEDULE:

GL-1: TEMPERED/ INSULATED (GLASS AT VINYL WINDOWS)
GL-2: TEMPERED/ INSULATED (EXTERIOR STOREFRONTS)
GL-3: TEMPERED
GL-4: TEMPERED/ FIRE RATED;
1. AT DOOR ASSEMBLIES IN CORRIDORS: 20 MINUTE MIN FIRE-PROTECTION-RATED, EXEMPT FROM HOSE STREAM TEST, D-20 MARKING, AS TESTED.
GL-5: TEMPERED/ FIRE RATED;
1.AT DOOR SIDELIGHT IN COORIDORS, 45 MINUTE, D-H-OH-45 MARKING

DOOR SCHEDULE ABBREVIATIONS:

ALUM	ALUMINUM
ALUM-1	ALUMINIUM - PAINTED "ACCENT COLOR"
ALUM-2	ALUMINUM - CLASS 1 ANODIZED - DARK BRONZE
HCW	HOLLOW CORE WOOD
HM	HOLLOW METAL (INSULATED AT EXTERIOR DOORS)
KD	KNOCK DOWN
P-#	PAINTED FINISH (SEE FINISH LEGEND FOR DESCRIPTION)
SCW	SOLID CORE WOOD
MTL	METAL
PMP	PERFORATED METAL PANEL

ALL SLIDING, BARN & POCKET DOORS :

1. DOOR HANDLES, PULLS, LATCHES LOCKS & OTHER OPERATING DEVICES ON DOORS REQUIRED TO BE ACCESSIBLE BY SBC CHAPTER 11 SHALL NOT REQUIRE TIGHT GRASPING, TIGHT PINCHING OR TWISTING OF THE WRIST TO OPERATE
2. CONTROLS, OPERATING MECHANISM AND HARDWARE INTENDED FOR OPERATION BY THE OCCUPANT IN ACCESSIBLE SPACES, ALONG ACCESSIBLE ROUTES OR AS PART OF ACCESSIBLE ELEMENTS SHALL BE ACCESSIBLE DOORS SHALL COMPLY WITH ANSI 117.1-2003
3. EXIT DOORS TO BE PROVIDED WITH ADJUSTABLE SWEEPS

THERMAL PERFORMANCE

1. OPAQUE (HM) EXTERIOR DOORS, BASIS OF DESIGN: WSEC TABLE 107.1(1): **U-0.37**
2. STOREFRONT ENTRANCE EXTERIOR DOORS (ALUM), BASIS OF DESIGN: NFC CPD# FA-KAW-13201: **U-0.46**

GENERAL NOTES:

HARDWARE GROUPS WERE ADDED FOR CONVENIENT REFERENCE. SPECIFICATIONS TAKE PRECEDENT. GC TO CONTACT ARCHITECT IF ANY DISCREPANCIES ARE IDENTIFIED WITH THE DOOR SCHEDULE AND SPECIFICATIONS

ALL DOORS WITHIN CORRIDOR FIRE PARTITIONS TO BE SELF-CLOSING AND LATCHING.

MITHUN

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Culver City, CA 90232 / 323.937.2150

mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
DOOR SCHEDULE

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A10.01

90% CD SET

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ORIGINAL SHEET SIZE 30" x 42"

2/7/2025 2:33:46 PM

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ROOM FINISH SCHEDULE

ROOM NUMBER	NAME	FLOORING	WALL BASE	WALL FINISH				CEILING
				NORTH	EAST	SOUTH	WEST	
LEVEL 01 COM (MID)								
TI100	TI SPACE	CONC-1						
001	RES TRASH	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
002	COM TRASH	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
004	VESTIBULE	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
003	TRANSFORMER	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
TI001	TI ECR							
LEVEL 01 COM (HIGH)								
190	COMM VEST	CONC-2	RB-2					
LEVEL 01								
110	MANAGER OFFICE	CPT-1	RB-2	PT-1	PT-1	PT-1	PT-1	ACP-1
112	MEETING	CPT-1	RB-2	PT-1	PT-1	PT-1	PT-1	ACP-1
113	MAIL / PACKAGE	CONC-1	RB-2	PT-1	PT-1	PT-1	PT-1	WD-1
114	STOR	CONC-1	-	PT-1/WP-1	PT-1/WP-1	PT-1/WP-1	PT-1/WP-1	PT-1
181	RR	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
115	BIKE ROOM	CONC-1	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
ST102	STAIR 2	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
100	LOBBY	CONC-1	RB-2	PT-1	PT-1	PT-1	PT-1	WD-1
101	VEST	WOM-1	RB-2	PT-1	PT-1	PT-1	PT-1	WD
182	FIRE	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
183	WATER	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
185	ELEC	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
186	MPOE	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
187	ST2 EXIT PASSAGE	CONC-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
188	LOBBY CORRIDOR	CONC-1	RB-2	PT-1	PT-1	PT-1	PT-1/FEATURE	ETS
189	SERVICE CORRIDOR	CONC-2	RB-2	PT-1	PT-1	PT-1	PT-1	ETS
185B	ELEC EM							
101	ELEV LOBBY							
ST101	STAIR 1	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
LEVEL 02								
TI 200	COMMERCIAL							
LEVEL 03								
305	OFFICE	CPT-1	RB-2	PT-1	PT-1	PT-1	PT-1	ACP-1
ST302	STAIR 2	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
384	LAUNDRY	RF-5	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
380	COMMUNITY ROOM	RF-5	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST301	STAIR 1	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
381	RR	RF-5	-	PT-1	PT-1	PT-1	PT-1	PT-1
385	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
300S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
300N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
386	ELEC							
LEVEL 04								
ST402	STAIR 2	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
484	LAUNDRY	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST401	STAIR 1	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
481	TRASH	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
485	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
482	JC	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
400S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
400N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
486	ELEC							
LEVEL 05								
ST502	STAIR 2	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
584	LAUNDRY	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST501	STAIR 1	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
581	TRASH	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
585	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
582	JC	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
500S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
500N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
586	ELEC							
LEVEL 06								
ST602	STAIR 2	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
684	LAUNDRY	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST601	STAIR 1	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
681	TRASH	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
685	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
682	JC	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
600S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
600N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
686	ELEC							
LEVEL 07								
ST702	STAIR 2	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
784	LAUNDRY	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST701	STAIR 1	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
781	TRASH	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
785	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
782	JC	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
700S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
700N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
786	ELEC							
LEVEL 08								
ST802	STAIR 2	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
884	LAUNDRY	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
ST801	STAIR 1	CPT-2	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
881	TRASH	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
885	RES LOUNGE	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
882	JC	RF-4	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
800S	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
800N	CORRIDOR	RF-1	RB-2	PT-1	PT-1	PT-1	PT-1	PT-1
886	ELEC							

FINISH LEGEND

FINISH TYPE	ITEM	MANUFACTURER	STYLE	COLOR	SIZE	COMMENTS
ACOUSTIC CEILING						
ACOUSTIC CEILING	ACP-1	ARMSTRONG	LYRA	WHITE		
CARPET						
CARPET	CPT-1	SHAW CONTRACT	OFFSET, CARPET TILE	TBD		
CARPET	CPT-2	SHAW CONTRACT	ACCORD, BROADLOOM	TBD		
CONCRETE						
CONCRETE	CONC-1	POLISHED, SEALED CONCRETE				
CONCRETE	CONC-2	SEALED CONCRETE				
PLASTIC LAMINATE						
PLASTIC LAMINATE	PLAM-1	WILSONART	HPL, MATTE FINISH	TBD		
RESILIENT FLOORING						
RESILIENT FLOORING	RF-1	SHAW CONTRACT	RESIDE, 12 MIL LVT	TBD		PLANK FORMAT - IN UNITS
RESILIENT FLOORING	RF-2	SHAW CONTRACT	INNATE LINEN, SHEET	TBD		RESILIENT SHEET - IN UNITS (BATHROOM)
RESILIENT FLOORING	RF-3	SHAW CONTRACT	RESIDE, 12 MIL LVT	TBD		PLANK FORMAT - IN SHARED AREAS
RESILIENT FLOORING	RF-4	ROPPE	RENEW, #95 TEXTURE	TBD		RUBBER TILE, STAIR RISER AND TREADS AT FLOORS 1-2
RESILIENT FLOORING	RF-5	SHAW CONTRACT	TATAMI, SHEET	TBD		RESILIENT SHEET - IN SHARED AREAS
RESILIENT FLOORING	RF-6	FORBO	MARMOLEUM COCOA	TBD		ALTERNATE - RESILIENT SHEET IN SHARED AREAS
RUBBER BASE						
RUBBER BASE	RB-1	ROPPE	4" COVE TOE	TBD		
RUBBER BASE	RB-2	ROPPE	4" COVE TOE	TBD		
SOLID SURFACE						
SOLID SURFACE	SS-1	CORIAN	CORIAN SOLID SURFACE	DOVE		
WALK OFF MAT						
WALK OFF MAT	WOM-1	SHAW CONTRACT	ALL ACCESS, SWIFT TILE	TBD		AT ENTRY VESTIBULES
WALL PANEL						
WALL PANEL	WP-1	ACROVYN	SMOOTH FACE WAINSCOT	TBD		
WOOD CEILING						
WOOD CEILING	WD-1	9-WOOD	9100 HYBRID PANEL	WESTERN HEMLOCK		

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mithun.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE ISSUE

NO. DATE REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
INTERIOR FINISH LEGEND AND ROOM SCHEDULE

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A10.03

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ORIGINAL SHEET SIZE 30" x 42"

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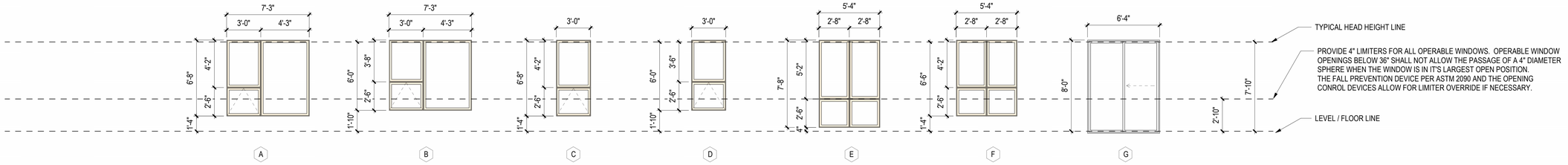
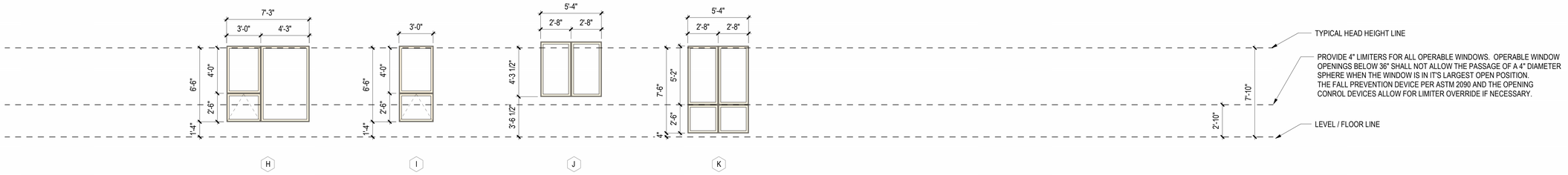


DOUBLE PANE WINDOWS



TRIPLE PANE WINDOWS

A10_WINDOW TYPE ELEVATIONS

1/4" = 1'-0"

WINDOW SCHEDULE

WINDOW TYPE	MANUFACTURER - BASIS OF DESIGN	MODEL - BASIS OF DESIGN	PRODUCT / OPERATION TYPE	Width	Height	Window Area	Count	U-FACTOR	CPD NO.	SHGC	VT VISUAL TRANSMITTANCE	FRAME FINISH	FRAME FINISH COLOR	FRAME MATERIAL	GLAZING MATERIAL	GLAZING TYPE	WINDOW NOTES
A	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND AWNING COMBINATION	7' - 3"	6' - 8"		45	0.27	VPI-A-20-07872-00002	0.23	0.42		WHITE			GL-2	
B	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND AWNING COMBINATION	7' - 3"	6' - 2"		2	0.27	VPI-A-20-07872-00002	0.23	0.42		WHITE			GL-2	
C	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND CASEMENT COMBINATION	3' - 0"	6' - 8"		92	0.27	VPI-A-19-07358-00002	0.22	0.42		WHITE			GL-2	
D	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND AWNING COMBINATION	3' - 0"	6' - 2"		2	0.27	VPI-A-19-07358-00002	0.22	0.42		WHITE			GL-2	
E	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED	5' - 4"	7' - 8"		5	0.26	VPI-A-18-01175-00006	0.18	0.40		WHITE			GL-2	
G	VPI OR EQUAL	BELLEVUE SERIES	SLIDING	6' - 4"	8' - 2"	52 SF	3	0.28	VPI-A-21-00811-00004	0.19	0.52		WHITE			GL-2	
H	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND AWNING COMBINATION	7' - 3"	6' - 8"		30	0.18	VPI-A-19-01636-00001	0.16	0.42		WHITE			GL-2	TRIPLE PANE
I	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED AND CASEMENT COMBINATION	3' - 0"	6' - 8"		54	0.18	VPI-A-19-01636-00001	0.16	0.42		WHITE			GL-2	TRIPLE PANE
J	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED	5' - 4"	4' - 10"		2	0.17	VPI-A-18-01476-00001	0.20	0.40		WHITE			GL-2	<varies>
K	VPI OR EQUAL	ENDURANCE SERIES VINYL	FIXED	5' - 4"	7' - 8"		5	0.17	VPI-A-18-01476-00001	0.20	0.40		WHITE			GL-2	TRIPLE PANE

VINYL WINDOW TYPICAL GLAZING NOTES

1. ALL GLAZING IN EXTERIOR VINYL WINDOWS TO BE INSULATED
2. GLAZING IN VINYL WINDOWS TO BE TEMPERED IN THE FOLLOWING LOCATIONS:
   A. FIXED AND OPERABLE PANELS OF SWINGING OR SLIDING DOORS
   B. WINDOW PANES WITHING 24" OF A DOOR
   C. WINDOW PANES > 9 SQ FT WHERE THE BOTTOM EDGE IS BELOW 18" AFF

VINYL WINDOW OPERATING HARDWARE NOTES

1. ALL OPERATING HARDWARE TO BE BETWEEN 15" AND 48" AFF
2. ALL OPERATING HARDWARE TO BE OPERABLE WITH ONE HAND AND SHALL NOT REQUIRE TIGHT GRASPING, PINCHING, OR TWISTING OF THE WRIST. THE FORCE REQUIRED TO ACTIVATE OPERATING HARDWARE SHALL BE 5 POUNDS MAX.

GLAZING SCHEDULE

GL-1: INSULATED
GL-2: TEMPERED / INSULATED
GL-3: INSULATED / LAMINATED INTERLAYER COLOR A
GL-4: INSULATED / LAMINATED INTERLAYER COLOR B
GL-5: TEMPERED
GL-6: SPANDREL
GL-7: FIRE RATED GLASS

ORIGINAL SHEET SIZE 30" x 42"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
WINDOW TYPES

PROJECT NO.
2324000
DATE
09/10/24
SHEET NUMBER
A10.04

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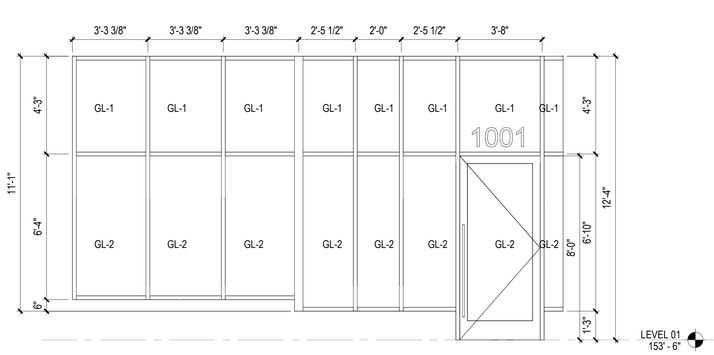
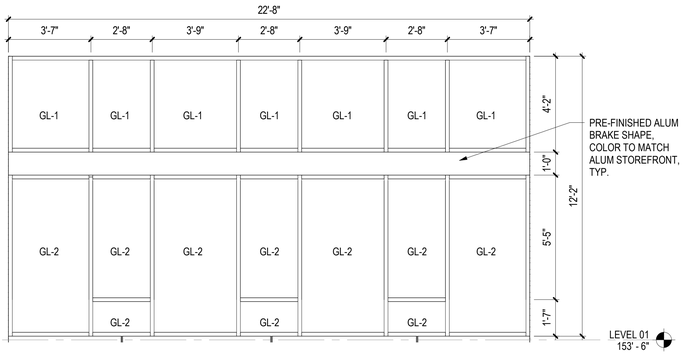
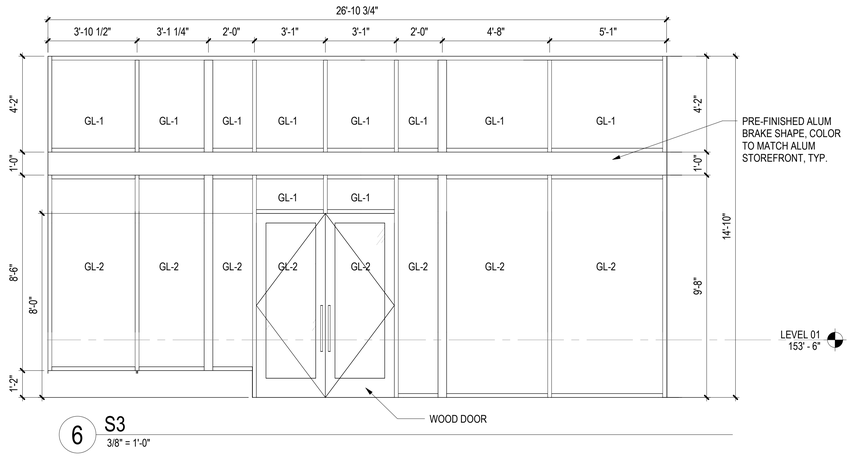


4 S1
3/8" = 1'-0"



5 S2
3/8" = 1'-0"



6 S3
3/8" = 1'-0"

7 S4
3/8" = 1'-0"

8 S5
3/8" = 1'-0"

1 S6
3/8" = 1'-0"

GLAZING SCHEDULE

GL-1: INSULATED
GL-2: TEMPERED / INSULATED
GL-3: INSULATED / LAMINATED INTERLAYER COLOR A
GL-4: INSULATED / LAMINATED INTERLAYER COLOR B
GL-5: TEMPERED
GL-6: SPANDREL
GL-7: FIRE RATED GLASS

ORIGINAL SHEET SIZE 36" x 42"

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Little Saigon Landmark

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Seattle, Washington
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PREPARED FOR
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NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
STOREFRONT TYPES, ELEVATIONS, AND RELITES

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
A10.05

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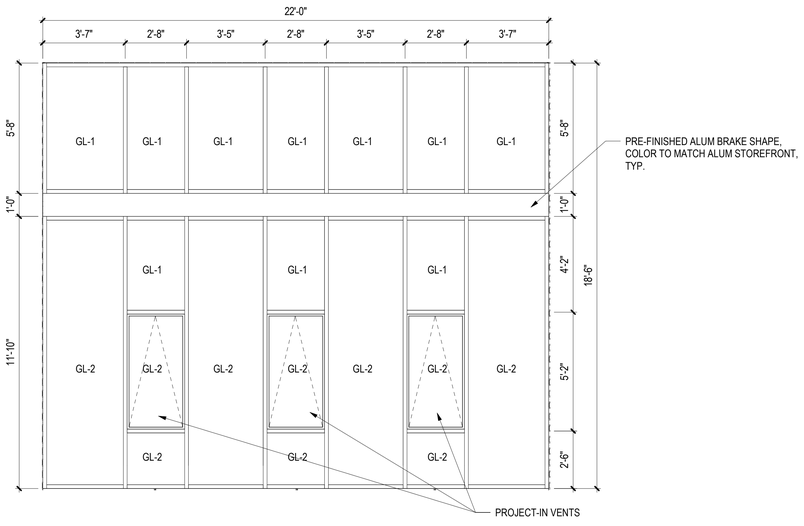
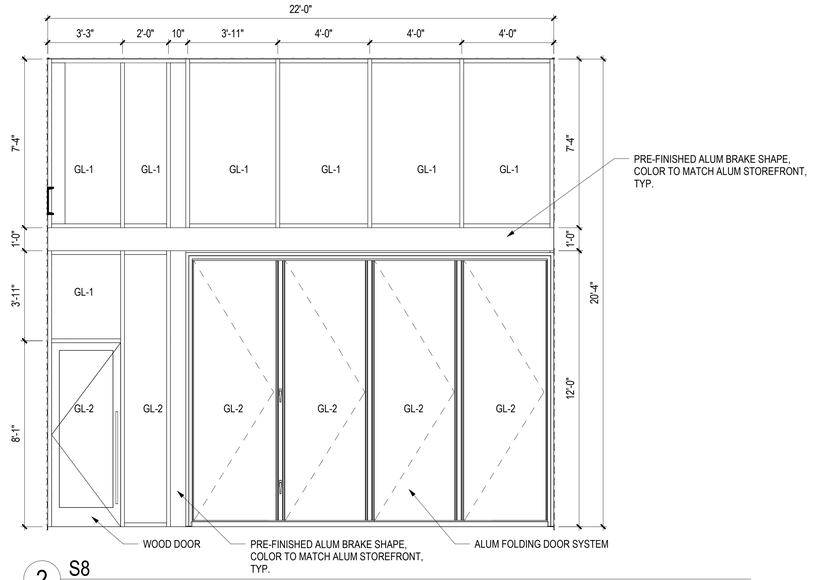
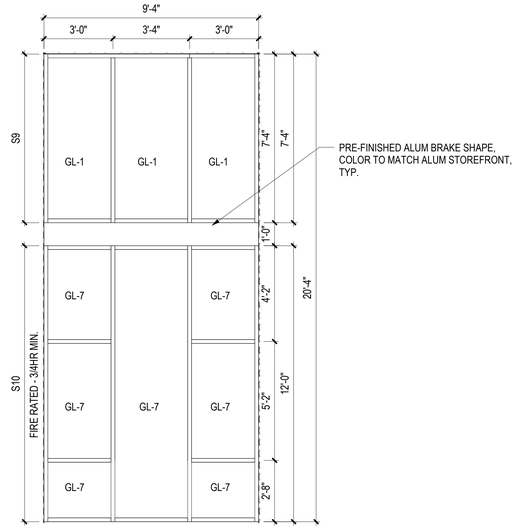


1 S7
3/8" = 1'-0"



2 S8
3/8" = 1'-0"



3 S9 & S10
3/8" = 1'-0"

4 S11
3/8" = 1'-0"

5 S12
3/8" = 1'-0"

GLAZING SCHEDULE

GL-1: INSULATED
GL-2: TEMPERED / INSULATED
GL-3: INSULATED / LAMINATED INTERLAYER COLOR A
GL-4: INSULATED / LAMINATED INTERLAYER COLOR B
GL-5: TEMPERED
GL-6: SPANDREL
GL-7: FIRE RATED GLASS

STOREFRONT SCHEDULE															
INSTANCE MARK NO.	MANUFACTURER - BASIS OF DESIGN	MODEL - BASIS OF DESIGN	LENGTH	UNCONNECTED HEIGHT	AREA	COUNT	U-FACTOR	CMA NO.	SHGC	VT VISUAL TRANSMITTANCE	FRAME MATERIAL	FRAME FINISH	FRAME FINISH COLOR	GLAZING TYPE	STOREFRONT NOTES
S1	KAWNEER	TRIFAB 451UT	21' - 8 1/4"	12' - 6"	240 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S2	KAWNEER	TRIFAB 451UT	22' - 8"	14' - 11"	276 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S3	KAWNEER	TRIFAB 451UT	26' - 10 3/4"	14' - 11"	389 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S4	KAWNEER	TRIFAB 451UT	31' - 5"	14' - 11"	466 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S5	KAWNEER	TRIFAB 451UT	22' - 0"	14' - 11"	329 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S6	KAWNEER	TRIFAB 451UT	22' - 0"	18' - 6"	407 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S7	KAWNEER	TRIFAB 451UT	22' - 0"	18' - 6"	407 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S8	KAWNEER	TRIFAB 451UT	22' - 0"	20' - 2"	447 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S9	KAWNEER	TRIFAB 451UT	20' - 0"	18' - 6"	78 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S10	SAFTI	GPX ARCHITECTURAL SERIES	9' - 4"	10' - 8 27/64"	112 SF	1	0.39		0.31		ALUM	FACTORY	DARK BRONZE	GL-7	MIN. 3/4HR RATED OPENING
S11	KAWNEER	TRIFAB 451UT	20' - 0 3/8"	18' - 6"	56 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
S12	KAWNEER	TRIFAB 451UT	7' - 3 1/16"	6' - 6"	15 SF	1	0.32	P-KAW-12784	0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
1	12/17/24	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
STOREFRONT TYPES, ELEVATIONS, AND RELITES

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
A10.06

90% CD SET

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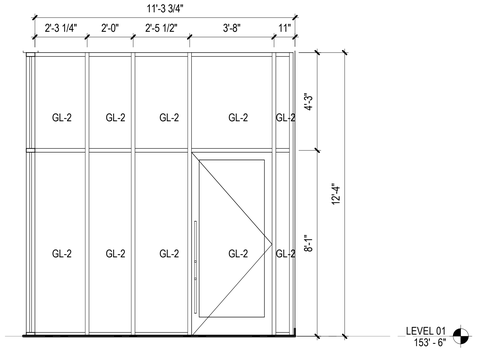
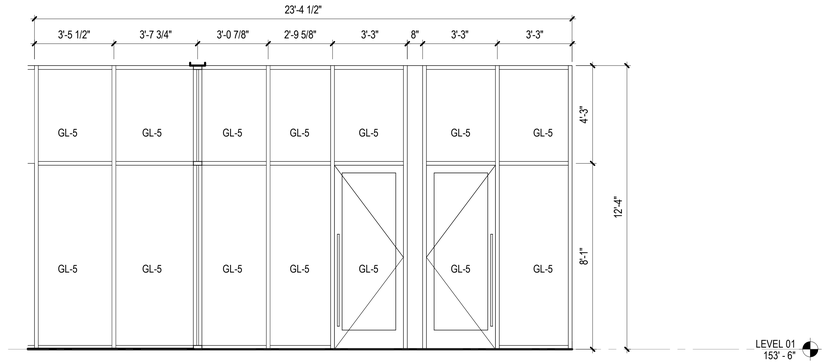
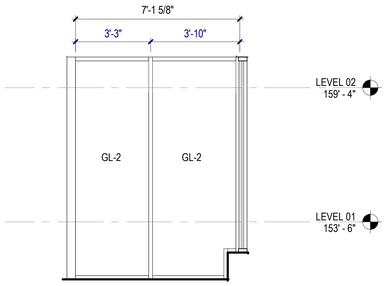
ORIGINAL SHEET SIZE 30" x 42"



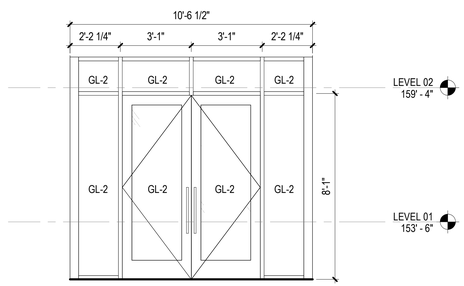
1 INTERIOR STOREFRONT R1
3/8" = 1'-0"



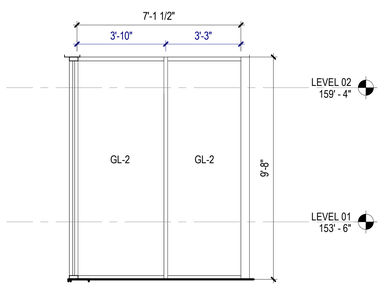
2 INTERIOR STOREFRONT R2
3/8" = 1'-0"



4 INTERIOR STOREFRONT R3
3/8" = 1'-0"



5 INTERIOR STOREFRONT R4
3/8" = 1'-0"



6 INTERIOR STOREFRONT R5
3/8" = 1'-0"

GLAZING SCHEDULE

GL-1: INSULATED
GL-2: TEMPERED / INSULATED
GL-3: INSULATED / LAMINATED INTERLAYER COLOR A
GL-4: INSULATED / LAMINATED INTERLAYER COLOR B
GL-5: TEMPERED
GL-6: SPANDREL
GL-7: FIRE RATED GLASS

INTERIOR RELITE SYSTEM SCHEDULE

INSTANCE MARK NO.	MANUFACTURER - BASIS OF DESIGN	MODEL - BASIS OF DESIGN	LENGTH	UNCONNECTED HEIGHT	AREA	COUNT	U-FACTOR	CMA NO.	SHGC	VT VISUAL TRANSMITTANCE	FRAME MATERIAL	FRAME FINISH	FRAME FINISH COLOR	GLAZING TYPE	STOREFRONT NOTES
R1	KAWNEER	TRIFAB VERSAGLAZE 450 STANDARD	11' - 2 3/4"	12' - 4"	138 SF	1	0.33		0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
R2	KAWNEER	TRIFAB VERSAGLAZE 450 STANDARD	24' - 1 5/16"	12' - 4"	297 SF	1	0.33		0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
R3	KAWNEER	TRIFAB VERSAGLAZE 450 STANDARD	7' - 0 11/16"	9' - 8"	68 SF	1	0.33		0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
R4	KAWNEER	TRIFAB VERSAGLAZE 450 STANDARD	10' - 6 1/2"	9' - 8"	102 SF	1	0.33		0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	
R5	KAWNEER	TRIFAB VERSAGLAZE 450 STANDARD	7' - 1 1/2"	9' - 8"	69 SF	1	0.33		0.34	0.62	ALUM	FACTORY	DARK BRONZE	GL-2	

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
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PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL, CA
CHECK
PC

TITLE
STOREFRONT TYPES, ELEVATIONS, AND RELITES

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
A10.07

90% CD SET

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ORIGINAL SHEET SIZE: 30" x 42"

General Structural Notes

(THE FOLLOWING APPLY UNLESS SHOWN OTHERWISE ON THE DRAWINGS.)

CRITERIA:

1. ALL MATERIALS, WORKMANSHIP, DESIGN, AND CONSTRUCTION SHALL CONFORM TO THE DRAWINGS, SPECIFICATIONS, AND THE SEATTLE BUILDING CODE (SBC), 2021 EDITION.

2. DESIGN LOADING CRITERIA:

RISK CATEGORY SBC TABLE 1604.5	II
ROOF, FLOOR, & STAIR LIVE LOAD	SEE LOADING DIAGRAMS
ROOF SNOW LOAD	25 PSF (I_S = 1.0)
GUARDRAILS/BALCONY RAILS	50 PLF OR 200 LB CONCENTRATED LOAD
MECHANICAL UNITS	SEE DRAWINGS FOR MAXIMUM ALLOWABLE WEIGHTS
EARTHQUAKE (NEW BUILDING DESIGN)	SEISMIC DESIGN CATEGORY D S_S = 1.408, S_1 = 0.491, S_{DS} = 0.939, S_{D1} = 0.888 I_E = 1.0, STORY DRIFT LIMIT = 0.20 * H EQUIVALENT LATERAL FORCE PROCEDURE SPECIAL REINFORCED CONCRETE SHEAR WALLS R = 5, Ω_0 = 2.5, C_D = 5, C_s = 0.188, BASE SHEAR = 1428 KIPS CALCULATED MAXIMUM DRIFT = 0.008 * H WOOD SHEAR WALLS R = 6.5, Ω_0 = 3.0, C_D = 4, C_s = 0.145, BASE SHEAR = 507 KIPS CALCULATED MAXIMUM DRIFT = 0.011 * H
WIND	V = 97 MPH, EXPOSURE "B"
WIND (CLADDING/ENCLOSURE ELEMENT DESIGN PRESSURES)	38/23 PSF MAX. AT WALLS (LRFD/ASD) 60/36 PSF GROSS UPLIFT AT ROOF (LRFD/ASD)

WIND PRESSURES BASED ON LESS THAN 10 SQUARE FOOT TRIBUTARY AREAS NEAR WALL CORNERS OR ROOF EDGES (EXCLUDING CORNER ZONES AT ROOF). REDUCED DESIGN PRESSURES MAY BE CALCULATED IN ACCORDANCE WITH ASCE 7-16 CHAPTER 30.

RAIN INTENSITY	I = 1.0 IN/HR

SEE DRAWINGS FOR ADDITIONAL LOADING CRITERIA

3. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS AND ALL OTHER CONTRACT DOCUMENTS FOR BIDDING AND CONSTRUCTION. CONTRACTOR SHALL VERIFY DIMENSIONS AND CONDITIONS FOR COMPATIBILITY AND SHALL NOTIFY ARCHITECT OF ALL DISCREPANCIES PRIOR TO CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE BUILDING LAYOUT DIMENSIONS (GRID LAYOUTS, SITE COORDINATES, ETC.) AMONGST ALL TRADES, INCLUDING SHOP FABRICATED ITEMS.

4. CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS, MEMBER SIZES AND CONDITIONS PRIOR TO COMMENCING ANY WORK AND PRIOR TO SUBMITTING SHOP DRAWINGS. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS ARE INTENDED AS GUIDELINES ONLY AND MUST BE VERIFIED. THE EXISTING CONDITIONS SHOWN ON THE DRAWINGS ARE BASED EITHER ON SITE OBSERVATION, ORIGINAL DRAWINGS OR WERE ASSUMED BASED ON EXPECTED CONDITIONS. IF THE EXISTING CONDITIONS DO NOT CLOSELY MATCH THE CONDITIONS SHOWN ON THE DRAWINGS, OR IF THE EXISTING MATERIALS ARE OF QUESTIONABLE OR SUBSTANDARD QUALITY, NOTIFY THE ENGINEER PRIOR TO COMMENCING ANY WORK.

5. CONTRACTOR SHALL PROVIDE TEMPORARY BRACING, BOTH FOR VERTICAL LOADS AND LATERAL STABILITY, FOR THE STRUCTURE AND STRUCTURAL COMPONENTS UNTIL ALL FINAL CONNECTIONS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE DRAWINGS.

6. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND THE METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED TO PERFORM THE WORK.

7. CONTRACTOR-INITIATED CHANGES SHALL BE SUBMITTED IN WRITING TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR APPROVAL PRIOR TO FABRICATION OR CONSTRUCTION. CHANGES SHOWN ONLY ON SHOP DRAWINGS WILL NOT SATISFY THIS REQUIREMENT.

8. DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND THE STRUCTURAL ENGINEER.

9. ALL STRUCTURAL SYSTEMS COMPOSED OF COMPONENTS TO BE FIELD ERECTED SHALL BE SUPERVISED BY THE SUPPLIER DURING MANUFACTURING, DELIVERY, HANDLING, STORAGE AND ERECTION IN ACCORDANCE WITH INSTRUCTIONS PREPARED BY THE SUPPLIER.

10. SHOP DRAWINGS FOR REINFORCING STEEL (FOR BOTH CONCRETE AND MASONRY CONSTRUCTION), PRECAST CONCRETE MEMBERS, STRUCTURAL STEEL, COLD-FORMED METAL FRAMING, GLUED LAMINATED MEMBERS, ENGINEERED WOOD I-JOISTS, AND FIRE-RETARDANT TREATED WOOD MEMBERS SHALL BE SUBMITTED TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR REVIEW PRIOR TO FABRICATION OF THESE ITEMS.

    SHOP DRAWINGS SHALL ALSO BE SUBMITTED TO THE SEATTLE DEPARTMENT OF CONSTRUCTION AND INSPECTIONS (SDCI) IN ACCORDANCE WITH SDCI REQUIREMENTS AT THE TIME OF CONSTRUCTION.

11. SHOP DRAWING REVIEW: DIMENSIONS AND QUANTITIES ARE NOT REVIEWED BY THE ENGINEER OF RECORD, AND THEREFORE MUST BE VERIFIED BY THE CONTRACTOR. THE CONTRACTOR SHALL REVIEW AND STAMP DRAWINGS PRIOR TO REVIEW BY ENGINEER OF RECORD. SUBMITTALS SHALL BE SUBMITTED ELECTRONICALLY IN PDF FORMAT.

    SHOP DRAWING SUBMITTALS PROCESSED BY THE ENGINEER ARE NOT CHANGE ORDERS. THE PURPOSE OF SHOP DRAWING SUBMITTALS BY THE CONTRACTOR IS TO DEMONSTRATE TO THE ENGINEER THAT THE CONTRACTOR UNDERSTANDS THE DESIGN CONCEPT BY INDICATING WHICH MATERIAL IS INTENDED TO BE FURNISHED AND INSTALLED AND BY DETAILING THE INTENDED FABRICATION AND INSTALLATION METHODS. IF DEVIATIONS, DISCREPANCIES, OR CONFLICTS BETWEEN SHOP DRAWING SUBMITTALS AND THE CONTRACT DOCUMENTS ARE DISCOVERED EITHER PRIOR TO OR AFTER SHOP DRAWING SUBMITTALS ARE PROCESSED BY THE ENGINEER, THE DESIGN DRAWINGS AND SPECIFICATIONS SHALL CONTROL AND SHALL BE FOLLOWED.

12. DEFERRED SUBMITTALS SHALL BE DESIGNED BY AN ENGINEER REGISTERED IN THE STATE OF WASHINGTON. IT IS CONTRACTOR'S RESPONSIBILTY TO VERIFY THE SUBMITTAL AND SCHEDULE REQUIREMENTS WITH THE LOCAL JURISDICTION. THE COMPONENT DESIGNER SHALL BE A REGISTERED STRUCTURAL ENGINEER IF REQUIRED BY THE BUILDING OFFICIAL OF THE LOCAL JURISDICTION. BUILDING COMPONENT SUBMITTALS SHALL INCLUDE THE DESIGNING PROFESSIONAL ENGINEER'S STAMP AND SHALL BE APPROVED BY THE COMPONENT DESIGNER PRIOR TO CURSORY REVIEW BY THE ENGINEER OF RECORD FOR LOADS IMPOSED ON THE BASIC STRUCTURE. THE COMPONENT DESIGNER IS RESPONSIBLE FOR CODE CONFORMANCE PER ASCE 7-16 CHAPTER 13, INCLUDING ACCOMMODATION FOR STRUCTURAL RELATIVE DISPLACEMENTS PER SECTION 13.3.2 AND ALL NECESSARY BRACING, SUPPORTS OR CONNECTIONS NOT SPECIFICALLY CALLED OUT ON THE ARCHITECTURAL OR STRUCTURAL DRAWINGS. SEE THE DESIGN LOADING CRITERIA FOR BUILDING DISPLACEMENTS AS REQUIRED. DEFERRED SUBMITTALS SHALL INDICATE LOCATION, MAGNITUDE AND DIRECTION OF ALL LOADS IMPOSED ON BASIC STRUCTURE. DESIGN CALCULATIONS SHALL BE INCLUDED IN THE SUBMITTAL. THE CONTRACTOR SHALL FORWARD DEFERRED SUBMITTALS TO THE BUILDING OFFICIAL WHERE REQUIRED.

    THE FOLLOWING BUILDING COMPONENTS SHALL BE DEFERRED SUBMITTALS FOR THIS PROJECT:
    - PREFABRICATED METAL STAIR SYSTEMS (INCLUDING CONNECTIONS PER ASCE 7-16 SECTION 13.5.10)
    - MECHANICAL & ELECTRICAL COMPONENTS & DISTRIBUTION SYSTEMS (SEE NOTE 13)
    - PRECAST STAIR TREADS
    - SEISMIC HOLD-DOWN SYSTEM (SEE NOTE 60)
    - CONCRETE POST-TENSIONING SYSTEM (SEE NOTE 39)
    - EXTERIOR CLADDING SYSTEMS (SEE NOTE 16)
    - PRECAST PRESTRESSED CONCRETE ELEMENTS (SEE NOTE 32)
    - PREFABRICATED ROOF AND WALL PANELS (SEE NOTE 56)

13. MECHANICAL & ELECTRICAL COMPONENTS & DISTRIBUTION SYSTEMS DESIGN FOR CODE PRESCRIBED GRAVTIY AND SEISMIC/WIND LOADS SHALL BE PROVIDED BY AN ENGINEER REGISTERED IN THE STATE OF WASHINGTON, EXCEPT FOR ELEMENTS SPECIFICALLY SHOWN AND DETAILED ON THE STRUCTURAL DRAWINGS. THE MECHANICAL/ELECTRICAL CONTRACTOR MUST HIRE THE ENGINEER AND IS RESPONSIBLE FOR ALL COSTS RELATED TO THE PURCHASE AND INSTALLATION OF NECESSARY SUPPORTS, BRACING AND ANCHORAGE. SEISMIC BRACING AND ANCHORAGE DESIGN SHALL COMPLY WITH CHAPTER 13 OF ASCE 7-16. SEE TABLE 13.6-1 FOR APPLICABLE COMPONENTS AND DISTRIBUTION SYSTEMS SEISMIC DESIGN COEFFICIENTS. WHERE APPLICABLE, THE DESIGN SHALL ACCOMMODATE RELATIVE DISPLACEMENTS PER SECTION 13.6.4.2. SEE GENERAL STRUCTURAL NOTE 12 FOR ADDITIONAL INFORMATION.

14. ARCHITECTURAL COMPONENTS DESIGN SEE SPECIFICATIONS FOR ARCHITECTURAL COMPONENTS DESIGN REQUIREMENTS. IF THE LOCAL JURISDICTION REQUIRES THE COMPONENT DESIGN BE SUBMITTED FOR PERMIT, THE CONTRACTOR OR COMPONENT VENDOR MUST HIRE AN ENGINEER REGISTERED IN THE STATE OF WASHINGTON AND IS RESPONSIBLE FOR ALL COSTS RELATED TO THE PURCHASE AND INSTALLATION OF NECESSARY SUPPORTS, BRACING AND ANCHORAGE. SEISMIC BRACING AND ANCHORAGE DESIGN SHALL COMPLY WITH CHAPTER 13 OF ASCE 7-16. SEE TABLE 13.5-1 FOR APPLICABLE SEISMIC DESIGN COEFFICIENTS. SEE GENERAL STRUCTURAL NOTE 12 FOR ADDITIONAL INFORMATION.

15. STAIR SYSTEM COMPONENTS DESIGN FOR CODE PRESCRIBED GRAVTIY AND SEISMIC LOADS SHALL BE PROVIDED BY AN ENGINEER REGISTERED IN THE STATE OF WASHINGTON, EXCEPT FOR ELEMENTS SPECIFICALLY SHOWN AND DETAILED ON THE STRUCTURAL DRAWINGS. THE CONTRACTOR OR SYSTEM SUPPLIER MUST HIRE THE ENGINEER AND IS RESPONSIBLE FOR ALL COSTS RELATED TO THE PURCHASE AND INSTALLATION OF NECESSARY SUPPORTS, BRACING AND ANCHORAGE. SEISMIC BRACING AND ANCHORAGE DESIGN SHALL COMPLY WITH CHAPTER 13 OF ASCE 7-16. SEE TABLE 13.5-1 FOR APPLICABLE SEISMIC DESIGN COEFFICIENTS. THE DESIGN SHALL ACCOMMODATE SEISMIC RELATIVE DISPLACEMENTS PER SECTION 13.3.2. SEE THE DESIGN LOADING CRITERIA FOR BUILDING DISPLACEMENTS AS REQUIRED. SEE GENERAL STRUCTURAL NOTE 12 FOR ADDITIONAL INFORMATION.

16. EXTERIOR CLADDING COMPONENTS DESIGN – WITH THE EXCEPTION OF THE FRAMING ELEMENTS SHOWN ON THE STRUCTURAL DRAWINGS, ALL CLADDING COMPONENTS SHALL BE DESIGNED BY THE CONTRACTOR FOR THE LOADS AND CONDITIONS SHOWN ON THE DRAWINGS AND THE REQUIREMENTS OF ASCE 7-16, CHAPTER 13. CONTRACTOR SHALL SUBMIT DETAILED DRAWINGS AND CALCULATIONS, INCLUDING INDICATION OF MAGNITUDE, LOCATION, AND DIRECTION OF ALL LOADS IMPOSED ON THE PRIMARY STRUCTURE, BEARING THE STAMP AND SIGNATURE OF AN ENGINEER REGISTERED IN THE STATE OF WASHINGTON. CONTRACTOR'S ENGINEER SHALL BE RESPONSIBLE FOR DESIGN, CODE CONFORMANCE, AND CONNECTION OF EXTERIOR CLADDING ELEMENTS TO PRIMARY STRUCTURE. ENGINEER OF RECORD TAKES NO RESPONSIBILITY FOR PRODUCT DESIGN, MANUFACTURE, DELIVERY AND HANDLING, OR CONNECTION TO PRIMARY STRUCTURE. ALL NECESSARY BRACING, EMBEDMENTS, TIES, ANCHORAGE, DISTRIBUTION MEMBERS, AND SIMILAR ELEMENTS SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH SUBMITTED DRAWINGS AND CALCULATIONS. SEE GENERAL STRUCTURAL NOTE 12 FOR ADDITIONAL INFORMATION.

    EXTERIOR ENCLOSURE ASSEMBLIES SHALL ACCOUNT FOR SHORTENING, TWIST, STRUCTURAL DEFLECTION, LONG-TERM CREEP, AND CONSTRUCTION TOLERANCES. SLABS AND BEAMS THAT SUPPORT CLADDING HAVE BEEN DESIGNED TO LIMIT DIFFERENTIAL VERTICAL MOVEMENT BETWEEN EACH FLOOR TO L/360 OR 1/2-INCH MAXIMUM, UNLESS OTHERWISE NOTED. WHERE APPLICABLE, THE DESIGN SHALL ACCOMMODATE RELATIVE DISPLACEMENTS PER SECTION 13.6.4.2. SEE THE DESIGN LOADING CRITERIA FOR BUILDING LATERAL DISPLACEMENTS.

STATEMENT OF SPECIAL INSPECTIONS (STRUCTURAL):

17. STATEMENT OF SPECIAL INSPECTIONS – STRUCTURAL ITEMS (SEISMIC DESIGN CATEGORY D):

    DEFINITIONS:
    THE SEISMIC FORCE RESISTING SYSTEM FOR THIS STRUCTURE CONSISTS PRIMARILY OF SHEAR WALLS, FLOOR/ROOF DIAPHRAGMS, AND STRUT MEMBERS AS SPECIFIED ON THE DRAWINGS. SEE THE LEGEND OF PLAN SHEETS FOR ADDITIONAL INFORMATION DEFINING MEMBER LOCATIONS.

    SPECIAL INSPECTIONS AND TESTING SHALL BE PERFORMED BY THE OWNER APPOINTED INSPECTION AGENCY IN ACCORDANCE WITH CHAPTER 17 OF THE SBC WITH REPORTS PER SBC SECTION 1704.2.4 SUBMITTED TO THE OWNER, ARCHITECT, STRUCTURAL ENGINEER, CONTRACTOR, AND BUILDING OFFICIAL. THESE INSPECTIONS ARE IN ADDITION TO THE INSPECTIONS SPECIFIED IN SBC SECTION 108. SEE TABLES BELOW FOR ADDITIONAL INFORMATION.

STRUCTURAL ITEMS	SPECIAL INSPECTION FREQUENCY	SBC REFERENCE
STRUCTURAL STEEL FABRICATION, ERECTION, AND NONDESTRUCTIVE TESTING*		
SPECIAL INSPECTION AND NONDESTRUCTIVE TESTING FOR STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH THE QUALITY ASSURANCE (QA) INSPECTION REQUIREMENTS OF AISC 360-16 CHAPTER N. CONTINUOUS INSPECTION SHALL BE PERFORMED AT "P" TASKS DEFINED IN AISC 360-16; PERIODIC INSPECTION SHALL BE PERFORMED AT "O" TASKS DEFINED IN AISC 360-16. ADDITIONAL SPECIAL INSPECTION AND TESTING REQUIREMENTS FOR THE STRUCTURAL STEEL SEISMIC SYSTEM SHALL BE PER AISC 341-16 CHAPTER J AS INDICATED BELOW.		
SHOP AND FIELD WELDING	CONTINUOUS/PERIODIC (QA PER AISC 360 CH. N5.4)	1705.2.1
HIGH STRENGTH BOLTING	CONTINUOUS/PERIODIC (QA AISC 360 CH. N5.6)	1705.2.1
METAL DECKING	PERIODIC	1705.2.2
HEADED STUDS	CONTINUOUS (QA PER STEEL DECK INSTITUTE)	1705.2.1
MATERIAL VERIFICATION (IDENTIFICATION MARKS AND MANUFACTURER'S TEST REPORTS)	PERIODIC	1705.2.1
STRUCTURAL STEEL SEISMIC SYSTEM (INSPECTION AND TESTING)	CONTINUOUS/PERIODIC (QA PER AISC 341 CH. J)	1705.12.1 & 1705.13.1
COLD-FORMED STEEL FRAMING		
FIELD WELDING	PERIODIC	1705.11.2,1705.12.3
FASTENERS, BOLTS, STRAPS, HOLDOWNS, ETC.	PERIODIC FOR CONNECTIONS OF ALL MEMBERS OF THE SEISMIC AND WIND FORCE RESISTING SYSTEM INCLUDING DIAPHRAGMS, SHEAR WALLS, STRUTS, & HOLDOWNS	1705.11.2 & 1705.12.3****
CONCRETE (SEE GENERAL STRUCTURAL NOTE 24 FOR ADDITIONAL REQUIREMENTS)**		
BATCH PLANT INSPECTION	CONTINUOUS DURING MIXING	AS REQUIRED PER 1705.3.2
REINFORCING PLACEMENT	PERIODIC AND PRIOR TO ALL CONCRETE POURS	TABLE 1705.3 ITEM 1
REINFORCING WELDING	PERIODIC (CONTINUOUS FOR SHEAR WALL, MOMENT FRAME, OR OTHER SHEAR REINFORCING AND ALL WELDS GREATER THAN 5/16")	TABLE 1705.3 ITEM 2c
ANCHOR BOLT PLACEMENT	PERIODIC AND PRIOR TO ALL CONCRETE POURS	TABLE 1705.3 ITEM 3
CONCRETE PLACEMENT***	CONTINUOUS	TABLE 1705.3 ITEMS 5-7
CURING & FORMWORK PROCEDURES	PERIODIC	TABLE 1705.3 ITEMS 8 & 14
POST-TENSIONING	CONTINUOUS	TABLE 1705.3 ITEMS 9 & 13
PRECAST CONCRETE ERECTION	PERIODIC	TABLE 1705.3 ITEM 10-12
MASONRY (SEE GENERAL STRUCTURAL NOTE <M01 OR M02> FOR ADDITIONAL REQUIREMENTS)		
LEVEL 2 SPECIAL INSPECTION TABLE 4	PERIODIC (CONTINUOUS FOR GROUTING AND WELDING OF REINFORCING BARS)	TMS 402-16 TABLE 3.1 & TMS 602-16
WOOD		
FASTENERS, BOLTS, STRAPS, HOLDOWNS, ETC.	PERIODIC FOR CONNECTIONS OF ALL MEMBERS OF THE SEISMIC AND WIND FORCE RESISTING SYSTEM INCLUDING DIAPHRAGMS, SHEAR WALLS, STRUTS, & HOLDOWNS	1705.11.1&1705.12.2**** (SEE 1705.5.1 FOR ADDL REQUIREMENTS AT HIGH LOAD DIAPHRAGMS)
PREFABRICATED CONNECTOR PLATE WOOD TRUSSES	REVIEW OF TEMPORARY AND PERMANENT INSTALLATION BRACING FOR SPANS > 60FT	1705.5.2
EXPANSION BOLTS, INSERTS, & CONCRETE SCREWS	PERIODIC INCLUDING TORQUE TESTS IN ACCORDANCE WITH APPROVED ICC-ES REPORTS	TABLE 1705.3 ITEM 4
EPOXY GROUTED RODS OR REBAR	PERIODIC INCLUDING INSPECTION OF EMBEDMENT DEPTH AND HOLE CLEANLINESS PRIOR TO ALL INSTALLATIONS (CONTINUOUS FOR UPWARDLY INCLINED ANCHORS)	TABLE 1705.3 ITEM 4, ACI 318-19 SECTION 26.13
FIBER-REINFORCED EPOXY COMPOSITE	CONTINUOUS	1705.13
SOIL COMPACTION	CONTINUOUS	1705.6

* STRUCTURAL STEEL QUALITY ASSURANCE INSPECTIONS, EXCEPT NONDESTRUCTIVE TESTING, MAY BE WAIVED IF APPROVED BY THE OWNER AND BUILDING OFFICIAL FOR WORK PERFORMED ON THE PREMISES OF A FABRICATOR REGISTERED AND APPROVED TO PERFORM SUCH WORK WITHOUT SPECIAL INSPECTION IN ACCORDANCE WITH SBC SECTION 1704.2.5.1.
** EXCEPTIONS 1 THRU 5 PER SBC SECTION 1705.3 SHALL NOT APPLY TO CONCRETE WORK ON THIS PROJECT.
*** FREQUENCY OF CONCRETE LABORATORY TESTING SHALL BE IN ACCORDANCE WITH ACI 318-14 SECTION 26.12.2 UNLESS OTHERWISE NOTED IN THE PROJECT SPECIFICATIONS.
**** EXCEPTION FOR SHEATHING FASTENED AT A SPACING GREATER THAN 4"oc SHALL NOT APPLY TO WOOD OR METAL FRAMING ON THIS PROJECT.

ARCH, MECH, & ELEC ITEMS	SEISMIC DESIGN REQUIREMENTS (ASCE 7-16 CHAPTER 13)	PERIODIC SPECIAL INSPECTION AS SPECIFIED PER SBC CHAPTER 17
EXTERIOR WALLS, VENEER & CLADDING	ASCE 7-16 SECTION 13.5.3	REQUIRED FOR WALL FRAMING, FOR FASTENING OF VENEER OR CLADDING EXCEEDING 5 PSF (SBC 1705.12.5)
SUSPENDED CEILINGS	ASCE 7-16 SECTION 13.5.6	INSPECTIONS PER SBC SECTION 108 AND ASCE 7-16 13.5.6.2.2 AS REQUIRED
PARTITION WALLS	ASCE 7-16 SECTION 13.5.8	REQUIRED DURING ERECTION AND FASTENING FOR WALLS > 15 PSF (SBC 1705.12.5)
GLAZING SYSTEMS	ASCE 7-16 SECTION 13.5.9	NOT REQUIRED
LIFE SAFETY COMPONENTS INCLUDING FIRE PUMPS, EMERGENCY GENERATORS, SMOKE EVACUATION FANS, AND COMPONENTS WITH HAZARDOUS COMBUSTIBLE, OR HIGHLY TOXIC CONTENTS (Ip=1.5 PER ASCE 7-16 SECTION 13.1.3)	ASCE 7-16 SECTION 13.6 AND SBC 1705.13.2	REQUIRED FOR VERIFICATION OF CERTIFICATE OF COMPLIANCE LABEL ON COMPONENT (SBC 1705.12.4)
INSTALLATION AND ANCHORAGE OF SPRINKLER SYSTEMS, FIRE PUMPS, EMERGENCY GENERATORS, COMPONENTS WITH HAZARDOUS, COMBUSTIBLE, OR HIGHLY TOXIC CONTENTS (Ip=1.5 PER ASCE 7-16 SECTION 13.1.3)	ASCE 7-16 SECTION 13.6 AND SBC 1705.13.2	REQUIRED (SBC 1705.12.4 & 1705.12.6)
ALL OTHER MECHANICAL AND ELECTRICAL COMPONENTS	ASCE 7-16 SECTION 13.6	NOT REQUIRED

STRUCTURAL OBSERVATION IN ACCORDANCE WITH SBC SECTION 1704.6 WILL BE PERFORMED BY THE STRUCTURAL ENGINEER OF RECORD DURING CONSTRUCTION AT SIGNIFICANT CONSTRUCTION STAGES AND AT COMPLETION OF THE STRUCTURAL SYSTEM. STRUCTURAL OBSERVATION CONSISTS OF VISUAL OBSERVATION FOR GENERAL CONFORMANCE TO THE CONSTRUCTION DOCUMENTS AND DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE INSPECTIONS REQUIRED BY SECTIONS 108, 1704, OR OTHER SECTIONS OF THE SBC.

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER: CSD
PROJECT MANAGER: AVA
PROJECT ENGINEER: ADG, HES
DRAWN BY: KF
PROJECT TEAM MEMBERS:
CHECK: AVA
SEAL:

SEATTLE DCI / OPCD APPROVAL STAMP:

TITLE
GENERAL STRUCTURAL NOTES

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S1.01

90% CD SET

ORIGINAL SHEET SIZE 30" x 42"

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General Structural Notes

(THE FOLLOWING APPLY UNLESS SHOWN OTHERWISE ON THE DRAWINGS.)

GEOTECHNICAL:

18. FOUNDATION NOTES: SUBGRADE PREPARATION INCLUDING DRAINAGE, EXCAVATION, COMPACTION, AND FILLING REQUIREMENTS, SHALL CONFORM STRICTLY WITH RECOMMENDATIONS GIVEN IN THE SOILS REPORT OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER. FOOTINGS SHALL BEAR ON FIRM, MEDIUM STIFF TO HARD NATIVE SEDIMENTS OR COMPACTED STRUCTURAL FILL, AT THE DIRECTION OF THE GEOTECHNICAL ENGINEER AT LEAST 18" BELOW LOWEST ADJACENT FINISHED GRADE. FOOTING DEPTHS/ ELEVATIONS SHOWN ON THE DRAWINGS ARE MINIMUM AND FOR GUIDANCE ONLY; THE ACTUAL ELEVATIONS SHALL BE ESTABLISHED BY THE CONTRACTOR IN THE FIELD WORKING WITH THE TESTING LAB AND GEOTECHNICAL ENGINEER. BACKFILL BEHIND ALL RETAINING WALLS WITH FREE DRAINING, GRANULAR FILL AND PROVIDE FOR SUBSURFACE DRAINAGE AS NOTED IN THE GEOTECHNICAL REPORT.

SOIL PROFILE TYPE	SITE CLASS D
COEFFICIENT OF FRICTION	0.26 (INCLUDING FACTOR OF SAFETY)
ALLOWABLE SOIL PRESSURE	3,000 PSF AT LEAST 5’-0” BELOW GRADE 6,000 PSF AT LEAST 10’-0” BELOW GRADE
LATERAL EARTH PRESSURE (RESTRAINED/UNRESTRAINED)	60 PCF/40 PCF

GEOTECHNICAL REPORT REFERENCE: "ASSOCIATED EARTH SCIENCES, LITTLE SAIGON LANDMARK, PROJECT #20220216E001 DATED JANUARY 31, 2025"

ANCHORAGE:

19. EXPANSION BOLTS INTO CONCRETE SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC-ES REPORTS INDICATED AND MANUFACTURER'S INSTRUCTIONS: "KWIK BOLT TZ" AS MANUFACTURED BY HILTI, INC. (ICC-ES NO. 1917); OR “STRONG-BOLT 2” AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, INC. (ICC-ES NO. 3037); OR “POWER-STUD+ SD2” AS MANUFACTURED BY DEWALT (ICC-ES NO. 2502). SUBSTITUTES PROPOSED BY CONTRACTOR SHALL BE SUBMITTED FOR REVIEW WITH ICC-ES REPORTS INDICATING EQUIVALENT OR GREATER LOAD CAPACITIES. IN ADDITION, SUBSTITUTIONS SHALL MEET ICC-ES ACCEPTANCE CRITERIA AC193. SPECIAL INSPECTION IS REQUIRED FOR ALL EXPANSION BOLT INSTALLATION.

EXPANSION BOLTS SHALL NOT BE USED AS SUBSTITUTES FOR EMBEDDED ANCHOR BOLTS UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER. NOTIFY ENGINEER IF BOLT LOCATIONS CONFLICT WITH REINFORCING STEEL – DO NOT CUT REINFORCING OR REDUCE EMBEDMENT DEPTHS WITHOUT PRIOR APPROVAL.

UNLESS OTHERWISE NOTED, PROVIDE THE FOLLOWING NOMINAL EMBEDMENT DEPTHS FOR EXPANSION BOLTS INTO CONCRETE:

HILTI KWIK BOLT TZ:

3/8”Ø EXPANSION BOLTS	2 5/16”
1/2”Ø EXPANSION BOLTS	3 5/8”
5/8”Ø EXPANSION BOLTS	4 7/16”
3/4”Ø EXPANSION BOLTS	5 5/16”

SIMPSON STRONG-BOLT 2:

3/8”Ø EXPANSION BOLTS	2 7/8”
1/2”Ø EXPANSION BOLTS	3 7/8”
5/8”Ø EXPANSION BOLTS	5 1/8”
3/4”Ø EXPANSION BOLTS	5 3/4”

DEWALT/POWERS POWER-STUD+ SD2:

3/8”Ø EXPANSION BOLTS	2 3/8”
1/2”Ø EXPANSION BOLTS	3 3/4”
5/8”Ø EXPANSION BOLTS	4 7/8”
3/4”Ø EXPANSION BOLTS	5 3/4”

20. EXPANSION BOLTS INTO GROUTED MASONRY SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC REPORTS INDICATED AND MANUFACTURER’S INSTRUCTIONS: "KWIK BOLT TZ2", AS MANUFACTURED BY HILTI, INC. (ICC-ES REPORT NO. 4561); OR “WEDGE-ALL” AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, INC. (ICC-ES REPORT NO. 1396); OR “POWER-STUD+ SD1” AS MANUFACTURED BY DEWALT (ICC-ES NO. 2966). SUBSTITUTES PROPOSED BY CONTRACTOR SHALL BE SUBMITTED FOR REVIEW WITH ICC-ES REPORTS INDICATING EQUIVALENT OR GREATER LOAD CAPACITIES. IN ADDITION, SUBSTITUTIONS SHALL MEET ICC-ES ACCEPTANCE CRITERIA AC01. SPECIAL INSPECTION IS REQUIRED FOR ALL EXPANSION BOLT INSTALLATION. EXPANSION BOLTS SHALL NOT BE USED AS SUBSTITUTES FOR EMBEDDED ANCHOR BOLTS UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER. A MINIMUM OF 6" OF SOLID GROUT SHALL BE IN PLACE AND CURED TO A MINIMUM STRENGTH OF 2 KSI ON ALL SIDES OF EXPANSION BOLTS AT MASONRY WALLS PRIOR TO BOLT INSTALLATION. BOLTS IN MASONRY WALL SHALL COMPLY WITH RESTRICTIONS SHOWN IN DETAIL 4/S4.01 AT HEAD JOINTS. NOTIFY ENGINEER IF BOLT LOCATIONS CONFLICT WITH REINFORCING STEEL – DO NOT CUT REINFORCING OR REDUCE EMBEDMENT DEPTHS WITHOUT PRIOR APPROVAL.

21. DRIVE PINS AND OTHER POWDER-ACTUATED FASTENERS SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC-ES REPORTS INDICATED AND MANUFACTURER'S INSTRUCTIONS INCLUDING MINIMUM EMBED REQUIREMENTS: “TE SERIES” (0.157” DIAMETER) AS MANUFACTURED BY ITW RAMSET (ICC-ES NO. 1799); OR “X-P” (0.157” DIAMETER) AS MANUFACTURED BY HILTI, INC. (ICC-ES NO. 2269); OR “STRONG-TIE PDPA” (0.157” DIAMETER) AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, INC. (ICC-ES NO. 2138); OR “CSI PIN” (0.157” DIAMETER) AS MANUFACTURED BY DEWALT (ICC-ES NO. 2024); OR AN APPROVED EQUIVALENT IN STRENGTH AND EMBEDMENT. MINIMUM EMBEDMENT IN CONCRETE SHALL BE 1" UNLESS OTHERWISE NOTED. MAINTAIN AT LEAST 3-1/2" TO NEAREST CONCRETE EDGE.

22. EPOXY-GROUTED RODS OR REBAR TO CONCRETE SPECIFIED ON THE DRAWINGS SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC-ES REPORTS INDICATED AND MANUFACTURER'S INSTRUCTIONS INCLUDING MINIMUM EMBED REQUIREMENTS: "SET-XP" AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, INC. (ICC-ES NO. 2508); OR "HIT-HY 200" AS MANUFACTURED BY HILTI, INC. (ICC-ES NO. 3187, “SAFE-SET” INSTALLATION WITH HOLLOW CARBIDE DRILL BIT IS PERMITTED); OR “PURE110+” AS MANUFACTURED BY DEWALT (ICC-ES NO. 3298), OR “AC200+” AS MANUFACTURED BY DEWALT (ICC-ES NO. 4027). SUBSTITUTES PROPOSED BY CONTRACTOR SHALL BE SUBMITTED FOR REVIEW WITH ICC-ES REPORTS INDICATING EQUIVALENT OR GREATER LOAD CAPACITIES. IN ADDITION, SUBSTITUTIONS SHALL MEET ICC-ES ACCEPTANCE CRITERIA AC308. SPECIAL INSPECTION OF EPOXY-GROUTED ANCHOR INSTALLATION IS REQUIRED. NOTIFY ENGINEER IF ANCHOR LOCATIONS CONFLICT WITH REINFORCING STEEL – DO NOT CUT REINFORCING OR REDUCE EMBEDMENT DEPTHS WITHOUT PRIOR APPROVAL. INSTALLATION OF ADHESIVE ANCHORS HORIZONTALLY OR UPWARDLY INCLINED TO SUPPORT SUSTAINED TENSION LOADS SHALL BE PERFORMED BY CERTIFIED PERSONNEL IN CONFORMANCE TO ACI 318-19 SECTION 26.13.1.6 AND 26.13.3.2. HOLES SHALL BE HAMMER DRILLED AND DRY. CONCRETE SHALL HAVE A MINIMUM AGE OF 21 DAYS AT THE TIME OF ANCHOR INSTALLATION.

EPOXY GROUTED RODS OR REBAR SHALL NOT BE USED AS SUBSTITUTES FOR CAST-IN-PLACE ANCHOR BOLTS, THREADED RODS, OR REINFORCING STEEL UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER. FIELD FIXES OR OTHER CONDITIONS NOT ADDRESSED IN THE DOCUMENTS MUST BE SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER, INCLUDING EMBEDMENT DEPTHS.

UNLESS OTHERWISE NOTED, PROVIDE THE FOLLOWING EMBEDMENT DEPTHS FOR ANCHORS AT CONCRETE:

3/8”Ø ROD OR #3 BAR	4”
1/2”Ø ROD OR #4 BAR	5”
5/8”Ø ROD OR #5 BAR	7”
3/4”Ø ROD OR #6 BAR	9”
7/8”Ø ROD OR #7 BAR	12”
1”Ø ROD OR #8 BAR	15”

23. CONCRETE SCREW ANCHORS SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC-ES REPORTS INDICATED AND MANUFACTURER'S INSTRUCTIONS INCLUDING MINIMUM EMBED REQUIREMENTS: "TITEN HD" AS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY (ICC-ES NO. 2713); OR “KH-EZ” AS MANUFACTURED BY HILTI, INC. (ICC-ES NO. 3027); OR “SCREW-BOLT+” AS MANUFACTURED BY DEWALT (ICC-ES NO. 3889). SUBSTITUTES PROPOSED BY CONTRACTOR SHALL BE SUBMITTED FOR REVIEW WITH ICC-ES REPORTS INDICATING EQUIVALENT OR GREATER LOAD CAPACITIES. IN ADDITION, SUBSTITUTIONS SHALL MEET ICC-ES ACCEPTANCE CRITERIA AC193. SPECIAL INSPECTION IS REQUIRED FOR ALL CONCRETE SCREW ANCHOR INSTALLATION. CONCRETE SCREW ANCHORS SHALL NOT BE USED AS SUBSTITUTES FOR EMBEDDED ANCHOR BOLTS OR EXPANSION BOLTS UNLESS SPECIFICALLY APPROVED BY THE STRUCTURAL ENGINEER. NOTIFY ENGINEER IF SCREW ANCHOR LOCATIONS CONFLICT WITH REINFORCING STEEL – DO NOT CUT REINFORCING OR REDUCE EMBEDMENT DEPTHS WITHOUT PRIOR APPROVAL.

CONCRETE:

24. CONCRETE SHALL BE MIXED, PROPORTIONED, CONVEYED AND PLACED IN ACCORDANCE WITH ACI 318-19 CHAPTER 26 AND ACI 301. STRENGTHS AT SPECIFIED MAX TEST AGE AND MIX CRITERIA SHALL BE AS FOLLOWS:

APPLICATION (UON ON DRAWINGS)	MIN. STRENGTH (U.O.N.) (f'c)	MAX TEST AGE (DAYS)
A. FOUNDATIONS (UNLESS LISTED OTHERWISE BELOW)	4 KSI	56
B. GRADE BEAMS AND FOUNDATIONS FOR SHEAR WALLS AND FRAMES	6 KSI	56
C. SLABS-ON-GRADE*	3.5 KSI	28
D. SLABS-ON-METAL DECK AND TOPPING SLABS*	4 KSI	28
E. COLUMNS	6 KSI	56
F. SHEAR WALLS	6 KSI	56
H. POST-TENSIONED SLAB & BEAMS**	3 KSI 6 KSI	3 56
I. MILD REINFORCED SLABS AND BEAMS	6 KSI	56
L. ALL OTHER CONCRETE	4 KSI	28

* WATER-CEMENTITIOUS MATERIAL RATIO FOR INTERIOR SLABS SHALL NOT EXCEED 0.44.

** SHRINKAGE CRITERIA: MIX SHALL BE PROPORTIONED SUCH THAT THE POST-TENSIONED SLAB DRYING SHRINKAGE SHALL NOT EXCEED 0.035% AT 28 DAYS (LABORATORY CONDITIONS). SUBMIT STRENGTH AND SHRINKAGE TEST DATA AND MIX DESIGN TO THE STRUCTURAL ENGINEER FOR REVIEW A MINIMUM OF TWO WEEKS PRIOR TO PLACING ANY CONCRETE.

CONCRETE MIXES SHALL MEET OR EXCEED THE REQUIREMENTS SPECIFIED ABOVE. MIXES SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER AND THE SEATTLE DEPARTMENT OF CONSTRUCTION AND INSPECTIONS (SDCI) FOR APPROVAL TWO WEEKS PRIOR TO PLACING ANY CONCRETE AND SHALL INCLUDE THE AMOUNTS OF CEMENT, CEMENTITIOUS MATERIAL, FINE AND COARSE AGGREGATE, WATER AND ADMIXTURES, AS WELL AS THE WATER-CEMENT RATIO, SLUMP, CONCRETE YIELD AND SUBSTANTIATING STRENGTH DATA IN ACCORDANCE WITH ACI 318-19, CHAPTER 26 AND 27. THE USE OF A PERFORMANCE MIX MAY REQUIRE BATCH PLANT SPECIAL INSPECTION DURING MIXING OF CONCRETE IN ACCORDANCE WITH SBC SECTION 1705.3.2, THE COST OF WHICH SHALL BE PAID BY THE GENERAL CONTRACTOR. REFER TO SDCI DIRECTOR’S RULE 11-2014 AND 13-2014 FOR ADDITIONAL INFORMATION REGARDING BATCH PLANT INSPECTIONS AND CONTINUOUSLY APPROVED MIXES. REVIEW OF MIX SUBMITTALS BY THE ENGINEER OF RECORD INDICATES ONLY THAT INFORMATION PRESENTED CONFORMS GENERALLY WITH CONTRACT DOCUMENTS. CONTRACTOR OR SUPPLIER MAINTAINS FULL RESPONSIBILITY FOR SPECIFIED PERFORMANCE.

CONCRETE MAY BE PLACED BY THE "SHOTCRETE" METHOD, PROVIDED THE APPROVALS, TESTS, AND INSPECTIONS REQUIRED BY THE BUILDING DEPARTMENT ARE OBTAINED. SHOTCRETE MATERIALS, EQUIPMENT, PROCEDURES, PROPORTIONS, BATCHING AND MIXING, AND PLACEMENT SHALL BE IN ACCORDANCE WITH ACI 506.2 AND IBC SECTION 1908. IF WALLS ARE EXPOSED COORDINATE FINISH REQUIREMENTS WITH ARCHITECT.

EXPOSURE CLASSES: CONCRETE MIXES SHALL CONFORM TO EXPOSURE CLASSES F0, S0, W0, AND C0 IN ACCORDANCE WITH ACI 318-19, TABLES 19.3.1.1 AND 19.3.2.1, EXCEPT FOR THE FOLLOWING: CONCRETE EXPOSED TO EARTH SHALL CONFORM TO EXPOSURE CLASS C1. CONCRETE EXPOSED TO WEATHER AND FREEZING SHALL CONFORM TO EXPOSURE CLASS F1 (F2 FOR EXTERIOR SLABS EXPOSED TO WEATHER).

25. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, fy = 60 KSI. GRADE 60 REINFORCING BARS WHICH ARE TO BE WELDED SHALL CONFORM TO ASTM A706. REINFORCEMENT COMPLYING WITH ASTM A615(S1) MAY BE WELDED ONLY IF MATERIAL PROPERTY REPORTS INDICATING CONFORMANCE WITH WELDING PROCEDURES SPECIFIED IN A.W.S. D1.4 ARE SUBMITTED.

WHERE NOTED ON PLAN REINFORCING SHALL BE ASTM A615, GRADE 80, Fyt = 80 KSI.

LONGITUDINAL REINFORCEMENT IN ALL COLUMNS, STRUT MEMBERS, COUPLING BEAMS, AND VERTICAL REINFORCEMENT IN SHEAR WALLS SHALL COMPLY WITH ASTM A706. ASTM A615 GRADE 60 REINFORCEMENT ARE ALLOWED IN THESE MEMBERS IF: (A) THE ACTUAL YIELD STRENGTH BASED ON MILL TESTS DOES NOT EXCEED THE SPECIFIED YIELD STRENGTH BY MORE THAN 18 KSI (RETESTS SHALL NOT EXCEED THIS VALUE BY MORE THAN AN ADDITIONAL 3 KSI), (B) THE RATIO OF THE ACTUAL ULTIMATE TENSILE STRESS TO THE ACTUAL TENSILE YIELD STRENGTH IS NOT LESS THAN 1.25, AND (C) MINIMUM ELONGATION IN 8 IN. SHALL BE AT LEAST 14 PERCENT FOR BAR SIZES NO. 3 THROUGH NO. 6, AT LEAST 12 PERCENT FOR BAR SIZES NO. 7 THROUGH NO. 11, AND AT LEAST 10 PERCENT FOR BAR SIZES NO. 14 AND NO. 18. CERTIFIED MILL TEST REPORTS FOR EACH SHIPMENT OF REINFORCING SHALL BE SUBMITTED FOR REVIEW.

WELDED WIRE FABRIC SHALL CONFORM TO ASTM A1064.

26. REINFORCING STEEL SHALL BE DETAILED (INCLUDING HOOKS AND BENDS) IN ACCORDANCE WITH ACI 315-18 AND 318-19. LAP ALL CONTINUOUS REINFORCEMENT IN ACCORDANCE WITH "REINFORCEMENT SPLICE AND DEVELOPMENT LENGTH SCHEDULE" OF 30/S3.01. PROVIDE CORNER BARS AT ALL WALL AND FOOTING INTERSECTIONS. LAP ADJACENT MATS OF WELDED WIRE FABRIC A MINIMUM OF 12" AT SIDES AND ENDS.

NO BARS PARTIALLY EMBEDDED IN HARDENED CONCRETE SHALL BE FIELD BENT UNLESS OTHERWISE NOTED ON THE DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER.

27. STUDRAILS SHALL BE ONE OF THE FOLLOWING INSTALLED IN STRICT ACCORDANCE WITH THE ICC-ES REPORTS INDICATED AND MANUFACTURER’S INSTRUCTIONS: “DECON STUDRAILS” AS MANUFACTURED BY DECON, INC. (ICC-ES NO. 2494); OR “JSW STUD RAILS” AS MANUFACTURED BY JOBSITE STUD WELDING, INC. (ICC-ES NO. 3264). SUBSTITUTES PROPOSED BY CONTACTOR SHALL BE SUBMITTED FOR REVIEW WITH ICC-ES REPORTS INDICATING COMPLIANCE WITH ASTM A1044, fy = 51 KSI.

28. CONCRETE PROTECTION (COVER) FOR REINFORCING STEEL SHALL BE AS FOLLOWS U.O.N.:

FOOTINGS AND OTHER UNFORMED SURFACES CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH	3"
FORMED SURFACES EXPOSED TO EARTH (i.e. WALLS BELOW GROUND) OR WEATHER (#6 BARS OR LARGER)	2"
(#5 BARS OR SMALLER)	1 1/2"
SLAB-ON-GRADE BOTTOM REINFORCING (WITH VAPOR BARRIER BELOW)	1 1/2"
COLUMN TIES OR SPIRALS, WALL TIES, AND BEAM STIRRUPS	1 1/2"
WALLS (INTERIOR FACE) (#11 BARS OR SMALLER)	1"
SLABS (#11 BARS OR SMALLER)	1"

29. FIBROUS REINFORCEMENT: POLYPROPYLENE FIBROUS REINFORCEMENT IN ACCORDANCE WITH THE SPECIFICATIONS SHALL BE USED WHERE NOTED ON THE DRAWINGS OR SPECIFICATIONS. ADD FIBERS TO THE CONCRETE MIX AND FINISH IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

30. CAST-IN-PLACE CONCRETE: SEE ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS AND DIMENSIONS OF DOOR AND WINDOW OPENINGS IN ALL CONCRETE WALLS. SEE MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF MISCELLANEOUS MECHANICAL OPENINGS THROUGH CONCRETE WALLS. SEE ARCHITECTURAL DRAWINGS FOR ALL GROOVES, NOTCHES, CHAMFERS, FEATURE STRIPS, COLOR, TEXTURE, AND OTHER FINISH DETAILS AT ALL EXPOSED CONCRETE SURFACES.

31. SLABS ON METAL DECK: AT SLABS ON METAL DECK, ACCOUNT FOR DEFLECTION OF METAL DECK DURING PLACEMENT OF WET CONCRETE SUCH THAT TOP OF SLAB ELEVATION IS SCREEDED OFF LEVEL BETWEEN ADJACENT DECK SUPPORTS. REFER TO DECK MANUFACTERER'S LITERATURE FOR APPROXIMATE DECK DEFLECTION VALUES. NOTIFY STRUCTURAL ENGINEER IF DECK DEFLECTION EXCEEDS 3/4". AT CAMBERED SUPPORTS, SET SCREED PINS ALONG EACH SUPPORT TO A UNIFORM HEIGHT BASED ON THE SPECIFIED SLAB THICKNESS.

32. PRECAST PRESTRESSED CONCRETE UNITS SHALL BE DESIGNED BY THE MANUFACTURER FOR THE LOADS AND SPANS SHOWN ON THE DRAWINGS. MANUFACTURER SHALL DESIGN FOR SPECIAL CONDITIONS AT OPENINGS AND BLOCK-OUTS SHOWN ON STRUCTURAL, ARCHITECTURAL, AND MECHANICAL DRAWINGS. DESIGN AND FABRICATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S PUBLISHED SPECIFICATIONS FOR THE UNIT FURNISHED AND ACI STANDARD 318-14. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO FABRICATION. ALL SUBMITTALS SHALL BEAR THE STAMP AND SIGNATURE OF A REGISTERED STRUCTURAL ENGINEER, STATE OF WASHINGTON. CALCULATIONS SHALL BE MADE AVAILABLE UPON REQUEST.

PRECAST CONCRETE MEMBERS SHALL BE ADEQUATELY BRACED UNTIL ALL FINAL CONNECTIONS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE DRAWINGS. CONTRACTOR SHALL PROVIDE ALL EXTRA REINFORCEMENT, INSERTS, LIFTING DEVICES, PRESTRESSING, ETC., REQUIRED FOR HANDLING AND ERECTION.

33. BONDING AGENT SHALL BE "MASTEREMACO ADH 326" BY BASF CORPORATION OR EQUIVALENT, AND SHALL BE USED WHERE NEW CONCRETE IS PLACED AGAINST HARDENED CONCRETE. PLACE IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, INCLUDING PREPARATION OF EXISTING SURFACES. CONCRETE SHALL BE CONSIDERED HARDENED AFTER 56 DAYS.

34. NON-SHRINK GROUT SHALL BE FURNISHED BY AN APPROVED MANUFACTURER AND SHALL BE MIXED AND PLACED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. GROUT STRENGTH SHALL BE AT LEAST EQUAL TO THE MATERIAL ON WHICH IT IS PLACED (6 KSI MINIMUM).

35. MECHANICAL SPLICING OF REINFORCING BARS, WHERE INDICATED ON THE DRAWINGS, SHALL BE A TYPE 2 SPLICE PER ACI 318-19 SECTION 18.2.7.1 BY AN ICC-ES APPROVED SYSTEM (SUCH AS BY LENTON OR DAYTON SUPERIOR). SPLICE LOCATIONS OF ALTERNATE BARS SHALL BE OFFSET BY A DISTANCE WHICH CONFORMS TO THE ICC-ES REPORT OF THE SPLICE USED BUT NOT LESS THAN 2’-6” UNLESS OTHERWISE PERMITTED ON THE DRAWINGS.

36. HIGH STRENGTH THREADED RODS (STRESSED AND NON-STRESSED) SHALL BE "DYWIDAG" THREADBARS WITH APPROPRIATE ANCHORAGE PLATES, NUTS, AND COUPLERS AS MANUFACTURED BY DYWIDAG-SYSTEMS INTERNATIONAL, INC., IN CONFORMANCE WITH ASTM A722 (fpu = 150 KSI).

37. HEADED DEFORMED BARS, WHERE INDICATED ON THE DRAWINGS, SHALL BE AN ICC-ES APPROVED SYSTEM AND SHALL CONFORM TO ASTM A970 INCLUDING ANNEX A1 REQUIREMENTS FOR CLASS HA HEAD DIMENSIONS.

38. RIGID INSULATION BELOW TOPPING SLABS SHALL BE CLOSED-CELL, LIGHTWEIGHT RIGID CELLULAR POLYSTYRENE GEOFOAM IN COMPLIANCE WITH ASTM D6817 WITH A COMPRESSIVE STRENGTH AS INDICATED BELOW. MAXIMUM DENSITY SHALL BE 2.5 POUNDS PER CUBIC FOOT. CONTRACTOR TO SUBMIT DATA FOR ENGINEER’S REVIEW. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER’S REQUIREMENTS WITH OFFSET JOINTS.

LOCATION	COMPRESSIVE STRENGTH
INTERIOR SLABS	EPS15 WITH A COMPRESSIVE RESISTANCE OF 3.6 PSI AT 1% STRAIN
EXTERIOR SLABS, ELEVATOR PITS, ENTRY RAMPS, AND LOADING DOCKS	EPS29 WITH A COMPRESSIVE RESISTANCE OF 10.9 PSI AT 1% STRAIN

POST-TENSIONED CONCRETE:

39. A. SPECIFICATIONS: ALL MATERIALS, INSTALLATION, AND WORKMANSHIP SHALL CONFORM TO THE PROJECT SPECIFICATIONS.

B. PRE-CONSTRUCTION MEETING: SHALL BE ARRANGED BY THE CONTRACTOR AS REQUIRED BY THE SEATTLE DEPARTMENT OF CONSTRUCTION AND INSPECTION (SDCI) DIRECTOR'S RULE 14-2014. THIS MEETING SHALL BE ATTENDED BY THE CONTRACTOR, STRUCTURAL ENGINEER OF RECORD, ANY SUBCONTRACTORS INVOLVED WITH POST-TENSIONING WORK, REPRESENTATIVES FROM THE SPECIAL INSPECTION AGENCY, AND THE SDCI. PRIOR TO SCHEDULING THE PRE-CONSTRUCTION MEETING, THE CONTRACTOR SHALL HAVE AN APPROVED COPY OF THE PT PLACEMENT SHOP DRAWINGS, STAMPED BY BOTH THE ENGINEER OF RECORD AND SDCI, ON SITE FOR REVIEW BY THE SDCI REPRESENTATIVE. SEE DIRECTOR'S RULE 14-2014 FOR ADDITIONAL REQUIREMENTS.

C. TENDON FORCES: THE FINAL EFFECTIVE FORCE IN EACH TENDON SHALL NOT BE LESS THAN 26.8 KIPS. THE CONTRACTOR SHALL PROVIDE ADDITIONAL TENDONS AS REQUIRED TO ACHIEVE FINAL EFFECTIVE FORCE AFTER ALL LOSSES ARE CONSIDERED. SUBMIT COMPLETE CACLCULATIONS TO THE ENGINEER PRIOR TO CONSTRUCTION.

D. PRESTRESSING STEEL: SHALL BE 1/2" DIAMETER, SEVEN WIRE, LOW-RELAXATION STRAND MANUFACTURED IN ACCORDANCE WITH ASTM A416, FREE FROM CORROSION AND HAVING A GUARANTEED MINIMUM ULTIMATE TENSILE STRENGTH OF 270 KSI. STRAND SHALL BE SHOP COATED WITH COMPOUND TO PREVENT BOND, REDUCE FRICTION, RESIST CORROSION, AND BE ENCASED IN SLIPPAGE SHEATHING. TEARS IN SHEATHING SHALL BE PATCHED BEFORE PLACING CONCRETE. TENDON FABRICATION PROCEDURE SHALL CONFORM TO THE POST-TENSIONING INSTITUTE "SPECIFICATION FOR UNBONDED SINGLE STRAND TENDONS."

E. POST-TENSIONED SLAB REVIEW: IN ACCORDANCE WITH THE TERMS AGREED TO BY ALL PARTIES DURING THE PRE CONSTRUCTION MEETING, THE CABLES, REINFORCING, AND EMBEDDED ITEMS IN A POST-TENSIONED SLAB SHALL BE REVIEWED BY THE ENGINEER OR APPOINTED REPRESENTATIVE PRIOR TO PLACING CONCRETE. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST 48 HOURS IN ADVANCE OF ALL SLAB REVIEWS. ALL REBAR COUNTS AND TENDON PROFILES SHALL BE REVIEWED BY THE SPECIAL INSPECTION AGENCY AND ALL NOTED DISCREPANCIES CORRECTED PRIOR TO REVIEW BY THE ENGINEER. THE CONTRACTOR SHALL ALLOW A MINIMUM OF FOUR HOURS FOR CORRECTION OF ALL DISCREPANCIES NOTED BY THE ENGINEER.

F. ANCHORAGES: ANCHORING HARDWARE SHALL MEET THE MINIMUM REQUIREMENTS SET FORTH IN ACI STANDARD BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE (PER SECTION 25.8 ACI 318-19) OR POST-TENSIONING INSTITUTE, "POST-TENSIONING MANUAL, 6th EDITION."

G. CONCRETE STRENGTH: SHALL BE PER GENERAL STRUCTURAL NOTE 24. GROUT OR CONCRETE CONTAINING CHLORIDES SHALL NOT BE USED IN THE VICINITY OF TENDONS OR ANCHORS. TENSIONING OPERATIONS SHALL NOT COMMENCE UNTIL TEST OF CYLINDERS, CURED UNDER JOBSITE CONDITIONS, INDICATES THAT CONCRETE HAS REACHED A MINIMUM COMPRESSIVE STRENGTH OF 3 KSI.

H. TENDON PLACEMENT: TENDONS SHALL BE DRAPED TO A PARABOLIC PROFILE BETWEEN SUPPORTS AS SHOWN IN DETAILS AND SHALL CONFORM TO THE PROFILE CONTROL POINTS SHOWN ON PLAN. DIMENSIONS SHOWN ON THE DRAWINGS LOCATE THE CENTER OF GRAVITY OF THE TENDON OR GROUP OF TENDONS. LOW POINTS ARE AT MIDSPAN UNLESS OTHERWISE NOTED. ADEQUATE SUPPORT BARS AND CHAIRS SHALL BE FURNISHED TO HOLD TENDONS IN PLACE DURING CONCRETE PLACEMENT. VERTICAL TENDON DIMENSIONS SHALL NOT VARY MORE THAN 1/4" (3/8" FOR CONCRETE THICKER THAN 8") FROM THE DIMENSIONS SHOWN, EXCEPT THAT 1" MINIMUM CONCRETE COVER SHALL BE MAINTAINED AT ALL TIMES. SLIGHT DEVIATION IN SPACING OF SLAB TENDONS WILL BE PERMITTED WHERE REQUIRED TO AVOID OPENINGS, INSERTS, AND DOWELS. WHERE TENDONS SEEM TO INTERFERE WITH EACH OTHER, ONE TENDON MAY BE MOVED HORIZONTALLY IN ORDER TO AVOID THE INTERFERENCE. A MINIMUM OF TWO BANDED & UNIFORMLY DISTRIBUTED TENDONS SHALL PASS OVER THE CENTER OF THE SUPPORTING COLUMN. CENTER BANDED TENDONS ON COLUMN WHERE POSSIBLE. WHERE MILD STEEL INTERFERES WITH TENDON LOCATIONS, PROPER TENDON LOCATION HAS PRIORITY. LOCATION OF BANDED TENDONS & BANDED REINFORCING HAS PRIORITY OVER UNIFORMLY DISTRIBUTED TENDONS & DISTRIBUTED REINFORCING AT SUPPORTS (SEE 30/S3.41 . TWISTING OR ENTWINING OF INDIVIDUAL WIRES OR STRANDS WITHIN A BUNDLE SHALL NOT BE PERMITTED. NO PORTION OF THE TENDON CABLE SHALL BE EXPOSED.

I. MINIMUM CHAIRING: TENDONS SHALL BE SECURED TO A SUFFICIENT NUMBER OF POSITIONING DEVICES TO ENSURE CORRECT LOCATION OF THE POST-TENSIONING TENDON DURING AND AFTER THE PLACING OF CONCRETE. SPACING OF POSITIONING DEVICES SHALL NOT EXCEED 3'-6" ON CENTER.

J. SUPPORT BARS: THE MILD REINFORCING SHOWN ON THE PLANS IS THAT WHICH IS REQUIRED BY DESIGN. SPACING OF SUPPORT BARS SHALL NOT EXCEED 4'-0" ON-CENTER. CHAIRS FOR SUPPORT BARS AT BANDED TENDONS SHALL BE SPACED NOT MORE THAN 2'-0"oc.

K. TENDON LOCATIONS: SHALL BE PERMANENTLY MARKED ON THE UNDERSIDE OF ALL POST-TENSIONED SLABS ACCORDING TO DETAIL [PTS-026]. MARKING SHALL BE SUFFICIENT TO ASSIST IN IDENTIFYING AS-BUILT TENDON LOCATIONS SHOULD FUTURE DRILLING OF THE POST-TENSIONED SLAB BE REQUIRED. TEMPORARY MARKING OF TENDON LOCATIONS WITH CHALK, FORM PAINT, OR SIMILAR MATERIAL MAY BE USED BUT MAY NOT BE SUBSTITUTED FOR THE PERMANENT TENDON MARKING METHOD.

L. SHORING: AT ALL POST-TENSIONED CONCRETE SHALL REMAIN IN PLACE UNTIL TENDONS ARE STRESSED. SHORING AT CLOSURE POUR STRIPS PER 10/S3.40 SHALL REMAIN IN PLACE UNTIL CONCRETE IN THE CLOSURE POUR STRIP HAS REACHED DESIGN STRENGTH. SHORING IN THIS ZONE SHALL BE DESIGNED FOR ALL CONSTRUCTION LOADS UNTIL THE CONCRETE WITHIN THE CLOSURE POUR STRIP HAS REACHED DESIGN STRENGTH.

M. CONSTRUCTION JOINTS: CONTRACTOR SHALL SUBMIT ALL PROPOSED CONSTRUCTION JOINT LOCATIONS FOR STRUCTURAL ENGINEERS REVIEW.

N. SHOP DRAWINGS: SHOWING ALL DETAILS OF TENDON PLACEMENT, END ANCHORAGE, CONNECTIONS, BLOCKOUTS OF ALL HOLES, INSERTS, ETC. AND EFFECTIVE FORCE CALCULATIONS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW PRIOR TO TENDON FABRICATION. THE POST-TENSION SHOP DRAW

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General Structural Notes

(THE FOLLOWING APPLY UNLESS SHOWN OTHERWISE ON THE DRAWINGS.)

O. PIPE & CONDUIT: CONTRACTOR SHALL SUBMIT SHOP DRAWINGS THREE WEEKS PRIOR TO PLACEMENT OF PIPE OR CONDUIT TO THE STRUCTURAL ENGINEER SHOWING SIZE, LOCATION, AND EXTENT OF ALL CONDUIT TO BE PLACED IN POST TENSIONED CONCRETE. ENGINEER SHALL REVIEW DRAWINGS PRIOR TO PLACEMENT OF PIPE OR CONDUIT FOR IMPACT OF PLACEMENT ON STRUCTURAL INTEGRITY OF CONCRETE. ENGINEER SHALL VISUALLY REVIEW CONDUIT PLACEMENT IN SLAB A MINIMUM OF ONE DAY PRIOR TO PLACING CONCRETE. CONTRACTOR SHALL NOTIFY THE ENGINEER, WITH REASONABLE LEAD TIME, FOR THIS SITE VISIT.

SEE POST-TENSIONING DETAILS AND NOTES BELOW FOR RESTRICTIONS ON PLACEMENT OF PIPE AND CONDUIT IN POST TENSIONED SLAB.

CONDUIT OR PIPE:
SHALL HAVE A MAXIMUM OUTSIDE DIA. OF 1/6 TIMES SLAB THICKNESS OR 2"
SHALL NOT BE PLACED WITHIN 4'-0" OF COLUMN FACE
SHALL NOT BE PLACED WITHIN 1'-6" OF TENDON ANCHORS
SHALL BE A MINIMUM OF 2" CLEAR FROM TENDONS AT ALL LOCATIONS
SHALL BE SPACED A MINIMUM OF THREE x DIA. APART (LARGEST DIA.)
SHALL BE LOCATED IN THE MIDDLE THIRD OF THE SLAB SPAN

AS MUCH AS POSSIBLE, CONDUIT SHALL RUN PARALLEL WITH EITHER THE BANDED OR DISTRIBUTED TENDONS, NOT DIAGONALLY.

WHERE MORE THAN (3) CONDUIT GROUPS OF (3) CONDUITS ARE LESS THAN 12" CENTER-TO-CENTER OR WHERE CONTRACTOR CHOOSES TO REDUCE CONDUIT SPACING WITHIN A GROUP, SPECIAL REINFORCING WILL BE REQUIRED. CONTACT ENGINEER FOR DIRECTION. TYPICAL REINFORCING AT CONDUIT GROUPS SHALL BE PER DETAIL 4/S3.41. CONDUIT SPACED FARTHER APART THAN SPECIFIED MINIMUM DO NOT REQUIRE ADDITIONAL REINFORCING.

P. BLOCKOUTS: CONTRACTOR SHALL SUBMIT TO THE STRUCTURAL ENGINEER LOCATIONS AND SIZES OF ALL MECHANICAL, PLUMBING & ELECTRICAL BLOCKOUTS LOCATED WITHIN THE POST-TENSIONED SLAB, SPECIFICALLY AT HATCHED AREAS OF STUDRAILS PER 30/S3.42 AND NEAR ALL COLUMNS. SUBMITTAL SHALL OCCUR THREE WEEKS PRIOR TO PLACEMENT OF BLOCKOUTS. SEE 16/S3.41 FOR ADDITIONAL REINFORCEMENT REQUIRED AT BLOCKOUT GROUPS.

Q. STRESSING OPERATION: TENDONS SHALL BE STRESSED BY MEANS OF A HYDRAULIC JACK EQUIPPED WITH A CALIBRATED HYDRAULIC PRESSURE GAUGE. A CALIBRATION CHART SHALL ACCOMPANY EACH JACK AND GAUGE. STRESSING OPERATIONS SHALL BE IN ACCORDANCE WITH SEQUENCE PROVIDED BY THE POST-TENSIONING SUPPLIER. AS A MINIMUM, STRESS MINIMUM OF (2) TENDONS AT SLAB EDGES PERPENDICULAR TO BANDED TENDONS BEFORE STRESSING BANDED TENDONS. JOB SITE INSTRUCTION OF CONTRACTOR'S PERSONNEL IN ALL PLACING AND STRESSING OPERATIONS SHALL BE PROVIDED BY POST-TENSIONING SUPPLIER AS REQUIRED. RECORDS SHALL BE KEPT BY A QUALIFIED AGENCY OF ALL JACKING FORCES AND ELONGATIONS AND SHALL BE SUBMITTED PROMPTLY TO THE STRUCTURAL ENGINEER. MEASURED ELONGATIONS DEVIATING UP TO 7% FROM REQUIRED ELONGATIONS ARE ACCEPTABLE. TENDONS LESS THAN 50 FEET IN LENGTH SHALL NOT HAVE MEASURED ELONGATIONS DEVIATING MORE THAN 1/4". IF MEASURED ELONGATIONS EXCEED TOLERANCE, CONTACT TENDON SUPPLIER AND STRUCTURAL ENGINEER. TENDON TAILS SHALL NOT BE CUT PRIOR TO REVIEW OF ELONGATION REPORTS BY STRUCTURAL ENGINEER.

R. INSERTS: CONCRETE INSERTS TO SUSPEND MECHANICAL, ELECTRICAL, AND ARCHITECTURAL WORK SHALL BE CAST-IN PLACE. POWER DRIVEN FASTENERS WILL BE PERMITTED ONLY WHERE IT CAN BE SHOWN THAT THE FASTENERS WILL NOT SPALL THE CONCRETE, ARE LOCATED SO AS TO AVOID DAMAGING THE TENDONS, AND DO NOT PENETRATE SLAB BY MORE THAN 3/4".

S. MILD REINFORCING ALLOWANCE: THE CONTRACTOR SHALL ALLOW FOR 0.1 PSF OF ADDITIONAL MILD REINF. AT EACH ELEVATED DECK AS A CONTINGENCY, PLACED AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.

T. ENCAPSULATED POST-TENSIONING ANCHORAGE SYSTEM:

ALL TENDON ANCHORS SHALL BE ENCAPSULATED. ENCAPSULATED ANCHORAGE SYSTEM SHALL MEET ALL REQUIREMENTS BELOW AND THOSE OF PTI GUIDE SPECIFICATIONS FOR MONO-STRAND CORROSION PROTECTION SYSTEMS FOR AGGRESSIVE ENVIRONMENTS. ALL ANCHOR PLATES SHALL BE PLASTIC COATED, HAVE GREASE-FILLED CAPS THAT COVER THE CUT END OF THE TENDON, AND HAVE GREASE-FILLED TUBES OR TRUMPETS TO COVER EXPOSED CABLE ON THE SLAB-SIDE OF THE ANCHOR PLATE.

FIELD QUALITY CONTROL:

1. ENCAPSULATED TENDONS SHALL NOT BE EXPOSED TO WEATHER FOR MORE THAN SEVEN CALENDAR DAYS PRIOR TO CONCRETE PLACEMENT.
2. TENDON SHEATHING DAMAGED OVER MORE THAN TEN PERCENT OF LENGTH SHALL BE REJECTED. DAMAGED LENGTH NEED NOT BE CONTINUOUS.
3. BEFORE CONCRETE PLACEMENT AROUND SHEATHING, ALL TENDON DAMAGE SHALL BE REPAIRED TO WATERTIGHT CONDITION. REPAIRS SHALL BE ACCEPTABLE TO THE ENGINEER.
4. INSPECT SHEATHING FOR UNREPAIRED DAMAGE, FOR WATERTIGHT SEAL BETWEEN SHEATHING AND ANCHOR, AND FOR CORRECT INSTALLATION OF ANCHORS, BEFORE CONCRETE IS PLACED.
5. RELATIVE WEDGE EMBEDMENT SHALL NOT EXCEED 1/8 INCH.

PROTECTION:

1. AFTER RECEIVING AUTHORIZATION FROM THE ENGINEER, AS DESCRIBED IN POST-TENSIONING GENERAL NOTE Q, THE TENDON TAILS SHALL BE CUT AND THE EXPOSED TENDON END AND CHUCKS SHALL BE MADE WATERTIGHT BY COVERING WITH GREASE-FILLED TENDON CAP AS SOON AS TENDONS ARE COOL TO THE TOUCH. CUTTING OF TENDONS AND INSTALLATION OF GREASE CAPS SHALL BE WITNESSED BY THE SPECIAL INSPECTOR.

2. AFTER SEALING EXPOSED END OF TENDONS AND CHUCKS, AND BEFORE GROUTING TENDON POCKET, COAT POCKET WITH BONDING AGENT. PREPARE SURFACE PER MANUFACTURERS INSTRUCTIONS.

3. GROUT TENDON POCKETS SOLID WITH NON-SHRINK, NON-STAIN, CHLORIDE FREE GROUT SUCH AS MASTERFLOW 816 OR TARGET PORTLAND EXPANDING GROUT.

MASONRY:

CONCRETE MASONRY UNIT WALLS SHALL BE CONSTRUCTED OF MEDIUM OR NORMAL WEIGHT MASONRY UNITS, CONFORMING TO ASTM C90, LAID IN A RUNNING BOND WITH A MINIMUM NET AREA COMPRESSIVE STRENGTH OF 1.9 KSI. MORTAR SHALL BE TYPE "S" IN CONFORMANCE WITH ASTM C270 AND ARTICLE 2.6A OF TMS602-16. GROUT SHALL CONFORM TO ARTICLE 2.2 OF TMS602-16 AND ASTM C1019 REQUIREMENTS AND ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 2 KSI AT 28 DAYS, DESIGN F'm = 1.5 KSI AT 28 DAYS. STRENGTH SHALL BE VERIFIED BY PRISM TESTING OR SHALL BE VERIFIED BY THE UNIT STRENGTH METHOD IN ACCORDANCE WITH SBC SECTION 1705.4 AND ARTICLE 1.4B OF TMS602-16 PRIOR TO CONSTRUCTION. ADDITIONAL UNIT STRENGTH OR PRISM TESTING IN ACCORDANCE WITH ASTM C1314 SHALL BE COMPLETED FOR EACH 5,000 SQUARE FEET OF WALL DURING CONSTRUCTION.

UNLESS OTHERWISE NOTED, PROVIDE THE FOLLOWING REINFORCEMENT:

6" WALLS	#4 @ 48"oc. VERT.	(2)#4 @ 48"oc. HORIZ.
8" WALLS	#5 @ 48"oc. VERT.	(2)#5 @ 48"oc. HORIZ.
12" WALLS	#5 @ 32"oc. VERT.	(2)#5 @ 32"oc. HORIZ.

IN ADDITION, PROVIDE (1)#5 (#4 @ 6" WALLS) VERT. AT FREE ENDS OF WALLS, AND (2)#5 ((2)#4 @ 6" WALLS) HORIZONTAL AT ELEVATED FLOOR AND ROOF LEVELS AND AT TOPS OF WALLS. REINFORCE WALL CORNERS AND INTERSECTIONS PER 9/S4.01. REINFORCE JAMBS AND FREE ENDS OF WALLS PER 3/S4.01 U.O.N. REINFORCE WALL OPENINGS PER 10/S4.01 U.O.N. ALL HORIZONTAL REINFORCEMENT SHALL BE PLACED IN BOND BEAMS. SEE 5/S4.01 FOR REINFORCING DEVELOPMENT AND LAP SPLICE SCHEDULE.

FILL ALL CELLS CONTAINING REINFORCEMENT OR EMBEDDED ITEMS AND ALL CELLS IN CONTACT WITH EARTH WITH GROUT. PROVIDE CLEANOUT HOLES AT BOTTOM OF ALL CELLS CONTAINING REINFORCEMENT FOR POURS GREATER THAN 5'-4" IN HEIGHT (MAXIMUM SPACING OF CLEANOUTS SHALL BE 32"oc FOR SOLIDLY GROUTED WALLS). MAXIMUM HEIGHT OF GROUT POURS SHALL BE IN ACCORDANCE WITH TMS602-16 TABLE 6. MAXIMUM HEIGHT OF GROUT LIFTS IS 5'-4", EXCEPT AS PERMITTED PER ARTICLE 3.5D OF TMS602-16.

STEEL:

41. STRUCTURAL STEEL DESIGN, FABRICATION, AND ERECTION SHALL BE BASED ON THE LATEST EDITIONS OF THE A.I.S.C. SPECIFICATIONS AND CODES:

    1. SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS-ALLOWABLE STRESS AND PLASTIC DESIGN, OR LOAD AND RESISTANCE FACTOR DESIGN SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.

    2. CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES, ADOPTED JUNE 15, 2016.

    IN REFERENCE TO SECTIONS 3.1.1 AND 4.4.1, THE CONTRACT DOCUMENTS (DESIGN DRAWINGS) SHOW COMPLETE CONNECTION DETAILS FOR ALL MEMBERS EXCEPT THOSE NOTED TO BE DESIGN-BUILD ITEMS. ALTERNATE CONNECTION DETAILS REQUESTED BY THE FABRICATOR SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL VIA A REQUEST FOR INFORMATION (RFI) PRIOR TO COMPLETION OF SHOP DRAWINGS.

    IN REFERENCE TO SECTION 3.1.6, FABRICATOR SHALL ALSO REVIEW PROJECT SPECIFICATIONS AND ARCHITECTURAL DRAWINGS TO DETERMINE PAINTING AND GALVANIZING REQUIREMENTS. MEMBERS EMBEDDED IN CONCRETE, MASONRY OR TO RECEIVE SPRAY-ON FIREPROOFING SHALL NOT BE PAINTED. DO NOT PAINT OR GALVANIZE AREAS OF PIECES TO BE FIELD WELDED, OR REMOVE PAINT AND GALVANIZING IN FIELD PRIOR TO WELDING.

    IN REFERENCE TO SECTION 3.3, IN THE EVENT OF DISCREPANCIES BETWEEN DESIGN DRAWINGS AND SPECIFICATIONS, THE DESIGN DRAWINGS GOVERN.

    IN REFERENCE TO SECTION 4.1, THE FABRICATOR SHALL NOT ASSUME BID PACKAGES CONSTITUTE RELEASING THE DRAWINGS FOR CONSTRUCTION WITHOUT EXPLICIT DIRECTION TO DO SO BY THE OWNER.

    3. SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS.

    4. QUALITY CONTROL SHALL BE IN ACCORDANCE WITH AISC 360 CHAPTER N (AISC 341 CHAPTER J FOR STEEL SEISMIC SYSTEM).

    CONTRACTOR SHALL ALSO COMPLY WITH OSHA REGULATION 29 CFR PART 1926 SUBPART R - STEEL ERECTION, PUBLISHED JANUARY 18, 2001. MISCELLANEOUS PLATES FOR GUYING CABLE ATTACHMENTS, TEMPORARY JOIST BRACING, ETC. SHALL BE ADDED AS REQUIRED. CONTRACTOR SHALL EVALUATE COLUMNS AND PROVIDE ADEQUATE BASE PLATE SHIMS, ADDITIONAL TEMPORARY ERECTION BOLTS/CLIPS, GUYS, OR TEMPORARY BRACING AS REQUIRED PER SECTION 1926.755.

42. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING REQUIREMENTS: WIDE FLANGE AND WT STEEL SHAPES SHALL CONFORM TO ASTM A992, Fy = 50 KSI. ANGLES, CHANNELS, AND RODS SHALL CONFORM TO ASTM A36, Fy = 36 KSI. STEEL PLATES SHALL CONFORM TO ASTM A572, Fy = 50 KSI. STEEL PIPE SHALL CONFORM TO ASTM A53, TYPE E OR S, GRADE B, Fy = 35 KSI. STRUCTURAL TUBING (HSS) SHALL CONFORM TO ASTM A500, GRADE C, Fy = 50 KSI. ANCHOR BOLTS OR ANCHOR RODS SHALL CONFORM TO ASTM F1554 (36 KSI). STEEL-TO-STEEL CONNECTION BOLTS SHALL CONFORM TO ASTM A325-N. THREADED RODS FOR EPOXY GROUTED CONNECTIONS SHALL CONFORM TO ASTM A36 OR ASTM F1554 (36 KSI).

43. DIMENSIONAL TOLERANCE FOR STRUCTURAL STEEL MEMBERS SHALL BE PER THE AISC CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES, SECTION 6.4 AND ASTM SPECIFICATION A6. UNLESS SPECIFICALLY ALLOWED BY THE ENGINEER, COLUMN MEMBERS SHALL NOT BE MODIFIED BY THE ROTARY STRAIGHTENING PROCESS.

44. FLOOR BEAM ELEVATIONS AND CAMBERS: UPON ERECTION OF FLOOR MEMBERS AND PRIOR TO PLACING CONCRETE TOPPING, CONTRACTOR SHALL MEASURE AND CONFIRM THE VERTICAL POSITION OF FLOOR MEMBERS ARE IN ACCORDANCE WITH THE FOLLOWING:

    THE ENDS OF ALL MEMBERS THAT FRAME INTO COLUMNS SHALL CONFORM TO THE TOLERANCES OF THE A.I.S.C. CODE OF STANDARD PRACTICE. THE MID-SPAN OF MEMBERS SPECIFIED TO HAVE CAMBERS SHALL BE WITHIN 1/2" OF THE SPECIFIED CAMBER VALUE. THE MID-SPAN OF ALL MEMBERS (CAMBERED AND NON-CAMBERED) THAT SUPPORT CLADDING ELEMENTS OR GUARDRAILS SHALL BE WITHIN 1/4" OF THE SPECIFIED STEEL ELEVATION OR CAMBER, AND SHALL BE CONFIRMED TO BE WITHIN ACCEPTABLE TOLERANCE FOR THE INSTALLATION OF THE CLADDING OR GUARDRAIL SYSTEMS.

    CONTRACTOR SHALL SUBMIT A REPORT TO ENGINEER OF RECORD PRIOR TO PLACING CONCRETE THAT DOCUMENTS THE MEASUREMENTS ARE WITHIN CONFORMANCE WITH THE ABOVE REQUIREMENTS. CONTRACTOR SHALL MAKE CORRECTIONS TO ANY MEMBERS FOUND NOT TO CONFORM, OR SUBMIT RFI WITH PROPOSED RESOLUTION FOR REVIEW AND APPROVAL.

45. ARCHITECTURALLY EXPOSED STRUCTURAL STEEL SHALL CONFORM TO SECTION 10 OF THE A.I.S.C. CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES, ADOPTED JUNE 15, 2016. ANY STEEL THAT IS TO BE EXPOSED TO VIEW UPON COMPLETION OF THE PROJECT SHALL BE CONSIDERED ARCHITECTURALLY EXPOSED. SEE SPECIFICATIONS FOR SPECIFIC FABRICATION AND ERECTION REQUIREMENTS FOR ARCHITECTURALLY EXPOSED STRUCTURAL STEEL.

46. BOLTS IN CONNECTIONS NOT SPECIFIED AS SLIP-CRITICAL NEED ONLY BE TIGHTENED TO THE SNUG TIGHT CONDITION. THE SNUG TIGHT CONDITION IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN ALL PLIES IN A JOINT ARE IN FIRM CONTACT. IF A SLOTTED HOLE OCCURS IN AN OUTER PLY, A FLAT HARDENED WASHER OR COMMON PLATE WASHER SHALL BE INSTALLED OVER THE SLOT.

    ALL SLIP-CRITICAL CONNECTION BOLTS SHALL BE APPROVED SELF LOAD INDICATING TYPES (SUCH AS BETHLEHEM INDICATOR BOLTS, LeJEUNE TENSION CONTROL BOLTS, ETC.), AND SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. CONNECTED PLIES SHALL BE PREPARED TO MEET THE REQUIREMENTS FOR CLASS A FAYING SURFACES.

47. HOLE SIZES IN STEEL MEMBERS FOR CONNECTIONS TO CONCRETE OR MASONRY SHALL BE AS FOLLOWS UNLESS SPECIFIED OTHERWISE ON THE DRAWINGS:

	MAXIMUM HOLE DIA. OVER NOMINAL BOLT DIA.	
ANCHOR TYPE	OTHER THAN COL. BASE PLATES	COL. BASE PLATES
CAST-IN-PLACE ANCHOR BOLTS	1/16" *	TABLE 14-2 OF AISC STEEL CONSTR. MANUAL, 15TH ED.
EXPANSION BOLTS	1/16" *	5/16"
EPOXY GROUTED BOLTS	1/8" *	5/16"

    * USE OF LARGER HOLES WOULD REQUIRE THE USE OF WELDED PLATE WASHERS AND WOULD REQUIRE PRIOR APPROVAL BY THE STRUCTURAL ENGINEER.

    HARDENED OR COMMON PLATE WASHERS ARE REQUIRED BELOW ALL NUTS WHERE OVERSIZED HOLES ARE USED AND SHALL BE SIZED TO COVER ENTIRE HOLE. MINIMUM WASHER SIZES FOR COLUMN BASE PLATES SHALL BE IN ACCORDANCE WITH TABLE 14-2 OF THE AISC STEEL CONSTRUCTION MANUAL, 15TH EDITION.

48. ALL WELDING SHALL BE IN CONFORMANCE WITH A.I.S.C. AND A.W.S. STANDARDS AND SHALL BE PERFORMED BY W.A.B.O. CERTIFIED WELDERS USING E70XX ELECTRODES. ONLY PREQUALIFIED WELDS (AS DEFINED BY A.W.S.) SHALL BE USED. DO NOT PAINT OR GALVANIZE AREAS OF PIECES TO BE FIELD WELDED, OR REMOVE PAINT AND GALVANIZING IN FIELD PRIOR TO WELDING. WELDING OF GRADE 60 REINFORCING BARS (IF REQUIRED) SHALL BE PERFORMED USING LOW HYDROGEN ELECTRODES. WELDING WITHIN 4" OF COLD BENDS IN REINFORCING STEEL IS NOT PERMITTED. SEE REINFORCEMENT NOTE FOR MATERIAL REQUIREMENTS OF WELDED BARS.

    THE WELD SYMBOLS SHOWN ON THE DRAWINGS ARE INTENDED ONLY TO AID THE CONTRACTOR IN THE DETERMINATION OF FIELD VERSUS SHOP WELDING. THE CONTRACTOR SHALL WORK WITH THE FABRICATOR AND ERECTOR TO COORDINATE THE FINAL DETERMINATION OF FIELD VERSUS SHOP WELDS TO ACCOMMODATE THE CONSTRUCTION SEQUENCING OF THE PROJECT.

    ALL WELDS SHALL BE MADE WITH A FILLER WELD METAL THAT HAS A MINIMUM CHARPY V-NOTCH TOUGHNESS OF 20 FT.-LBS. AT 0 DEGREES F. WELDS SPECIFICALLY DENOTED AS "DEMAND CRITICAL" SHALL BE MADE WITH FILLER WELD METAL THAT ADDITIONALLY HAS A MINIMUM CHARPY V-NOTCH TOUGHNESS OF 40 FT-LBS AT 70 DEGREES F. SEE AISC 341-16 CHAPTER A3 (4B) AND AWS D1.8 SECTION 6.3 FOR ADDITIONAL REQUIREMENTS. PROPOSED FILLER MATERIAL FOR BOTH SHOP AND FIELD WELDS SHALL BE SUBMITTED FOR REVIEW PRIOR TO CONSTRUCTION.

49. METAL FLOOR AND ROOF DECKING: PROVIDE SIZE, TYPE, GAGE, AND ATTACHMENT TO THE SUPPORTING STRUCTURE AS SHOWN ON THE DRAWINGS. ALTERNATES MUST BE CONNECTED ACCORDING TO PUBLISHED ICC-ES CRITERIA FOR DIAPHRAGM SHEARS SHOWN. PROVIDE SHORING WHERE REQUIRED PER MANUFACTURER'S PUBLISHED CRITERIA. ALL DECKING SHALL CONFORM TO THE REQUIREMENTS OF THE STEEL DECK INSTITUTE. SUBMIT DECK INFORMATION TO ARCHITECT AND ENGINEER PRIOR TO BEGINNING SHOP DRAWINGS.

50. COLD-FORMED STEEL FRAMING MEMBERS SHALL BE OF THE SHAPE, SIZE, AND GAGE SHOWN ON THE DRAWINGS. NOTATIONS ON THE DRAWINGS, RELATING TO MEMBER TYPES AND SIZES OR MISCELLANEOUS FRAMING ITEMS, REFER TO CATALOG NUMBERS OF THE "STEEL STUD MANUFACTURER'S ASSOCIATION" STANDARD SPECIFICATIONS, AND ICC-ESR REPORT NO. 3064P. ALTERNATE FRAMING SHALL BE SUBJECT TO REVIEW BY THE ARCHITECT AND STRUCTURAL ENGINEER PRIOR TO FABRICATION. ALL COLD-FORMED STEEL FRAMING SHALL ALSO CONFORM TO THE AISI "NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" AND THE AISI "CODE OF STANDARD PRACTICE FOR COLD-FORMED STRUCTURAL FRAMING." SEE 30/S7.01 FOR METAL FRAMING NOTES.

51. HEADED STUDS FOR COMPOSITE CONNECTION OF STRUCTURAL STEEL TO CONCRETE AND THREADED STUDS (CPL'S OR CFL'S) FOR CONNECTION OF STRUCTURAL STEEL TO OTHER ELEMENTS SHALL BE MANUFACTURED FROM MATERIAL CONFORMING TO ASTM A29 GR. 1010 THROUGH 1020 (TYPE 2, Fu = 60 KSI MIN.). HEADED STUDS SHALL BE WELDED IN CONFORMANCE WITH THE REQUIREMENTS OF A.W.S D1.1 CHAPTER 7. UNLESS OTHERWISE NOTED, STUDS SHALL BE WELDED BY THE AUTOMATIC MACHINE WELDING PROCESS IN CONFORMANCE WITH A.W.S. REQUIREMENTS.

    STUD TYPES SHALL BE MANUFACTURED BY NELSON STUD WELDING, INC. OR EQUIVALENT. HEADED STUDS SHALL BE TYPE S3L SHEAR CONNECTORS, THREADED STUDS SHALL BE TYPE CPL PARTIALLY THREADED STUDS OR TYPE CFL FULLY THREADED STUDS.

52. DEFORMED BAR ANCHORS (D2L's) SHALL BE TYPE D2L ANCHORS BY NELSON STUD WELDING, INC., OR EQUIVALENT. ANCHORS SHALL BE MADE FROM COLD ROLLED, DEFORMED STEEL CONFORMING TO ASTM A-496. D2L ANCHORS MAY NOT BE SUBSTITUTED FOR WELDED A706 BARS WHERE THESE BARS ARE PART OF THE LATERAL FORCE RESISTING SYSTEM.

    A706 GRADE 60 REINFORCING BARS OF AN EQUAL DIAMETER AND LENGTH OF THE SPECIFIED D2L's MAY BE USED PROVIDED THEY ARE WELDED TO THE SUPPORTING STEEL IN ACCORDANCE WITH THE TABLE BELOW:

BAR DIAMETER	ALL-AROUND FILLET WELD SIZE
1/2" (#4)	5/16"
5/8" (#5)	3/8"
3/4" (#6)	7/16"

53. NOT USED

WOOD:

54. FRAMING LUMBER SHALL BE KILN DRIED OR MC-19, AND GRADED AND MARKED IN CONFORMANCE WITH W.C.L.I.B. STANDARD GRADING RULES FOR WEST COAST LUMBER NO. 17 OR W.W.P.A. WESTERN LUMBER GRADING RULES. FURNISH TO THE FOLLOWING MINIMUM STANDARDS:

STUDS AND JOISTS:	
(2x AND 3x MEMBERS)	DOUGLAS FIR NO. 2 MINIMUM BASIC DESIGN STRESS, Fc = 1350 PSI, Fb = 900 PSI, Fv = 180 PSI, E = 1600 KSI
(4x MEMBERS)	DOUGLAS FIR NO. 1 MINIMUM BASIC DESIGN STRESS, Fc = 1500 PSI, Fb = 1000 PSI, Fv = 180 PSI, E = 1700 KSI
BEAMS AND STRINGERS: (INCLUDING 6x AND LARGER MEMBERS)	DOUGLAS FIR NO. 1 MINIMUM BASIC DESIGN STRESS, Fb = 1350 PSI, Fv = 170 PSI, E = 1600 KSI
POSTS: (4x MEMBERS)	DOUGLAS FIR NO. 1 MINIMUM BASIC DESIGN STRESS, Fc = 1500 PSI, E = 1700 KSI
(6x & LARGER MEMBERS)	DOUGLAS FIR NO. 1 MINIMUM BASIC DESIGN STRESS, Fc = 1000 PSI, E = 1600 KSI
PLATES, LEDGERS & MISCELLANEOUS LIGHT FRAMING:	DOUGLAS FIR NO. 3 OR STUD GRADE MINIMUM BASIC DESIGN STRESS, Fb = 525 PSI, E = 1400 KSI Fc = 775 PSI, Ft = 325 PSI
NOTE:	FINGER JOINTED STUDS MAY BE SUBSTITUTED ONLY IF THEY MEET PRESCRIBED BENDING STRESS & TENSION STRESS CRITERIA.

55. ENGINEERED LUMBER: EACH PIECE SHALL BEAR A STAMP OR STAMPS NOTING THE NAME AND PLANT NUMBER OF THE MANUFACTURER, THE GRADE, THE NER OR ICC-ES REPORT NUMBER, AND THE QUALITY CONTROL AGENCY. ALL MEMBERS SHALL BE MANUFACTURED WITH AN APPROVED ADHESIVE.

BEAMS:	ENGINEERED TYPE A (LSL) Fb = 2250 PSI, E = 1500 KSI, Fv = 220 PSI
	ENGINEERED TYPE B (PSL) Fb = 2900 PSI, E = 2000 KSI, Fv = 285 PSI
RIM BOARD:	1 1/4" OR 3 1/2" LAMINATED STRAND LUMBER Fb = 1700 PSI, E = 1300 KSI, Fv = 400 PSI
STUDS:	LAMINATED STRAND LUMBER (LSL) Fb = 2250 PSI, E = 1500 KSI, Fv = 285 PSI, Fc = 1950 PSI (WIDTH ≥ 7 1/4") Fb = 1700 PSI, E = 1300 KSI, Fv = 285 PSI, Fc = 1400 PSI (WIDTH < 7 1/4")
POSTS:	PARALLEL STRAND LUMBER (PSL) Fb = 2400 PSI, E = 1800 KSI, Fv = 285 PSI, Fc = 2500 PSI

DESIGN SHOWN ON THE DRAWINGS SHALL MEET OR EXCEED THE MINIMUM PROPERTIES INDICATED ABOVE. A CURRENT NER OR ICC-ES REPORT MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW. ENGINEERED LUMBER MANUFACTURER SHALL BE ONE OF THE FOLLOWING:

WEYERHAEUSER (ICC-ES REPORT NO. ESR-1387)
REDBUILT LLC (ICC-ES REPORT NO. ESR-2993)
BOISE CASCADE (ICC-ES REPORT NO. ESR-1040)
ROSEBURG (ICC-ES REPORT NO. ESR-1210)

ALTERNATE ENGINEERED LUMBER MAY BE USED SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER. A CURRENT NER OR ICC-ES REPORT AND A LIST STATING THE ITEM-FOR-ITEM SUBSTITUTION MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR ANY PROPOSED SUBSTITUTES.

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PROJECT
Little Saigon Landmark

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PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
GENERAL STRUCTURAL NOTES

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S1.03

90% CD SET

ORIGINAL SHEET SIZE 30" x 42"

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General Structural Notes

(THE FOLLOWING APPLY UNLESS SHOWN OTHERWISE ON THE DRAWINGS.)

56. PREFABRICATED WALL PANELS: ALL NECESSARY CONNECTIONS, BLOCKING, HEADERS, JAMB STUDS, POSTS, ETC., SHALL AND PROVIDED BY THE FABRICATOR IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. SUBMIT SHOP DRAWINGS TO THE ARCHITECT, AND STRUCTURAL ENGINEER FOR CURSORY REVIEW PRIOR TO FABRICATION. SPLICE TOP PLATES PER 6/S6.01 . NAIL STUDS TOGETHER AT ADJOINING PANELS WITH 16d @ 12"oc STAGGERED (REFER TO 30/S6.05 FOR SPECIAL NAILING REQUIREMENTS AT SHEAR WALLS). REFER TO <GSN-W14> FOR OTHER FRAMING REQUIREMENTS, UNLESS OTHERWISE NOTED.

57. ENGINEERED WOOD I-JOISTS SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. ALL NECESSARY BRIDGING, BLOCKING, BLOCKING PANELS, STIFFENERS, ETC., SHALL BE DETAILED AND FURNISHED BY THE MANUFACTURER. PERMANENT AND TEMPORARY BRIDGING SHALL BE INSTALLED IN CONFORMANCE WITH MANUFACTURER'S INSTRUCTIONS. ALL JOIST HANGERS AND OTHER HARDWARE SHALL BE COMPATIBLE IN SIZE WITH ENGINEERED WOOD I-JOISTS PROVIDED.

JOIST TYPES:

11 7/8" I-110 JOIST
M = 3160 (ft-lbs), EI = 267 x 106 (in.2-lbs), V = 1420 (lbs)

11 7/8" I-210 JOIST
M = 3755 (ft-lbs), EI = 315 x 106 (in.2-lbs), V = 1480 (lbs)

11 7/8" I-230 JOIST
M = 4215 (ft-lbs), EI = 347 x 106 (in.2-lbs), V = 1485 (lbs)

11 7/8" I-360 JOIST
M = 6180 (ft-lbs), EI = 419 x 106 (in.2-lbs), V = 1550 (lbs)

11 7/8" I-560 JOIST
M = 9500 (ft-lbs), EI = 621 x 106 (in.2-lbs), V = 2050 (lbs)

I-JOISTS SHALL MEET OR EXCEED MINIMUM PROPERTIES INDICATED ABOVE AND FROM APA TECHNICAL PUBLICATION ON I-JOISTS Z725. A CURRENT NER OR ICC-ES REPORT MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW. JOIST CHORD MEMBERS SHALL BE AT LEAST 1 3/4" WIDE AND CONSIST OF MATERIAL WITH A SPECIFIC DENSITY OF AT LEAST 0.50. JOIST MANUFACTURER SHALL BE ONE OF THE FOLLOWING:

WEYERHAEUSER (ICC-ES REPORT NO. ESR-1153)

REDBUILT LLC (ICC-ES REPORT NO. ESR-2994)

BOISE CASCADE (ICC-ES REPORT NO. ESR-1336)

ROSEBURG (ICC-ES REPORT NO. ESR-1251)

PACIFIC WOODTECH CORPORATION (ICC-ES REPORT NO. ESR-1305)

ALTERNATE ENGINEERED WOOD I-JOISTS MAY BE USED SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER. A CURRENT NER OR ICC-ES REPORT AND A LIST STATING THE ITEM-FOR-ITEM SUBSTITUTION MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR ANY PROPOSED SUBSTITUTES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ENGINEERING COSTS RELATING TO REVIEW AND/OR RE-DESIGN TO ACCOMMODATE PROPOSED SUBSTITUTIONS.

THE JOIST MANUFACTURER SHALL COORDINATE LOCATIONS AND SUPPORT CONFIGURATIONS OF PLUMBING, MECHANICAL UNITS, DUCTS, AND/OR OTHER MISCELLANEOUS ITEMS WITH THE CONTRACTOR PRIOR TO JOIST FABRICATION. THE JOIST MANUFACTURER SHALL DESIGN JOISTS TO SUPPORT ALL LOADS ASSOCIATED WITH SUCH ITEMS. THE JOIST SHOP DRAWINGS SHALL INCLUDE ALL DESIGN LOADS AND APPROVED HANGER CONNECTION DETAILS TO JOISTS FOR SUPPORT OF HUNG MECHANICAL SYSTEM COMPONENTS.

SUBMIT SHOP DRAWINGS TO THE ARCHITECT AND STRUCTURAL ENGINEER FOR REVIEW PRIOR TO FABRICATION.

ALL I-JOIST HANGERS SHALL BE 'ITS' SERIES, UNLESS OTHERWISE NOTED.

58. ROOF, FLOOR & WALL SHEATHING SHALL BE APA RATED, EXTERIOR OR EXPOSURE 1 ORIENTED STRAND BOARD (OSB) IN CONFORMANCE WITH IBC SECTION 2303.1.5. REFER TO 30/S6.05 FOR REQUIRED SHEATHING TYPE AT SHEAR WALL SHEATHING. SHEATHING SHALL BE MANUFACTURED UNDER THE PROVISIONS OF VOLUNTARY PRODUCT STANDARDS DOC PS 1-09, PS 2-10, OR APA PRP-108 PERFORMANCE STANDARDS AND POLICIES FOR STRUCTURAL USE PANELS. SEE DRAWINGS FOR THICKNESS, SPAN RATING, AND NAILING REQUIREMENTS. UNLESS OTHERWISE NOTED, WALL SHEATHING SHALL BE 1/2" (NOMINAL) WITH SPAN RATING OF 24/0. GLUE FLOOR SHEATHING TO ALL SUPPORTING MEMBERS WITH ADHESIVE CONFORMING TO ASTM SPECIFICATION D3498.

59. ALL PRESSURE-TREATED (P.T.) WOOD MEMBERS SPECIFIED ON THE DRAWINGS THAT OCCUR ABOVE GROUND AND CONTINUOUSLY PROTECTED FROM MOISTURE (INTERIOR LOCATIONS) SHALL BE PRESSURE-TREATED WITH DOT SODIUM BORATE (SBX) WITHOUT $NaSiO_2$. AT LOCATIONS PERMANENTLY EXPOSED TO WEATHER OR IN CONTACT WITH THE GROUND, WOOD MEMBERS SHALL BE PRESSURE-TREATED WITH COPPER AZOLE CA-B (HEM-FIR ONLY), OR ALKALINE COPPER QUAT (ACQ-C FOR DOUGLAS-FIR, OR ACQ-D FOR HEM-FIR) PRESERVATIVES UNLESS OTHERWISE NOTED. AMMONIACAL COPPER ZINC ARSENATE (ACZA) PRESERVATIVE, OR OTHER PRESERVATIVES WITH AMMONIA CARRIERS, SHALL NOT BE USED.

SEE GENERAL STRUCTURAL NOTES 62 AND 63 FOR MATERIAL REQUIREMENTS OF CONNECTORS AND FASTENERS IN CONTACT WITH PRESSURE-TREATED MEMBERS.

INSTALL 2 LAYERS OF ASPHALT-IMPREGNATED BUILDING PAPER BETWEEN UNTREATED LEDGERS, BLOCKING, ETC., AND CONCRETE OR MASONRY.

60. SELF-TIGHTENING HOLDOWN SYSTEM SHALL BE DESIGNED BY THE MANUFACTURER FOR THE LOADS AND CONDITIONS SHOWN ON THE DRAWINGS AND SHALL BE FURNISHED AND INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. SELF-TIGHTENING SYSTEM SHALL BE DESIGNED TO ACCOMMODATE 3/8" OF SHRINKAGE PER FLOOR. SHOP DRAWINGS AND CALCULATIONS SHALL BE PROVIDED AS A DEFERRED SUBMITTAL TO THE ARCHITECT AND STRUCTURAL ENGINEER PER GENERAL STRUCTURAL NOTE <GSN-I13A>. SHOP DRAWINGS SHALL INDICATE LOCATIONS, LOAD CAPACITIES AND SELF-TIGHTENING DEVICE OF EACH HOLDOWN RUN. THESE PRODUCTS SHALL BE ONE OF THE FOLLOWING:

AUTO TIGHT ROD SYSTEM USING THE "AT AUTOMATIC TAKE-UP SHRINKAGE COMPENSATOR" TAKEUP DEVICE MANUFACTURED BY COMMINS MANUFACTURING INC. (ICC-ES REPORT NO. ESR-1344)

EARTHBOUND SEISMIC HOLDOWN SYSTEM USING THE "SLACKJACK" TAKEUP DEVICE MANUFACTURED BY EARTHBOUND CORPORATION (ICC-ES REPORT NO. ESR-2848)

ATS ANCHOR TIEDOWN SYSTEMS USING THE "TUD", "ATUD", & "CTUD" TAKEUP DEVICE MANUFACTURED BY SIMPSON STRONG-TIE (ICC-ES REPORT NO. ESR-2320)

THE MANUFACTURER SHALL DESIGN THE SELF-TIGHTENING HOLDOWN SYSTEM SUCH THAT VERTICAL ELONGATION, DEFLECTION, AND MOVEMENT OF THE HOLDOWN SYSTEM AT EACH FLOOR DOES NOT EXCEED 0.15". VERTICAL ELONGATION, DEFLECTION, AND MOVEMENT SHALL INCLUDE ROD ELONGATION, BEARING PLATE DEFLECTION RESULTING FROM WOOD PERPENDICULAR TO GRAIN COMPRESSION, AND TAKE UP DEVICE LOAD DEFORMATION AT SPECIFIED LOADS FROM THE HOLDOWN LOAD SCHEDULE OF 30/S6.06 . TAKE UP DEVICE LOAD DEFORMATION SHALL INCLUDE TAKEUP DEVICE AVERAGE TRAVEL AND SEATING INCREMENT Δ_R IN ACCORDANCE WITH ICC ACCEPTANCE CRITERIA AC316.

SUBSTITUTES PROPOSED BY CONTRACTOR SHALL BE SUBMITTED FOR REVIEW WITH CURRENT ICC-ES REPORTS. IN ADDITION, SUBSTITUTIONS SHALL MEET ICC-ES ACCEPTANCE CRITERIA AC316.

61. WOOD FRAMING NOTES THE FOLLOWING APPLY UNLESS OTHERWISE NOTED ON THE DRAWINGS:

A. ALL WOOD FRAMING DETAILS SHALL BE CONSTRUCTED TO THE MINIMUM STANDARDS OF THE IBC. MINIMUM NAILING SHALL CONFORM TO IBC TABLE 2304.10.2 OR CURRENT ICC-ES REPORT NER-272. COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS WITH MECHANICAL AND ARCHITECTURAL DRAWINGS. INSTALL WASHERS UNDER THE HEADS AND NUTS OF ALL BOLTS AND LAG SCREWS BEARING ON WOOD. INSTALLATION OF LAG SCREWS SHALL CONFORM TO 2018 NDS SECTION 12.1.4, AND INSTALLATION OF BOLTS SHALL CONFORM TO 2018 NDS SECTION 12.1.3.

B. WALL FRAMING: TWO STUDS MINIMUM SHALL BE INSTALLED AT THE ENDS OF ALL WALLS, UNLESS OTHERWISE NOTED. INSTALL SOLID BLOCKING FOR WOOD COLUMNS THROUGH FLOOR SPACES TO SUPPORTS BELOW.

ALL STUD WALLS SHALL HAVE THEIR LOWER WOOD PLATES ATTACHED TO WOOD FRAMING BELOW WITH 16d NAILS AT 12"oc STAGGERED OR BOLTED TO CONCRETE WITH 5/8" DIAMETER ANCHOR BOLTS @ 4'-0"oc PER IBC SECTION 2308.3.1 (EMBED 7"), UNLESS OTHERWISE NOTED. 3" x 3" x 0.229" PLATE WASHERS SHALL BE USED WITH ALL SILL PLATE ANCHOR BOLTS AND INSTALLED PER AWC SDPWS-2021 SECTION 4.3.6.4.3. INDIVIDUAL MEMBERS OF BUILT-UP STUD POSTS SHALL BE NAILED TO EACH OTHER WITH 16d @ 12"oc STAGGERED.

C. FLOOR AND ROOF FRAMING: INSTALL DOUBLE JOISTS SEPARATED BY SOLID BLOCKING EQUAL TO DEPTH OF STUDS ABOVE UNDER ALL PARALLEL PARTITIONS THAT EXTEND OVER MORE THAN HALF THE JOIST LENGTH AND AROUND ALL OPENINGS IN FLOORS OR ROOFS. INSTALL SOLID BLOCKING AT ALL BEARING POINTS. TOENAIL JOISTS TO SUPPORTS WITH TWO 16d NAILS. ATTACH TIMBER JOISTS TO FLUSH HEADERS OR BEAMS WITH SIMPSON METAL JOIST HANGERS IN ACCORDANCE WITH NOTES ABOVE. NAIL ALL MULTI-JOIST BEAMS TOGETHER WITH 16d @ 12"oc STAGGERED.

ROOF AND FLOOR SHEATHING SHALL BE LAID UP WITH GRAIN PERPENDICULAR TO SUPPORTS AND NAILED AS SHOWN ON THE DRAWINGS. INSTALL APPROVED PANEL EDGE CLIPS CENTERED BETWEEN JOISTS/TRUSSES AT UNBLOCKED ROOF SHEATHING EDGES. ALL FLOOR SHEATHING EDGES SHALL HAVE APPROVED TONGUE-AND-GROOVE JOINTS OR SHALL BE SUPPORTED WITH SOLID BLOCKING. ALLOW 1/8" SPACING AT ALL PANEL EDGES AND ENDS OF FLOOR AND ROOF SHEATHING. TOENAIL BLOCKING TO SUPPORTS WITH 16d @ 12"oc. AT BLOCKED FLOOR AND ROOF DIAPHRAGMS, INSTALL FLAT 2x BLOCKING AT ALL UNFRAMED PANEL EDGES AND NAIL WITH EDGE NAILING SPECIFIED.

IN ACCORDANCE WITH IBC SECTION 1604.8.3, DECKS SHALL BE POSITIVELY ANCHORED TO THE STRUCTURE BY MEANS OTHER THAN NAILS SUBJECT TO WITHDRAWAL. ANCHOR WITH MINIMUM (1) CS16 STRAP AT EACH END ATTACHED TO DECK JOISTS AND TO A SOLID BLOCKING MEMBER WITHIN THE BUILDING.

D. WOOD SHRINKAGE: THE PLUMBING, FIRE PROTECTION, DRAINAGE, MECHANICAL, ELECTRICAL, CLADDING, AND OTHER SYSTEMS INSTALLED WITHIN THE BUILDING SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE VERTICAL SHRINKAGE AT THE WOOD FRAMING LEVELS. THE WOOD SHRINKAGE AMOUNT SHALL BE ASSUMED TO EQUAL 3/8" FOR EACH WOOD FRAMED FLOOR LEVEL.

E. NAILING: MINIMUM NAIL DIAMETER AND LENGTH SHALL BE AS FOLLOWS:

	NAIL SIZE ON DRAWINGS	DIAMETER AND LENGTH
SHEATHING NAILS	8d	0.131" x 2 1/4"
	10d	0.148" x 2 1/2"
FRAMING NAILS	10d	0.148" x 3"
	16d	0.148" x 3 1/4"

62. WOOD CONNECTORS CALLED OUT BY LETTERS AND NUMBERS SHALL BE "STRONG-TIE" BY SIMPSON COMPANY, AS SPECIFIED IN THEIR WOOD CONSTRUCTION CONNECTORS CATALOG NO. C-C-2024. A CURRENT ICC-ES REPORT AND A LIST STATING THE ITEM-FOR-ITEM SUBSTITUTION MUST BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR ANY PROPOSED SUBSTITUTES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ENGINEERING COSTS RELATING TO REVIEW AND/OR RE-DESIGN TO ACCOMMODATE PROPOSED SUBSTITUTIONS. INSTALL NUMBER AND SIZE OF FASTENERS AS SPECIFIED BY MANUFACTURER. CONNECTORS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. WHERE CONNECTOR STRAPS CONNECT TWO MEMBERS, CENTER STRAP ON JOINT AND INSTALL NUMBER AND SIZE OF FASTENERS AS SPECIFIED BY MANUFACTURER, WITH EQUAL NUMBER AND SIZE OF FASTENERS IN EACH MEMBER. ALL SHIMS SHALL BE SEASONED AND DRIED AND THE SAME GRADE (MINIMUM) AS MEMBERS CONNECTED.

ALL TIMBER CONNECTORS IN CONTACT WITH FIRE RETARDANT TREATED WOOD OR PRESSURE-TREATED WOOD THAT USES PRESERVATIVE CHEMICALS OTHER THAN DOT SODIUM BORATE (SBX) WITHOUT $NaSiO_2$ SHALL BE MANUFACTURED FROM ZMAX STEEL BY SIMPSON (G185 STEEL PER ASTM A653), OR TYPE 304 OR 316 STAINLESS STEEL. ALTERNATIVELY, CONNECTORS CAN BE POST HOT DIP GALVANIZED PER ASTM A123 OR MECHANICALLY GALVANIZED PER ASTM B695, CLASS 55 OR GREATER. STAINLESS STEEL FASTENERS SHALL BE USED WITH STAINLESS STEEL CONNECTORS, AND HOT DIP GALVANIZED FASTENERS PER ASTM A153 SHALL BE USED WITH GALVANIZED CONNECTORS.

63. WOOD FASTENERS

SDS SCREWS SHALL BE SDS25 (ICC-ES ESR-3046) AND SDWS SCREWS SHALL BE SDWS22 (IAMPO-UES ER-192), LENGTH PER DRAWINGS, WITH DOUBLE BARRIER COATING U.O.N.

BOLTS IN WOOD MEMBERS SHALL CONFORM TO ASTM A307. INSTALL WASHERS UNDER THE HEADS AND NUTS OF ALL BOLTS AND LAG SCREWS BEARING ON WOOD.

ALL TIMBER FASTENERS IN CONTACT WITH FIRE RETARDANT TREATED WOOD OR PRESSURE-TREATED WOOD THAT USES CHEMICALS OTHER THAN DOT SODIUM BORATE (SBX) WITHOUT $NaSiO_2$, SHALL BE POST HOT DIP GALVANIZED PER ASTM A153.

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(206) 343-0460 www.cplinc.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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TITLE
GENERAL STRUCTURAL NOTES

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S1.04

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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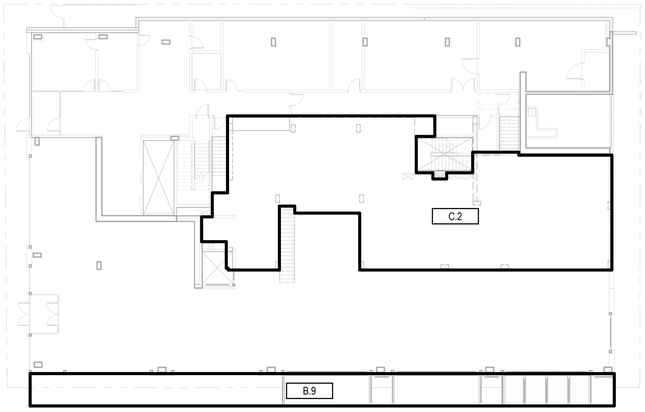
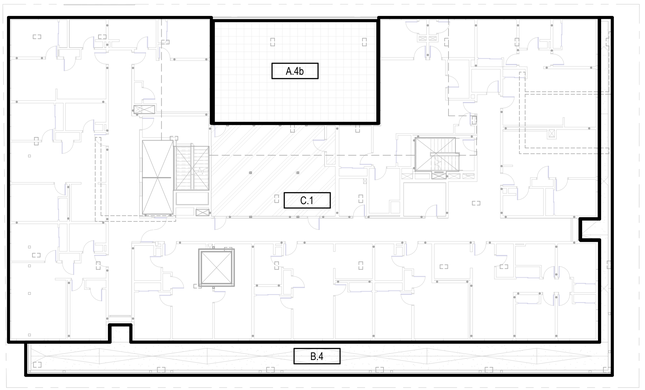


1 LEVEL 02 LOADING DIAGRAM
1/16" = 1'-0"

N



2 LEVEL 03 LOADING DIAGRAM
1/16" = 1'-0"

N

3 LEVEL 04 LOADING DIAGRAM
1/16" = 1'-0"

N

LEGEND:

[R]	REDUCIBLE LIVE LOAD
A.1a(x)	ADDITIONAL LOAD PER LEGEND BELOW (WHERE OCCURS) LOAD TYPE PER DETAILED SDL TABLE (WHERE OCCURS) LOAD TYPE PER SUPERIMPOSED DEAD LOAD TABLE (SDL) LOAD TYPE PER LIVE LOAD TABLE
xxx	CLADDING WEIGHT ALLOWANCE (POUNDS PER SQUARE FOOT OF WALL SURFACE AREA)
xxx	CLADDING WEIGHT ALLOWANCE (KIPS PER FOOT OF WALL PERIMETER)
(o)	INCLUDES ADDITIONAL 60 PSF ALLOWANCE FOR OVERFRAMED SLAB
(p)	INCLUDES ADDITIONAL xx PSF ALLOWANCE FOR PV ARRAY

LOADING DIAGRAM NOTES:

1. LOAD TYPES OCCUR WITHIN THE REGIONS BOUND BY THICK LINES.
2. WHERE THE LOAD TYPES DO NOT INCLUDED PARTITION LOAD, A 5 PSF ALLOWANCE IS CONSIDERED IN SEISMIC WEIGHT FOR PARTITIONS BELOW.
3. WHERE THE COMBINED WEIGHT OF THE UNIT AND PAD/CURB SUPPORT LOCALLY EXCEED THE MEP ALLOWANCE NOTED IN THE SDL TABLE, DESIGN CONSIDERS THE ACTUAL UNIT WEIGHTS AND 40 PSF SDL WHERE UNITS DO NOT OCCUR.
4. LOAD SHOWN IN TABLE INCLUDES ALL DEAD LOADS, INCLUDING SELF-WEIGHT, WITH EXCEPTION OF PARTITION WEIGHT. 15 PSF IS CONSIDERED AS AN ALLOWANCE FOR PARTITION WEIGHT IN SEISMIC DESIGN AND FOR DESIGN OF CONCRETE TRANSFER SLAB.

LIVE LOAD TABLE			
TYPE	DESCRIPTION	**LIVE LOAD (PSF)**	COMMENTS
A	ASSEMBLY, CORRIDOR, LOBBY, STAIR,	**100**	-
B	ROOF (SNOW)	**25**	-
C	RESIDENTIAL, PRIVATE CORRIDORS, MEP ROOMS	**40 [R]**	-

TYPICAL SUPERIMPOSED DEAD LOAD TABLE					
TYPE	DESCRIPTION	**TOTAL SDL (PSF)**	MEP/ CEILING (PSF)	FLOOR/ ROOF (PSF)	COMMENTS
1	CONCRETE RESIDENTIAL	**20**	4	5	INCLUDES 10 PSF OF PARTITION WEIGHT
2	MEP	**80**	5	0	-
3	ASSEMBLY, LOBBY, RETAIL	**10**	4	3	-
4	CONCRETE HARDSCAPE & LANDSCAPE	**12 + VARIES**	4	5	SEE DETAILED SDL TABLE
5	WOOD-FRAME RESIDENTIAL	**29**	7	16	SEE PLAN NOTE 7
6	2-HOUR WOOD-FRAME RESIDENTAL (LEVEL 3)	**34**	12	16	SEE PLAN NOTE 7
7	WOOD UNOCCUPIED ROOF	**17**	0	0	SEE PLAN NOTE 7
8	WOOD HARDSCAPE & LANDSCAPE	**19 + VARIES**	4	5	SEE DETAILED SDL TABLE AND PLAN NOTE 7
9	CANOPY	**10**	0	10	-

DETAILED SDL TABLE				
TYPE	DESCRIPTION	**EXTERIOR SDL (PSF)**	PAVING (PSF)	SOIL/GRAVEL (PSF)
a	PEDESTAL PAVERS	**25**	25	--
b	CONCRETE PAVERS	**50**	50	--
c	4" PLANTERS	**30**	--	30 PSF (4" dp. AT 90 PCF)
d	PV PANELS	**8**	--	--

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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE ISSUE

NO. DATE REVISION

DESIGN PARTNER
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PROJECT MANAGER
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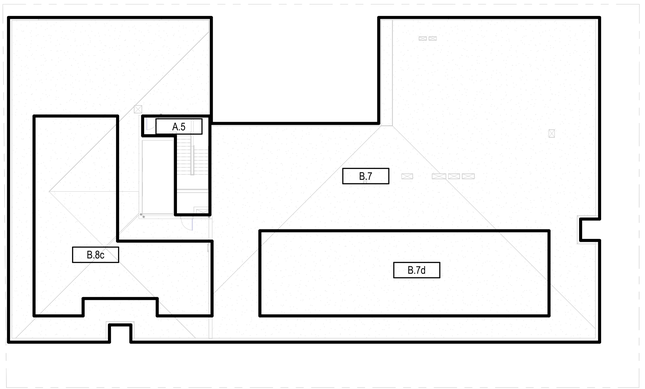
1 LEVEL 05-08 LOADING DIAGRAM
1/16" = 1'-0"

N



2 ROOF LOADING DIAGRAM
1/16" = 1'-0"

N

LIVE LOAD TABLE			
TYPE	DESCRIPTION	**LIVE LOAD (PSF)**	COMMENTS
A	ASSEMBLY, CORRIDOR, LOBBY, STAIR,	**100**	-
B	ROOF (SNOW)	**25**	-
C	RESIDENTIAL, PRIVATE CORRIDORS, MEP ROOMS	**40 [R]**	-

TYPICAL SUPERIMPOSED DEAD LOAD TABLE					
TYPE	DESCRIPTION	**TOTAL SDL (PSF)**	MEP/ CEILING (PSF)	FLOOR/ ROOF (PSF)	COMMENTS
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5	WOOD-FRAME RESIDENTIAL	**29**	7	16	SEE PLAN NOTE 7
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7	WOOD UNOCCUPIED ROOF	**17**	0	0	SEE PLAN NOTE 7
8	WOOD HARDSCAPE & LANDSCAPE	**19 + VARIES**	4	5	SEE DETAILED SDL TABLE AND PLAN NOTE 7
9	CANOPY	**10**	0	10	-

DETAILED SDL TABLE				
TYPE	DESCRIPTION	**EXTERIOR SDL (PSF)**	PAVING (PSF)	SOIL/GRAVEL (PSF)
a	PEDESTAL PAVERS	**25**	25	--
b	CONCRETE PAVERS	**50**	50	--
c	4" PLANTERS	**30**	--	30 PSF (4" dp. AT 90 PCF)
d	PV PANELS	**8**	--	--

LEGEND:

[R] REDUCIBLE LIVE LOAD

A.1a(x)
- ADDITIONAL LOAD PER LEGEND BELOW (WHERE OCCURS)
- LOAD TYPE PER DETAILED SDL TABLE (WHERE OCCURS)
- LOAD TYPE PER SUPERIMPOSED DEAD LOAD TABLE (SDL)
- LOAD TYPE PER LIVE LOAD TABLE

(xxx) CLADDING WEIGHT ALLOWANCE (POUNDS PER SQUARE FOOT OF WALL SURFACE AREA)

(xxx) CLADDING WEIGHT ALLOWANCE (KIPS PER FOOT OF WALL PERIMETER)

(o) INCLUDES ADDITIONAL 60 PSF ALLOWANCE FOR OVERFRAMED SLAB

(p) INCLUDES ADDITIONAL xx PSF ALLOWANCE FOR PV ARRAY

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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE ISSUE

NO. DATE REVISION

DESIGN PARTNER
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PROJECT MANAGER
AVA
PROJECT ENGINEER
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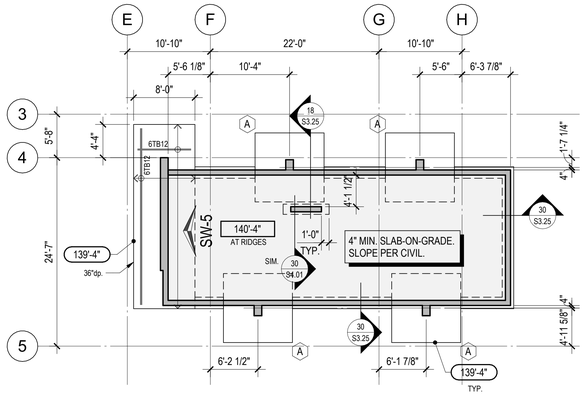
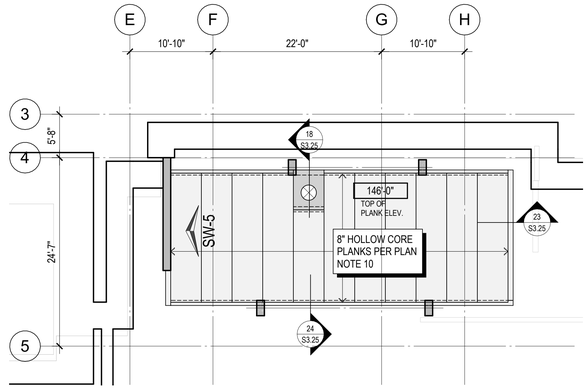


2 DETENTION VAULT FOUNDATION PARTIAL PLAN

1/8" = 1'-0"

N



3 DETENTION VAULT LID PARTIAL PLAN

1/8" = 1'-0"

N

BAR LEGEND:

- QUANTITY (WHERE SPECIFIED) BAR SIZE "T" TOP, "M" MIDDLE, or "B" BOTTOM or "TB" TOP & BOTTOM
- @ SPACING oc (EQ. SPACE IF NOT SPECIFIED)
- LENGTH OF BAR, PER DETAILS IF NOT SPECIFIED
- (8) 5 B 15 x 10'-0"
- 5B15 CONT.
- BARS CONTINUOUS TO EA. END OF SLAB, LAP AS REQUIRED

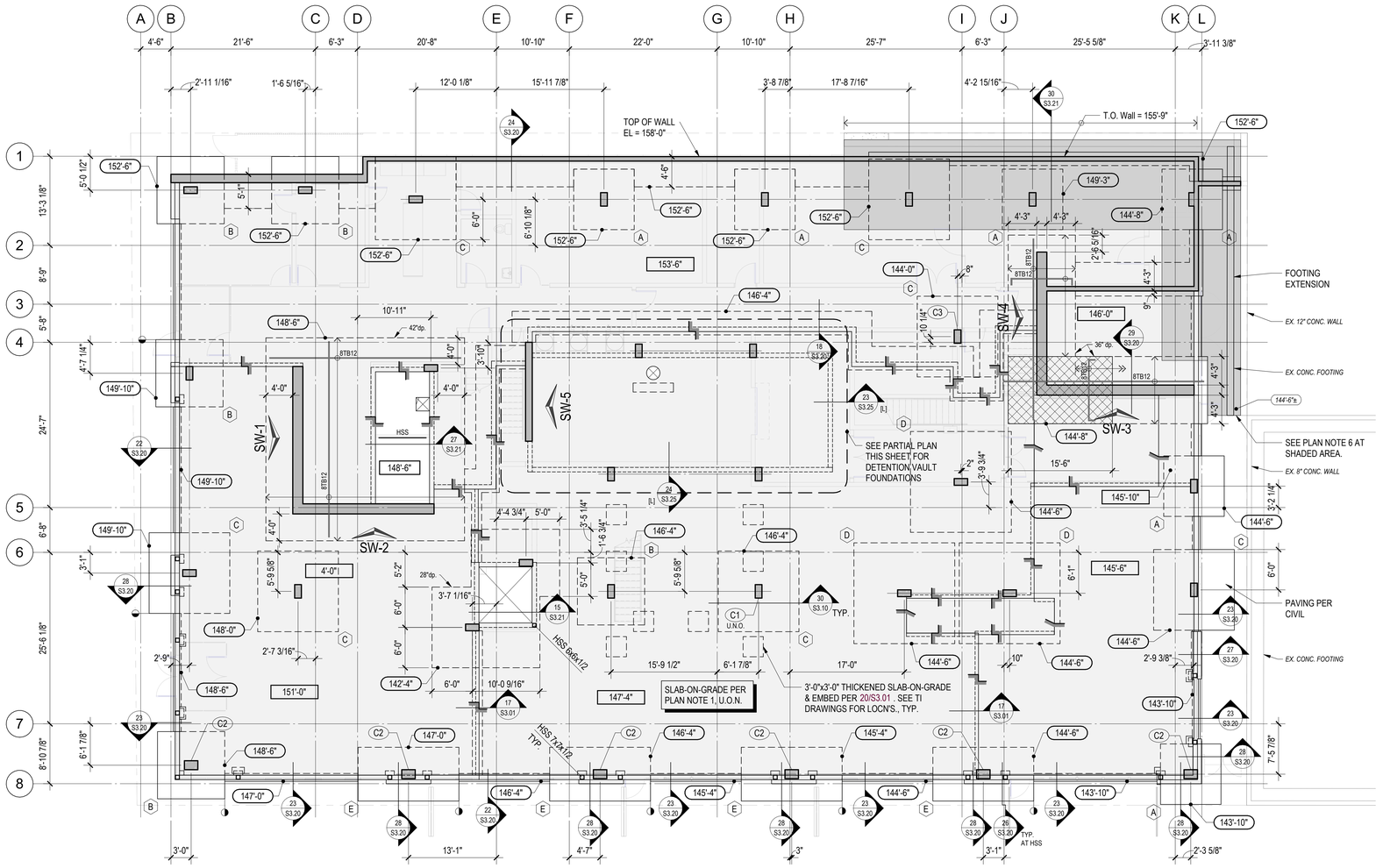
LEGEND:

- x'-x" — TOP OF SLAB ELEVATION
- x'-x" — TOP OF FOOTING ELEVATION
- STEP IN TOP OF SLAB
- (x) — FOOTING MARK PER 30/S3.10
- high / low — STEP IN FOOTING PER 14/S3.01
- (x) — COLUMN MARK PER SCHEDULE OF 29/S3.10
- TIES REQUIRED PER 29/S3.20
- HSS — HSS BEAM PER DETAILS
- [H], [M], [L] — RELATIVE PLACEMENT OF FRAMING MEMBER OR DETAIL CUT. [H] HIGH, [M] MIDDLE, [L] LOW

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

- SW-x — SHEAR WALL PER ELEVATION OF SHEET S3.30



1 LEVEL 01 FLOOR PLAN

1/8" = 1'-0"

N

FOUNDATION PLAN NOTES:

1. SLAB ELEVATION SHALL BE AS SHOWN IN PLAN. SLAB-ON-GRADE SHALL BE 4" THICK WITH 6x6 W1.4xW1.4 WWM AT CENTER, U.O.N. PROVIDE VAPOR BARRIER PER SPECIFICATIONS BELOW SLAB AT INTERIOR SPACES OVER FREE-DRAINING CAPILLARY BREAK MATERIAL PER GEOTECHNICAL REPORT.

   SEE ARCHITECTURAL DRAWINGS FOR SLAB DEPRESSION AND SLOPE REQUIREMENTS.

2. PROVIDE CONSTRUCTION/CONTROL JOINTS IN SLABS ON GRADE TO DIVIDE SLAB INTO RECTANGULAR AREAS 225 SQUARE FEET OR LESS. AREAS SHALL BE APPROXIMATELY SQUARE AND HAVE NO ACUTE ANGLES. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. JOINT LOCATIONS MUST BE APPROVED BY THE ARCHITECT. SEE 12/S3.01

3. TOPS OF ALL FOOTINGS SHALL BE AS SHOWN ON PLAN. FOOTINGS SHALL BEAR ON COMPETENT SOIL, 5 '-0" MINIMUM BELOW EXISTING GRADES AS DIRECTIED BY OWNER APPROVED GEOTECHNICAL ENGINEER. FOOTING ELEVATIONS SHOWN ARE FOR CONTRACTOR CONVENIENCE AND BIDDING ONLY. FINAL ELEVATIONS SHALL BE DETERMINED BY ON-SITE VERIFICATION BY OWNER APPOINTED BY GEOTECHNICAL ENGINEER. CONTRACTOR SHALL COORDINATE WITH FINAL SITE GRADES AND MAINTAIN MINIMUM DEPTH OF FOOTINGS SHOWN ON THE DRAWINGS.

4. ALL STAIRS AND LANDINGS NOT SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS ARE DESIGN BUILD COMPONENTS. ALL DESIGN BUILD STEEL COMPONENTS SHALL BE DESIGNED, DETAILED, AND SUPPLIED BY THE STEEL FABRICATOR - SEE GENERAL STRUCTURAL NOTE 12 FOR REQUIREMENTS INCLUDING ACCOMMODATION FOR STRUCTURAL DISPLACEMENTS. SUPPLY AND INSTALL COMPLETE STAIR SYSTEMS INCLUDING TREADS, RISERS, AND INTERMEDIATE LANDINGS. ANY NON-STEEL COMPONENTS INCLUDING FOOTINGS SHALL BE DESIGNED PER GENERAL STRUCTURAL NOTE 15 AND SHALL BE SUPPLIED AND INSTALLED BY SUPPLIERS AND SUBCONTRACTORS AS DIRECTED BY THE GENERAL CONTRACTOR.

5. SEE ARCHITECTURAL/MECHANICAL/CIVIL/UTILITIES DRAWINGS FOR UNDERSLAB PIPING. COORDINATE FOUNDATION DEPTHS AND PIPING IN ACCORDANCE WITH 8/S3.01 .

6. POUR LEAN MIX CONCRETE IN THE EXTENTS SHOWN TO ELEVATION 147'-5" ABOVE EXISTING BUILDING SLAB ON GRADE PRIOR TO DEMOLISION OF THE BUILDING ABOVE. NEW FOOTINGS SHALL BEAR DIRECTLY ON LEAN MIX OR STRUCTURAL FILL ABOVE THE LEAN MIX AS DIRECTED BY THE GEOTECHNICAL ENGINEER. LOCALLY REMOVE LEAN MIX IN 4'-0" SECTIONS TO CONSTRUCT NEW FOOTINGS AND EXISTING FOOTING EXTENSIONS ALONG SOUTH PROPERTY LINE.

DETENTION VAULT PLAN NOTES:

7. SLAB ELEVATION VARIES PER CIVIL PLAN. SLAB-ON-GRADE SHALL BE 4" THICK WITH 6x6 W1.4xW1.4 WWM AT CENTER, U.O.N. BELOW THE SLAB PROVIDE FREE-DRAINING CAPILLARY BREAK MATERIAL PER GEOTECHNICAL REPORT.

   SEE CIVIL DRAWINGS FOR SLAB DEPRESSION AND SLOPE REQUIREMENTS.

8. SEE CIVIL DRAWINGS FOR SIZES AND LOCATIONS OF MANHOLE ACCESS, PIPING SLEEVES THROUGH WALLS AND ACCESSORIES NOT SHOWN. REINFORCE WALL OPENINGS PER 4/S3.25 .

9. VAULT STRUCTURE SHALL BE COMPLETE AND CONCRETE MUST ACHIEVE REQUIRED 28-DAY COMPRESSIVE STRENGTH BEFORE BACKFILLING BEHIND VAULT WALLS. BACKFILL WALLS ON ALL FOUR SIDES CONCURRENTLY, FOR EACH LIFT OF BACKFILL. VAULT IS NOT DESIGNED TO RESIST RETAINING WALL LOADS FROM UNEVEN BACKFILL. REFERENCE GEOTECHNICAL REPORT FOR STRUCTURAL BACKFILL REQUIREMENTS INCLUDING MAX LIFT HEIGHT AND FILL COMPOSITION. CONTRACTOR MUST SUBMIT PROPOSED STRUCTURAL FILL MATERIALS TO GEOTECHNICAL ENGINEER FOR APPROVAL PRIOR TO IMPORTING TO SITE.

10. VAULT LID SHALL CONSIST OF 8" HOLLOW CORE PLANKS PER GENERAL STRUCTURAL NOTE 32 AND TOPPED WITH 12" OF SOIL AND 4" SLAB-ON-GRADE PER PLAN. SEE DETAIL 6/S3.25 FOR VAULT LID DESIGN LOADS.

0 4' 8' 16' 24'
1/8" = 1' - 0"

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DATE	ISSUE

NO.	DATE	REVISION
1	02/07/25	6982286-CN Cycle 1 Correction

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LEVEL 01 FLOOR PLAN

PROJECT NO.
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S2.01

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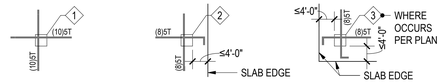
TYPICAL STUD RAILS & REINFORCING:

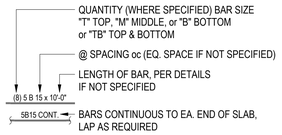


REINFORCING AT INTERIOR COLUMNS, TYPICAL U.O.N.

REINFORCING AT EXTERIOR COLUMNS, TYPICAL U.O.N.

REINFORCING AT CORNER COLUMNS, TYPICAL U.O.N.

BAR LEGEND:



LEGEND:

x'-x"	TOP OF SLAB ELEVATION
x'-x"	BOTTOM OF SLAB (SOFFIT) ELEVATION
	STRESSING END OF PT STRAND
	ANCHOR END OF PT STRAND
x.x	HEIGHT TO TENDON CGS FROM BOTTOM OF SLAB (x.xx = 1.25 IF NOT NOTED)
x.x	HEIGHT TO TENDON CGS FROM TOP OF SLAB (x.xx = 1.25 IF NOT NOTED)
	HEIGHT TO TENDON CGS AT MID-DEPTH OF SLAB
xT	x NUMBER OF BANDED TENDONS, SEE 30/S3.41
Tx"	x SPACING OF DISTRIBUTED TENDONS, SEE 30/S3.41
x" dp.	DEPTH OF DROP IN SLAB SOFFIT
x	STUDRAIL CALLOUT PER 30/S3.42
	CLOSURE/POUR STRIP PER 4/S3.40
A B C D	CLOSURE POUR REINFORCING PER 4/S3.40
HSS	SIZE PER S8.01

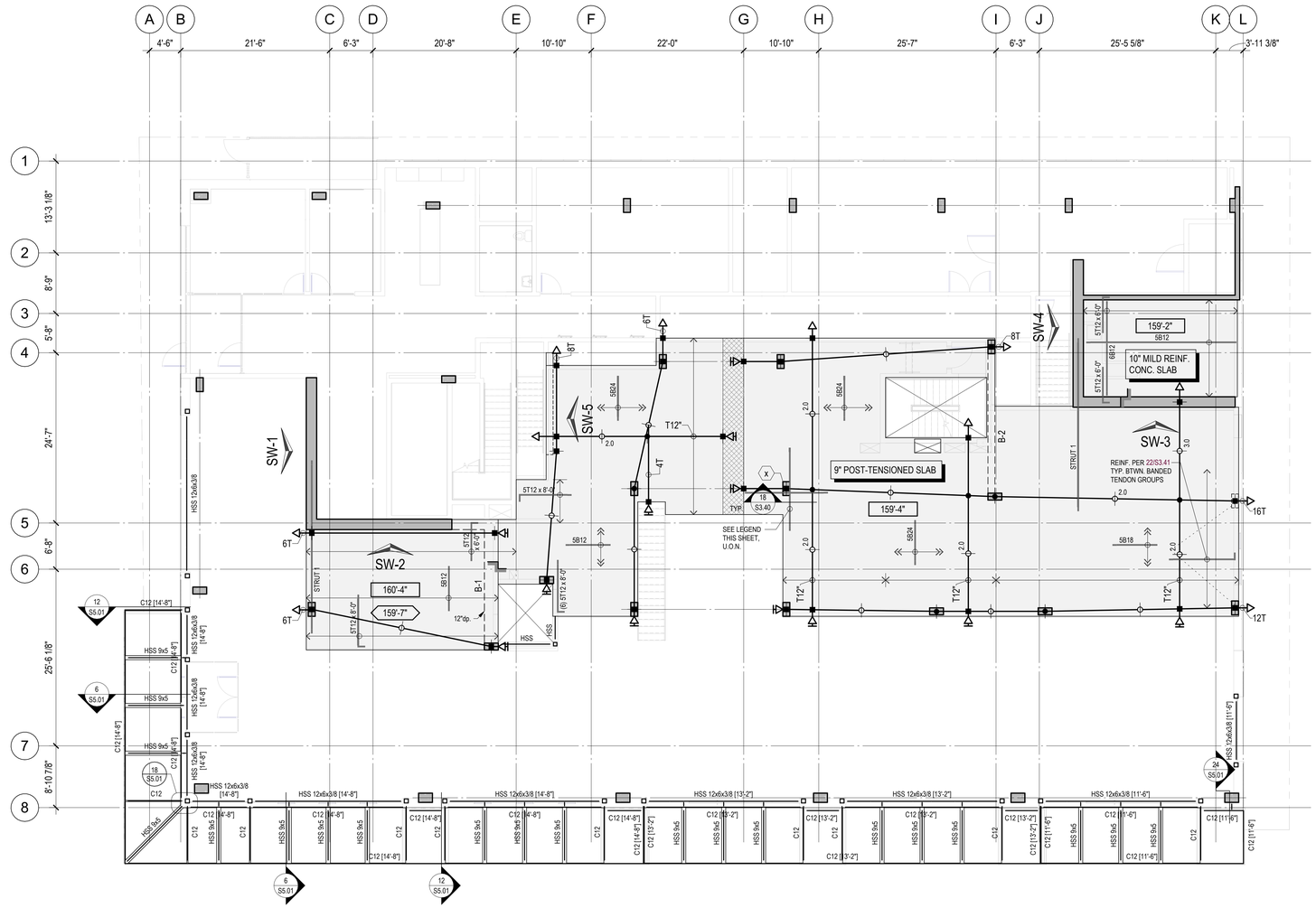
CANOPY FRAMING LEGEND:

C12	C12x20.7
HSS 9x5	HSS 9x5x3/8

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

SW-x	SHEAR WALL PER ELEVATION OF SHEET S3.30
STRUT	DRAG STRUT OR CHORD COMPONENT OF THE SEISMIC FORCE RESISTING SYSTEM
DIAPHRAGM	DIAPHRAGM AT THIS LEVEL CONSISTS OF THE FLOOR SLAB PER PLAN NOTE 4.



PT PLAN NOTES:

1. T.O. SLAB ELEVATION, SLAB THICKNESS AND REINFORCING SHALL BE AS NOTED ON PLAN. VERIFY DIMENSIONS, SLOPES, AND ELEVATIONS W/ ARCHITECTURAL DRAWINGS.
2. SEE S3.40 AND S3.41 FOR TYPICAL POST-TENSIONING DETAILS, INCLUDING ADDITIONAL REQUIRED REINFORCING.
3. SEE 30/S6.06 FOR ADDED MILD STEEL AND STUDRAILS AT HOLDOWNS. LOCATE HOLDOWNS PER SHEET S2.03W.
4. SLAB IS DESIGNED FOR 3-HOUR FIRE SEPARATION. PROVIDE 1 1/4" MIN. CLEAR COVER TO BOTTOM MILD REINFORCING AT EXTERIOR SPANS AND 1" MIN. CLEAR COVER TO ALL OTHER MILD REINFORCING. PROVIDE 2 1/2" MIN. CLEAR COVER TO BOTTOM POST-TENSIONED REINFORCING AT EXTERIOR SPANS AND 1" MIN. CLEAR COVER TO ALL OTHER POST-TENSIONED REINFORCING.
5. PROVIDE (3)#4 T&B CONT. (SEE 24/S3.40 FOR PLACEMENT) ALONG PERIMETER OF SLAB WHERE NOTED ON PLAN. BARS ARE IN ADDITION TO (2)#4 EDGE BARS SHOWN IN 24/S3.40 AND ON PLAN. (3)#4 T&B ARE NOT REQUIRED WHERE CONCRETE SHEAR WALL REINFORCING OF 30/S3.40 IS REQUIRED.
6. TENDON LOCATIONS SHALL BE MARKED ACCORDING TO DETAIL 30/S3.40.
7. MECHANICAL PIPING, ELECTRICAL FIXTURES AND OTHER HEAVY LOADS HUNG FROM PT SLAB SHALL BE SUPPORTED WITH UNISTRUT CONCRETE INSERTS OR EQUAL.
8. MECHANICAL PIPING AND ELECTRICAL CONDUIT SHALL PENETRATE THE PT SLAB AT ONLY PREDETERMINED SLEEVE LOCATIONS. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR LOCATION AND SIZE OF SLAB PENETRATIONS.
9. CORE DRILLING OR ROTO-HAMMERING OF P.T. SLAB IS NOT PERMITTED WITHOUT ENGINEER APPROVAL. SEE GENERAL STRUCTURAL NOTE 39.
10. REFERENCE ARCHITECTURAL DRAWINGS FOR MISC. EMBEDS REQUIRED AT NON-STRUCTURAL ELEMENTS.

1 LEVEL 02 FLOOR PLAN
1/8" = 1'-0"

N

0 4' 8' 16' 24'
1/8" = 1'-0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	02/07/25	6982286-CN Cycle 1 Correction

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / OPCD APPROVAL STAMP

TITLE
LEVEL 02 FLOOR PLAN

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S2.02

ORIGINAL SHEET SIZE 36" x 42"

90% CD SET

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SHEAR WALL TYPE SCHEDULE				
mark	SW-A	SW-B	SW-C	SW-D
LEVEL 8	W6	W6	W4	W4
LEVEL 7	W6	W3	W2	2W3
LEVEL 6	W4	W2	2W3	2W2
LEVEL 5	W2	2W3	2W2	2W2
LEVEL 4	2W4	2W2	2W2	2W2
LEVEL 3	2W4	2W2	2W2	2W2

NOTES:
1. SHEAR WALL TYPES PER SCHEDULE OF 30/S6.05 .
2. TWO-SIDED SHEAR WALLS (INDICATED BY 2Wx) SHALL RECEIVE BOTH LAYERS ON SAME STUD WALL, (1) LAYER ON EA. SIDE.

STUD WALL TYPE SCHEDULE										
mark	Typical Demising Wall - Staggered Studs (4)		Typical Interior Unit Bearing Wall		(A)		(B)		(C)	
	2x4 studs	2x6 studs	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls
LEVEL 8	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 7	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 6	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 5	2x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 4	3x4 @ 12"oc	2x6 @ 12"oc	3x4 @ 12"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc
LEVEL 3	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc

NOTE:
1. SEE PLAN NOTES FOR UNSCHEDUED WALLS.
2. A DOUBLE 2x STUD MAY BE SUBSTITUTED FOR EACH 3x STUD. (NAIL TOGETHER PER GENERAL STRUCTURAL NOTES)
3. 2x8 & LARGER STUDS WIDTHS SHALL MATCH THICKNESS AND SPACING AS REQUIRED FOR 2x6 WALLS.
4. SEE 16/S6.01 FOR SPACING AT STAGGERED STUD WALLS.

MULTI-STUD POST TYPE SCHEDULE							
mark	(a)		(b)		(c)		(d)
	2x4	2x6	2x4	2x6	2x4	2x6	2x6
LEVEL 8	2	2	2	2	2	2	2
LEVEL 7	2	2	3	2	2	2	2
LEVEL 6	2	2	4	2	3	2	3
LEVEL 5	2	2	6	3	3	2	4
LEVEL 4	3	2	-	3	4	3	4
LEVEL 3	3	3	-	4	5	3	6

NOTE:
1. SEE PLAN NOTES WHERE # OF STUDS NOT GIVEN.
2. 2x8 & LARGER POSTS SHALL MATCH NUMBER OF STUDS AS REQUIRED FOR 2x6 POSTS.

BEAM SCHEDULE	
mark	description
B-1	LSL 3 1/2x11 7/8
B-2	PSL 7x11 7/8
B-3	GL 5 1/2x6

WOOD JOIST SCHEDULE		
mark	description	hanger type, U.O.N. in details
J-1	11 7/8" I-110 @ 16"oc	ITS (BA AT SKEWED CONDITIONS)
J-2	(2) 11 7/8" I-230 @ 16"oc	ITS
J-3	11 7/8" I-110 @ 19.2"oc	ITS

NOTE:
ALL JOIST TYPES MAY NOT OCCUR THIS PLAN.

STRAP SCHEDULE		
mark	description	comments
(A)	CS16 x 6'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(B)	CMSTC16 x 8'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(C)	CMST12 x 13'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07

NOTES:
1. ALL SCHEDULED STRAP TYPES MAY NOT OCCUR THIS PLAN.
2. WHERE DIMENSIONS SHOWN ON PLAN, LAP STRAP WITH SHEAR WALL BY 1/2 OF LENGTH SHOWN IN SHEDULE

WOOD PLAN LEGEND:

- POST THIS LEVEL (SEE PLAN NOTE 2)
- POST BELOW
- STRUCTURAL WALL BELOW THIS LEVEL
- STRUCTURAL WALL THIS LEVEL (SEE PLAN NOTE 1)
- (x) STUD WALL PER SCHEDULE THIS SHEET
- (x) NUMBER OF STUDS IN MULTI-STUD POST THIS LEVEL - NAIL TOGETHER PER GENERAL STRUCTURAL NOTES
- SPAN DIRECTION OF FLOOR JOISTS PER SCHEDULE THIS SHEET
- OVERFRAMING PER PLAN NOTE _
- DJ DOUBLE JOIST
- (D) DROPPED BEAM - JOISTS BEAR ON BEAM BELOW
- EXTENT OF NON-TYPICAL FRAMING MEMBERS

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

- SW-x SHEAR WALL THIS LEVEL PER SCHEDULE OF THIS SHEET (SEE PLAN NOTE 10)
- HDx HOLDOWN RUN TYPE 'x' THIS LEVEL PER SCHEDULE OF 30/S6.06 (SEE PLAN NOTE 9)
- STRUT FRAMING MEMBER NAILED AS STRUT PER PLAN NOTES
- BLOCKED DIAPHRAGM PER PLAN NOTE 5
- 3x FLAT BLOCKING BETWEEN JOISTS
- DJS DOUBLE JOIST STRUT - NAIL AS STRUT PER PLAN NOTES

WOOD PLAN NOTES:

1. EXTERIOR STUD WALLS SHALL BE 2x6 STUDS AT 16 "oc, U.O.N. STUDS AND FRAMING IN EXTERIOR WALLS SHALL BE FIRE-TREATED, SEE DETAILS. CORRIDOR STUDS WALLS SHALL BE 2x4 @12 "oc STAGGERED ON A 2x6 PLATE PER 16/S6.01 , U.O.N. DEMISING WALLS SHALL BE PER "TYPICAL DEMISING WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N. INTERIOR UNIT BEARING WALLS SHALL BE PER "TYPICAL INTERIOR WALL " IN THE STUD WALL TYPE SCHEDULE, U.O.N.

   ALL OTHER STUD WALLS SHALL BE 2x STUDS @ 16"oc, U.O.N.

   AT LEVEL 3, ALL SRUCTURAL WALLS SHALL BE 2-HOUR RATED. AT OTHER FLOORS, SEE ARCHITECTURAL FOR WALL TYPES. SEE 30/S6.05 FOR SPECIAL STUD REQUIREMENTS AT HEAVILY NAILED SHEAR WALL PANEL EDGES. SEE 12/S6.01 , 3/S6.01 , AND 4/S6.01 FOR HOLES AND NOTCHES IN STUDS AND PLATES. SEE 15/S6.01 FOR EXAMPLE OF INTERIOR STUD WALL TYPE EXTENTS.

2. POSTS OR JAMB STUDS SUPPORTING BEAMS, OR POSTS ABOVE SHALL BE TYPE "a" PER THE MULIT-STUD POST SCHEDULE, U.O.N. NAIL STUDS TOGETHER PER GENERAL STRUCTURAL NOTES.

3. FLOOR AND ROOF SHEATHING SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   FLOOR SHEATHING SHALL CONSIST OF 3/4 " T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24). SEE ARCHITECTURAL FOR GYPCRETE TOPPING REQUIREMENTS (1 1/4" MAXIMUM THICKNESS).

   ROOF SHEATHING AT (NON-ROOF DECK AND NON-LANDSCAPED AREAS) SHALL CONSIST OF 5/8" SHEATHING, U.O.N. (PANEL SPAN RATING 32/16).

   ROOF SHEATHING AT ROOF DECK AND LANDSCAPED ROOF AREAS SHALL CONSIST OF 3/4" T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24).

   NAIL SHEATHING AT ALL FRAMED PANEL EDGES, DIAPHRAGM BOUNDARIES AND BLOCKING W/ 10d @ 6"oc. NAIL SHEATHING TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ TWO ROWS OF 10d @ 6 "oc (STAGGER ROWS). NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. GLUE SHEATHING AT ALL SUPPORTS PER GENERAL STRUCTURAL NOTES.

4. SEE DETAIL 12/S6.07 FOR TYPICAL SHEATHING LAYOUT AND NAILING.

5. AT AREAS INDICATED AS BLOCKED DIAPHRAGM, INSTALL 2x FLAT BLOCKING AT ALL UNFRAMED PANEL EDGES. NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. NAILS SHALL BE LOCATED AT LEAST 3/8" FROM EDGES OF PANEL.

   NAIL SHEATHING AT ALL PANEL EDGES AND DIAPHRAGM BOUNDARIES W/ 10d @ 6"oc. NAIL SHEATHING IN PANEL FIELD TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ (2) ROWS OF 10d @ 4 1/2"oc (STAGGER ROWS).

6. FLOOR JOISTS SHALL BE TYPE J-1 PER SCHEDULE THIS SHEET, U.O.N.

   ROOF JOISTS SHALL BE TYPE J-3 PER SCHEDULE THIS SHEET, U.O.N.

7. BEAMS SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   INTERIOR BEAMS OVER DOORS SHALL BE (2) 2x8 AND DROPPED BELOW STUD WALL TOP PLATE PER 18/S6.01 (4'–0" MAX. SPAN). BEAMS ACROSS CORRIDORS SHALL BE B-3 PER 30/S6.01 , U.O.N. ALL OTHER BEAMS SHALL BE B-1 AND FLUSH FRAMED PER DETAILS, U.O.N.

   EXTERIOR BEAMS, AT FLOOR LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.03 AND 24/S6.03 , U.O.N. EXTERIOR BEAMS, AT ROOF LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.04 AND 24/S6.04 .

   BEAMS SHALL BE CONTINUOUS OVER WALL OPENINGS, U.O.N.

8. INSTALL HU (MAX.) HANGERS AT ALL FLUSH WOOD BEAM-TO-WOOD BEAM CONNECTIONS AND ALL FLUSH SKEWED FRAMING CONNECTIONS, U.O.N. INSTALL HUC HANGERS AT ALL FLUSH WOOD BEAM-TO-CONTINUOUS POST CONNECTIONS, U.O.N. HU AND HUC HANGERS SHALL BE SIZED TO MATCH NOMINAL DEPTH OF SUPPORTED MEMBERS, U.O.N.

9. SELF-TIGHTENING HOLDOWN SYSTEM SHALL BE DESIGNED TO RESIST NET UPLIFT AND COMPRESSION FORCES PER THE SCHEDULE OF 30/S6.06 . SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS.

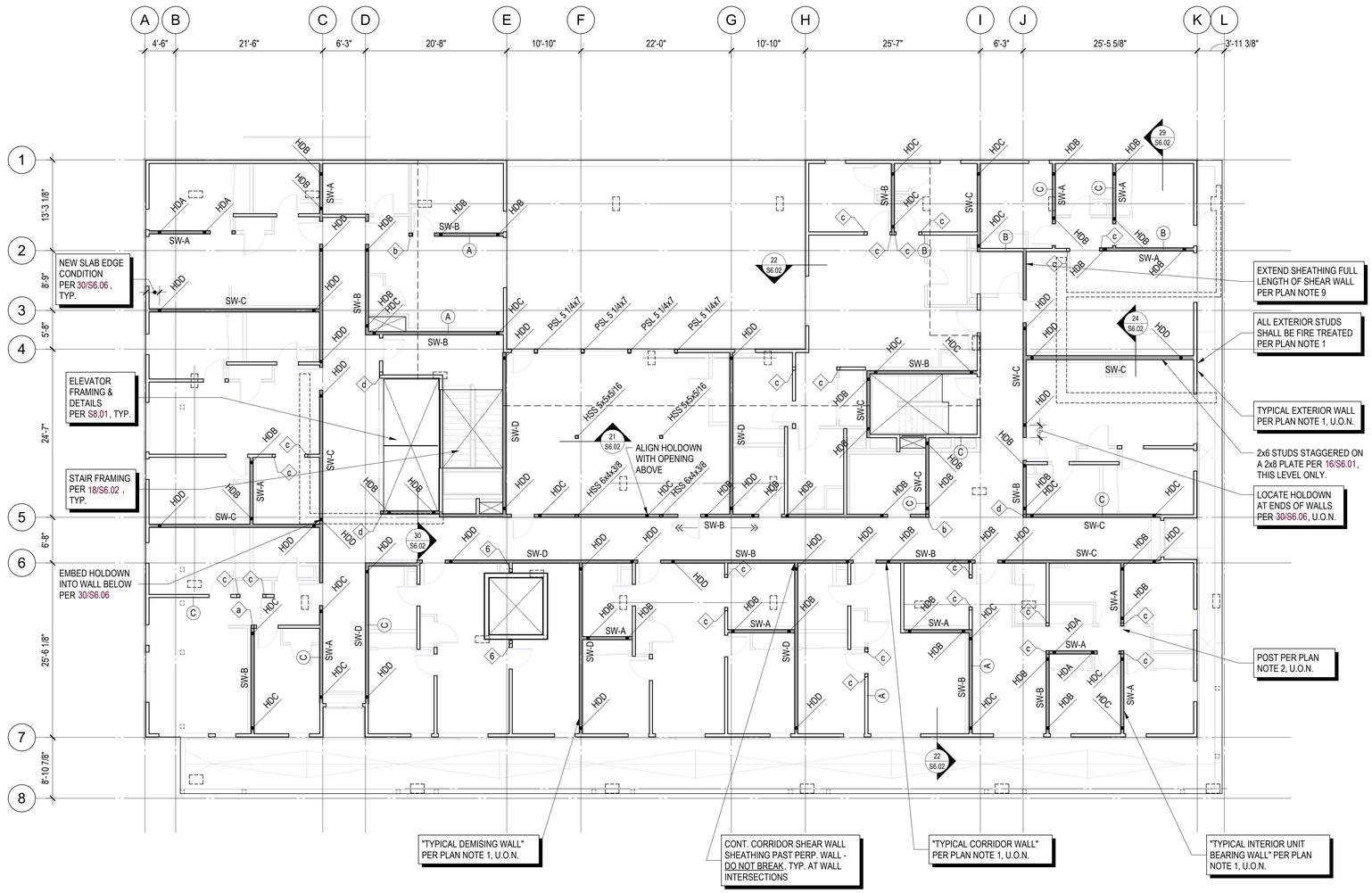
10. AT SHEATHED WALLS, CONTRACTOR SHALL EXTEND SHEATHING TO ACHIEVE FULL COVERAGE OF ENTIRE WALL TO AVOID CONFLICTS BETWEEN VARYING STRUCTURAL SHEATHING AND GWB THICKNESSES.

11. RIM BOARD AT 2-HR RATED SHAFT WALLS SHALL BE PER 22/S6.01, U.O.N. SEE ARCHITECTURAL FOR LOCATIONS.

12. THE CONTRACTOR SHALL CONTROL EXPANSION OF THE FLOOR DIAPHRAGM DUE TO MOISTURE ABSORPTION BY INSTALLING TEMPORARY EXPANSION JOINTS IN ACCORDANCE WITH APA TECHNICAL FORM U425 OR BY OTHER ACCEPTABLE MEANS. COORDINATE LOCATION OF TEMPORARY JOINTS WITH THE ARCHITECT AND STRUCTURAL ENGINEER.

13. GENERAL CONTRACTOR SHALL COORDINATE PLUMBING, PIPING, DUCTING AND OTHER MECHANICAL SYSTEM SUPPORT CONFIGURATIONS, LOADS AND CONNECTION DETAILS WITH MECHANICAL CONTRACTOR, TRUSS MANUFACTURER AND JOIST MANUFACTURER PRIOR TO FABRICATION.

14. ALL STAIRS AND LANDINGS NOT SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS ARE DESIGN BUILD COMPONENTS. ALL DESIGN BUILD STEEL COMPONENTS SHALL BE DESIGNED, DETAILED, AND SUPPLIED BY THE STEEL FABRICATOR - SEE GENERAL STRUCTURAL NOTE 12. SUPPLY AND INSTALL COMPLETE STAIR SYSTEMS INCLUDING TREADS, RISERS, AND INTERMEDIATE LANDINGS. ANY NON-STEEL COMPONENTS INCLUDING FOOTINGS SHALL BE DESIGNED PER GENERAL STRUCTURAL NOTE 12 AND SHALL BE SUPPLIED AND INSTALLED BY SUPPLIERS AND SUBCONTRACTORS AS DIRECTED BY THE GENERAL CONTRACTOR.



1 LEVEL 03 FLOOR WOOD FRAMING PLAN
1/8" = 1'-0"

N

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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PROJECT NO.
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SHEAR WALL TYPE SCHEDULE				
mark	SW-A	SW-B	SW-C	SW-D
LEVEL 8	W6	W6	W4	W4
LEVEL 7	W6	W3	W2	2W3
LEVEL 6	W4	W2	2W3	2W2
LEVEL 5	W2	2W3	2W2	2W2
LEVEL 4	2W4	2W2	2W2	2W2
LEVEL 3	2W4	2W2	2W2	2W2

NOTES:
1. SHEAR WALL TYPES PER SCHEDULE OF 30/S6.05 .
2. TWO-SIDED SHEAR WALLS (INDICATED BY 2Wx) SHALL RECEIVE BOTH LAYERS ON SAME STUD WALL, (1) LAYER ON EA. SIDE.

STUD WALL TYPE SCHEDULE										
mark	Typical Demising Wall - Staggered Studs (4)		Typical Interior Unit Bearing Wall		(A)		(B)		(C)	
	2x4 studs	2x6 studs	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls
LEVEL 8	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 7	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 6	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 5	2x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 4	3x4 @ 12"oc	2x6 @ 12"oc	3x4 @ 12"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc
LEVEL 3	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc

NOTE:
1. SEE PLAN NOTES FOR UNSCHEDUED WALLS.
2. A DOUBLE 2x STUD MAY BE SUBSTITUTED FOR EACH 3x STUD. (NAIL TOGETHER PER GENERAL STRUCTURAL NOTES)
3. 2x8 & LARGER STUDS WIDTHS SHALL MATCH THICKNESS AND SPACING AS REQUIRED FOR 2x6 WALLS.
4. SEE 16/S6.01 FOR SPACING AT STAGGERED STUD WALLS.

MULTI-STUD POST TYPE SCHEDULE							
mark	(a)		(b)		(c)		(d)
	2x4	2x6	2x4	2x6	2x4	2x6	2x6
LEVEL 8	2	2	2	2	2	2	2
LEVEL 7	2	2	3	2	2	2	2
LEVEL 6	2	2	4	2	3	2	3
LEVEL 5	2	2	6	3	3	2	4
LEVEL 4	3	2	-	3	4	3	4
LEVEL 3	3	3	-	4	5	3	6

NOTE:
1. SEE PLAN NOTES WHERE # OF STUDS NOT GIVEN.
2. 2x8 & LARGER POSTS SHALL MATCH NUMBER OF STUDS AS REQUIRED FOR 2x6 POSTS.

BEAM SCHEDULE	
mark	description
B-1	LSL 3 1/2x11 7/8
B-2	PSL 7x11 7/8
B-3	GL 5 1/2x6

WOOD JOIST SCHEDULE		
mark	description	hanger type, U.O.N. in details
J-1	11 7/8" I-110 @ 16"oc	ITS (BA AT SKEWED CONDITIONS)
J-2	(2) 11 7/8" I-230 @ 16"oc	ITS
J-3	11 7/8" I-110 @ 19.2"oc	ITS

NOTE:
ALL JOIST TYPES MAY NOT OCCUR THIS PLAN.

STRAP SCHEDULE		
mark	description	comments
(A)	CS16 x 6'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(B)	CMSTC16 x 8'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(C)	CMST12 x 13'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07

NOTES:
1. ALL SCHEDULED STRAP TYPES MAY NOT OCCUR THIS PLAN.
2. WHERE DIMENSIONS SHOWN ON PLAN, LAP STRAP WITH SHEAR WALL BY 1/2 OF LENGTH SHOWN IN SHEDULE

WOOD PLAN LEGEND:

- POST THIS LEVEL (SEE PLAN NOTE 2)
- POST BELOW
- STRUCTURAL WALL BELOW THIS LEVEL
- STRUCTURAL WALL THIS LEVEL (SEE PLAN NOTE 1)
- (x) STUD WALL PER SCHEDULE THIS SHEET
- (x) NUMBER OF STUDS IN MULTI-STUD POST THIS LEVEL - NAIL TOGETHER PER GENERAL STRUCTURAL NOTES
- SPAN DIRECTION OF FLOOR JOISTS PER SCHEDULE THIS SHEET
- OVERFRAMING PER PLAN NOTE _
- DJ DOUBLE JOIST
- (D) DROPPED BEAM - JOISTS BEAR ON BEAM BELOW
- EXTENT OF NON-TYPICAL FRAMING MEMBERS

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

- SW-x SHEAR WALL THIS LEVEL PER SCHEDULE OF THIS SHEET (SEE PLAN NOTE 10)
- HDx HOLDOWN RUN TYPE 'x' THIS LEVEL PER SCHEDULE OF 30/S6.06 (SEE PLAN NOTE 9)
- STRUT FRAMING MEMBER NAILED AS STRUT PER PLAN NOTES
- BLOCKED DIAPHRAGM PER PLAN NOTE 5
- 3x FLAT BLOCKING BETWEEN JOISTS
- DJS DOUBLE JOIST STRUT - NAIL AS STRUT PER PLAN NOTES

WOOD PLAN NOTES:

1. EXTERIOR STUD WALLS SHALL BE 2x6 STUDS AT 16 "oc, U.O.N. STUDS AND FRAMING IN EXTERIOR WALLS SHALL BE FIRE-TREATED, SEE DETAILS. CORRIDOR STUDS WALLS SHALL BE 2x4 @12 "oc STAGGERED ON A 2x6 PLATE PER 16/S6.01 , U.O.N. DEMISING WALLS SHALL BE PER "TYPICAL DEMISING WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N. INTERIOR UNIT BEARING WALLS SHALL BE PER "TYPICAL INTERIOR WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N.

   ALL OTHER STUD WALLS SHALL BE 2x STUDS @ 16"oc, U.O.N.

   AT LEVEL 3, ALL SRUCTURAL WALLS SHALL BE 2-HOUR RATED. AT OTHER FLOORS, SEE ARCHITECTURAL FOR WALL TYPES. SEE 30/S6.05 FOR SPECIAL STUD REQUIREMENTS AT HEAVILY NAILED SHEAR WALL PANEL EDGES. SEE 12/S6.01 , 3/S6.01 , AND 4/S6.01 FOR HOLES AND NOTCHES IN STUDS AND PLATES. SEE 15/S6.01 FOR EXAMPLE OF INTERIOR STUD WALL TYPE EXTENTS.

2. POSTS OR JAMB STUDS SUPPORTING BEAMS, OR POSTS ABOVE SHALL BE TYPE "a" PER THE MULIT-STUD POST SCHEDULE, U.O.N. NAIL STUDS TOGETHER PER GENERAL STRUCTURAL NOTES.

3. FLOOR AND ROOF SHEATHING SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   FLOOR SHEATHING SHALL CONSIST OF 3/4 " T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24). SEE ARCHITECTURAL FOR GYPCRETE TOPPING REQUIREMENTS (1 1/4" MAXIMUM THICKNESS).

   ROOF SHEATHING AT (NON-ROOF DECK AND NON-LANDSCAPED AREAS) SHALL CONSIST OF 5/8" SHEATHING, U.O.N. (PANEL SPAN RATING 32/16).

   ROOF SHEATHING AT ROOF DECK AND LANDSCAPED ROOF AREAS SHALL CONSIST OF 3/4" T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24).

   NAIL SHEATHING AT ALL FRAMED PANEL EDGES, DIAPHRAGM BOUNDARIES AND BLOCKING W/ 10d @ 6"oc. NAIL SHEATHING TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ TWO ROWS OF 10d @ 6 "oc (STAGGER ROWS). NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. GLUE SHEATHING AT ALL SUPPORTS PER GENERAL STRUCTURAL NOTES.

4. SEE DETAIL 12/S6.07 FOR TYPICAL SHEATHING LAYOUT AND NAILING.

5. AT AREAS INDICATED AS BLOCKED DIAPHRAGM, INSTALL 2x FLAT BLOCKING AT ALL UNFRAMED PANEL EDGES. NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. NAILS SHALL BE LOCATED AT LEAST 3/8" FROM EDGES OF PANEL.

   NAIL SHEATHING AT ALL PANEL EDGES AND DIAPHRAGM BOUNDARIES W/ 10d @ 6"oc. NAIL SHEATHING IN PANEL FIELD TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ (2) ROWS OF 10d @ 4 1/2"oc (STAGGER ROWS).

6. FLOOR JOISTS SHALL BE TYPE J-1 PER SCHEDULE THIS SHEET, U.O.N.

   ROOF JOISTS SHALL BE TYPE J-3 PER SCHEDULE THIS SHEET, U.O.N.

7. BEAMS SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   INTERIOR BEAMS OVER DOORS SHALL BE (2) 2x8 AND DROPPED BELOW STUD WALL TOP PLATE PER 18/S6.01 (4'–0" MAX. SPAN). BEAMS ACROSS CORRIDORS SHALL BE B-3 PER 30/S6.01 , U.O.N. ALL OTHER BEAMS SHALL BE B-1 AND FLUSH FRAMED PER DETAILS, U.O.N.

   EXTERIOR BEAMS, AT FLOOR LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.03 AND 24/S6.03 , U.O.N. EXTERIOR BEAMS, AT ROOF LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.04 AND 24/S6.04 .

   BEAMS SHALL BE CONTINUOUS OVER WALL OPENINGS, U.O.N.

8. INSTALL HU (MAX.) HANGERS AT ALL FLUSH WOOD BEAM-TO-WOOD BEAM CONNECTIONS AND ALL FLUSH SKEWED FRAMING CONNECTIONS, U.O.N. INSTALL HUC HANGERS AT ALL FLUSH WOOD BEAM-TO-CONTINUOUS POST CONNECTIONS, U.O.N. HU AND HUC HANGERS SHALL BE SIZED TO MATCH NOMINAL DEPTH OF SUPPORTED MEMBERS, U.O.N.

9. SELF-TIGHTENING HOLDOWN SYSTEM SHALL BE DESIGNED TO RESIST NET UPLIFT AND COMPRESSION FORCES PER THE SCHEDULE OF 30/S6.06 . SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS.

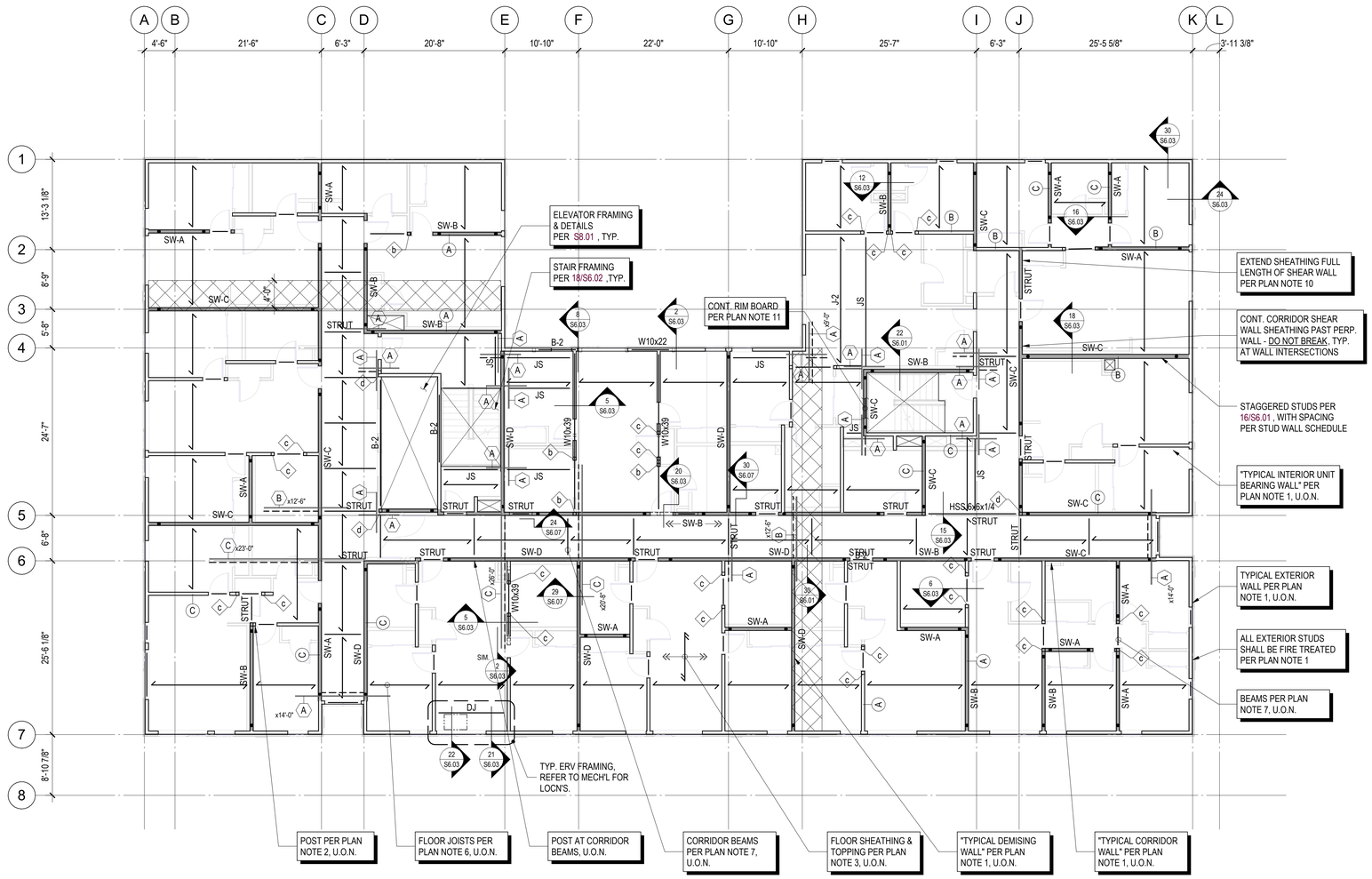
10. AT SHEATHED WALLS, CONTRACTOR SHALL EXTEND SHEATHING TO ACHIEVE FULL COVERAGE OF ENTIRE WALL TO AVOID CONFLICTS BETWEEN VARYING STRUCTURAL SHEATHING AND GWB THICKNESSES.

11. RIM BOARD AT 2-HR RATED SHAFT WALLS SHALL BE PER 22/S6.01, U.O.N. SEE ARCHITECTURAL FOR LOCATIONS.

12. THE CONTRACTOR SHALL CONTROL EXPANSION OF THE FLOOR DIAPHRAGM DUE TO MOISTURE ABSORPTION BY INSTALLING TEMPORARY EXPANSION JOINTS IN ACCORDANCE WITH APA TECHNICAL FORM U425 OR BY OTHER ACCEPTABLE MEANS. COORDINATE LOCATION OF TEMPORARY JOINTS WITH THE ARCHITECT AND STRUCTURAL ENGINEER.

13. GENERAL CONTRACTOR SHALL COORDINATE PLUMBING, PIPING, DUCTING AND OTHER MECHANICAL SYSTEM SUPPORT CONFIGURATIONS, LOADS AND CONNECTION DETAILS WITH MECHANICAL CONTRACTOR, TRUSS MANUFACTURER AND JOIST MANUFACTURER PRIOR TO FABRICATION.

14. ALL STAIRS AND LANDINGS NOT SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS ARE DESIGN BUILD COMPONENTS. ALL DESIGN BUILD STEEL COMPONENTS SHALL BE DESIGNED, DETAILED, AND SUPPLIED BY THE STEEL FABRICATOR - SEE GENERAL STRUCTURAL NOTE 12. SUPPLY AND INSTALL COMPLETE STAIR SYSTEMS INCLUDING TREADS, RISERS, AND INTERMEDIATE LANDINGS. ANY NON-STEEL COMPONENTS INCLUDING FOOTINGS SHALL BE DESIGNED PER GENERAL STRUCTURAL NOTE 12 AND SHALL BE SUPPLIED AND INSTALLED BY SUPPLIERS AND SUBCONTRACTORS AS DIRECTED BY THE GENERAL CONTRACTOR.



1 LEVEL 04 FLOOR FRAMING PLAN
1/8" = 1'-0"

N

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson Seattle, Washington 98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
LEVEL 04 FLOOR FRAMING PLAN

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S2.04

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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SHEAR WALL TYPE SCHEDULE				
mark	SW-A	SW-B	SW-C	SW-D
LEVEL 8	W6	W6	W4	W4
LEVEL 7	W6	W3	W2	2W3
LEVEL 6	W4	W2	2W3	2W2
LEVEL 5	W2	2W3	2W2	2W2
LEVEL 4	2W4	2W2	2W2	2W2
LEVEL 3	2W4	2W2	2W2	2W2

NOTES:
1. SHEAR WALL TYPES PER SCHEDULE OF 30/S6.05 .
2. TWO-SIDED SHEAR WALLS (INDICATED BY 2Wx) SHALL RECEIVE BOTH LAYERS ON SAME STUD WALL, (1) LAYER ON EA. SIDE.

STUD WALL TYPE SCHEDULE										
mark	Typical Demising Wall - Staggered Studs (4)		Typical Interior Unit Bearing Wall		(A)		(B)		(C)	
	2x4 studs	2x6 studs	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls
LEVEL 8	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 7	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 6	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 5	2x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 4	3x4 @ 12"oc	2x6 @ 12"oc	3x4 @ 12"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc
LEVEL 3	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc

NOTE:
1. SEE PLAN NOTES FOR UNSCHEDUED WALLS.
2. A DOUBLE 2x STUD MAY BE SUBSTITUTED FOR EACH 3x STUD. (NAIL TOGETHER PER GENERAL STRUCTURAL NOTES)
3. 2x8 & LARGER STUDS WIDTHS SHALL MATCH THICKNESS AND SPACING AS REQUIRED FOR 2x6 WALLS.
4. SEE 16/S6.01 FOR SPACING AT STAGGERED STUD WALLS.

MULTI-STUD POST TYPE SCHEDULE							
mark	a		b		c		d
	2x4	2x6	2x4	2x6	2x4	2x6	2x6
LEVEL 8	2	2	2	2	2	2	2
LEVEL 7	2	2	3	2	2	2	2
LEVEL 6	2	2	4	2	3	2	3
LEVEL 5	2	2	6	3	3	2	4
LEVEL 4	3	2	-	3	4	3	4
LEVEL 3	3	3	-	4	5	3	6

NOTE:
1. SEE PLAN NOTES WHERE # OF STUDS NOT GIVEN.
2. 2x8 & LARGER POSTS SHALL MATCH NUMBER OF STUDS AS REQUIRED FOR 2x6 POSTS.

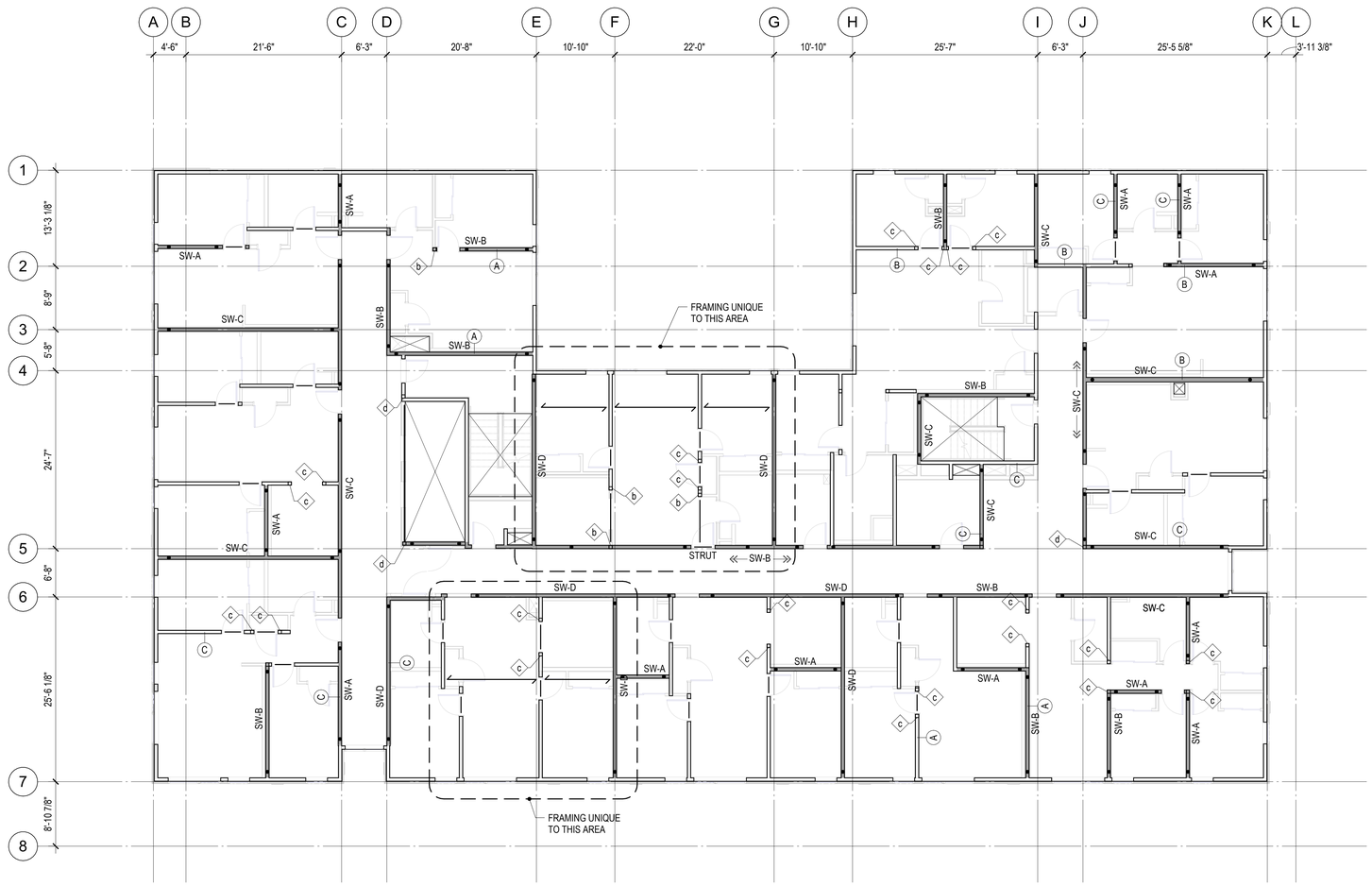
BEAM SCHEDULE	
mark	description
B-1	LSL 3 1/2x11 7/8
B-2	PSL 7x11 7/8
B-3	GL 5 1/2x6

WOOD JOIST SCHEDULE		
mark	description	hanger type, U.O.N. in details
J-1	11 7/8" I-110 @ 16"oc	ITS (BA AT SKEWED CONDITIONS)
J-2	(2) 11 7/8" I-230 @ 16"oc	ITS
J-3	11 7/8" I-110 @ 19.2"oc	ITS

NOTE:
ALL JOIST TYPES MAY NOT OCCUR THIS PLAN.

STRAP SCHEDULE		
mark	description	comments
A	CS16 x 6'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
B	CMSTC16 x 8'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
C	CMST12 x 13'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07

NOTES:
1. ALL SCHEDULED STRAP TYPES MAY NOT OCCUR THIS PLAN.
2. WHERE DIMENSIONS SHOWN ON PLAN, LAP STRAP WITH SHEAR WALL BY 1/2 OF LENGTH SHOWN IN SHEDULE



SEE S2.04 FOR TYPICAL FLOOR AND WALL FRAMING, DETAILS, CALLOUTS, STRAPS, STRUTS, AND OTHER INFORMATION NOT SHWON, U.O.N.

1 LEVEL 05-08 FLOOR PLAN
1/8" = 1'-0"

N

WOOD PLAN LEGEND:

- POST THIS LEVEL (SEE PLAN NOTE 2)
- POST BELOW
- STRUCTURAL WALL BELOW THIS LEVEL
- STRUCTURAL WALL THIS LEVEL (SEE PLAN NOTE 1)
- (x) STUD WALL PER SCHEDULE THIS SHEET
- x NUMBER OF STUDS IN MULTI-STUD POST THIS LEVEL - NAIL TOGETHER PER GENERAL STRUCTURAL NOTES
- SPAN DIRECTION OF FLOOR JOISTS PER SCHEDULE THIS SHEET
- OVERFRAMING PER PLAN NOTE _
- DJ DOUBLE JOIST
- (D) DROPPED BEAM - JOISTS BEAR ON BEAM BELOW
- EXTENT OF NON-TYPICAL FRAMING MEMBERS

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

- SW-x SHEAR WALL THIS LEVEL PER SCHEDULE OF THIS SHEET (SEE PLAN NOTE 10)
- HDx HOLDOWN RUN TYPE 'x' THIS LEVEL PER SCHEDULE OF 30/S6.06 (SEE PLAN NOTE 9)
- STRUT FRAMING MEMBER NAILED AS STRUT PER PLAN NOTES
- BLOCKED DIAPHRAGM PER PLAN NOTE 5
- 3x FLAT BLOCKING BETWEEN JOISTS
- DJS DOUBLE JOIST STRUT - NAIL AS STRUT PER PLAN NOTES

WOOD PLAN NOTES:

1. EXTERIOR STUD WALLS SHALL BE 2x6 STUDS AT 16 "oc, U.O.N. STUDS AND FRAMING IN EXTERIOR WALLS SHALL BE FIRE-TREATED, SEE DETAILS. CORRIDOR STUDS WALLS SHALL BE 2x4 @12 "oc STAGGERED ON A 2x6 PLATE PER 16/S6.01 , U.O.N. DEMISING WALLS SHALL BE PER "TYPICAL DEMISING WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N. INTERIOR UNIT BEARING WALLS SHALL BE PER "TYPICAL INTERIOR WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N.

   ALL OTHER STUD WALLS SHALL BE 2x STUDS @ 16"oc, U.O.N.

   AT LEVEL 3, ALL SRUCTURAL WALLS SHALL BE 2-HOUR RATED. AT OTHER FLOORS, SEE ARCHITECTURAL FOR WALL TYPES. SEE 30/S6.05 FOR SPECIAL STUD REQUIREMENTS AT HEAVILY NAILED SHEAR WALL PANEL EDGES. SEE 12/S6.01 , 3/S6.01 , AND 4/S6.01 FOR HOLES AND NOTCHES IN STUDS AND PLATES. SEE 15/S6.01 FOR EXAMPLE OF INTERIOR STUD WALL TYPE EXTENTS.

2. POSTS OR JAMB STUDS SUPPORTING BEAMS, OR POSTS ABOVE SHALL BE TYPE "a" PER THE MULIT-STUD POST SCHEDULE, U.O.N. NAIL STUDS TOGETHER PER GENERAL STRUCTURAL NOTES.

3. FLOOR AND ROOF SHEATHING SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   FLOOR SHEATHING SHALL CONSIST OF 3/4 " T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24). SEE ARCHITECTURAL FOR GYPCRETE TOPPING REQUIREMENTS (1 1/4" MAXIMUM THICKNESS).

   ROOF SHEATHING AT (NON-ROOF DECK AND NON-LANDSCAPED AREAS) SHALL CONSIST OF 5/8" SHEATHING, U.O.N. (PANEL SPAN RATING 32/16).

   ROOF SHEATHING AT ROOF DECK AND LANDSCAPED ROOF AREAS SHALL CONSIST OF 3/4" T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24).

   NAIL SHEATHING AT ALL FRAMED PANEL EDGES, DIAPHRAGM BOUNDARIES AND BLOCKING W/ 10d @ 6"oc. NAIL SHEATHING TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ TWO ROWS OF 10d @ 6 "oc (STAGGER ROWS). NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. GLUE SHEATHING AT ALL SUPPORTS PER GENERAL STRUCTURAL NOTES.

4. SEE DETAIL 12/S6.07 FOR TYPICAL SHEATHIING LAYOUT AND NAILING.

5. AT AREAS INDICATED AS BLOCKED DIAPHRAGM, INSTALL 2x FLAT BLOCKING AT ALL UNFRAMED PANEL EDGES. NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. NAILS SHALL BE LOCATED AT LEAST 3/8" FROM EDGES OF PANEL.

   NAIL SHEATHING AT ALL PANEL EDGES AND DIAPHRAGM BOUNDARIES W/ 10d @ 6"oc. NAIL SHEATHING IN PANEL FIELD TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ (2) ROWS OF 10d @ 4 1/2"oc (STAGGER ROWS).

6. FLOOR JOISTS SHALL BE TYPE J-1 PER SCHEDULE THIS SHEET, U.O.N.

   ROOF JOISTS SHALL BE TYPE J-3 PER SCHEDULE THIS SHEET, U.O.N.

7. BEAMS SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   INTERIOR BEAMS OVER DOORS SHALL BE (2) 2x8 AND DROPPED BELOW STUD WALL TOP PLATE PER 18/S6.01 (4'–0" MAX. SPAN). BEAMS ACROSS CORRIDORS SHALL BE B-3 PER 30/S6.01 , U.O.N. ALL OTHER BEAMS SHALL BE B-1 AND FLUSH FRAMED PER DETAILS, U.O.N.

   EXTERIOR BEAMS, AT FLOOR LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.03 AND 24/S6.03 , U.O.N. EXTERIOR BEAMS, AT ROOF LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.04 AND 24/S6.04 .

   BEAMS SHALL BE CONTINUOUS OVER WALL OPENINGS, U.O.N.

8. INSTALL HU (MAX.) HANGERS AT ALL FLUSH WOOD BEAM-TO-WOOD BEAM CONNECTIONS AND ALL FLUSH SKEWED FRAMING CONNECTIONS, U.O.N. INSTALL HUC HANGERS AT ALL FLUSH WOOD BEAM-TO-CONTINUOUS POST CONNECTIONS, U.O.N. HU AND HUC HANGERS SHALL BE SIZED TO MATCH NOMINAL DEPTH OF SUPPORTED MEMBERS, U.O.N.

9. SELF-TIGHTENING HOLDOWN SYSTEM SHALL BE DESIGNED TO RESIST NET UPLIFT AND COMPRESSION FORCES PER THE SCHEDULE OF 30/S6.06 . SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS.

10. AT SHEATHED WALLS, CONTRACTOR SHALL EXTEND SHEATHING TO ACHIEVE FULL COVERAGE OF ENTIRE WALL TO AVOID CONFLICTS BETWEEN VARYING STRUCTURAL SHEATHING AND GWB THICKNESSES.

11. RIM BOARD AT 2-HR RATED SHAFT WALLS SHALL BE PER 22/S6.01, U.O.N. SEE ARCHITECTURAL FOR LOCATIONS.

12. THE CONTRACTOR SHALL CONTROL EXPANSION OF THE FLOOR DIAPHRAGM DUE TO MOISTURE ABSORPTION BY INSTALLING TEMPORARY EXPANSION JOINTS IN ACCORDANCE WITH APA TECHNICAL FORM U425 OR BY OTHER ACCEPTABLE MEANS. COORDINATE LOCATION OF TEMPORARY JOINTS WITH THE ARCHITECT AND STRUCTURAL ENGINEER.

13. GENERAL CONTRACTOR SHALL COORDINATE PLUMBING, PIPING, DUCTING AND OTHER MECHANICAL SYSTEM SUPPORT CONFIGURATIONS, LOADS AND CONNECTION DETAILS WITH MECHANICAL CONTRACTOR, TRUSS MANUFACTURER AND JOIST MANUFACTURER PRIOR TO FABRICATION.

14. ALL STAIRS AND LANDINGS NOT SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS ARE DESIGN BUILD COMPONENTS. ALL DESIGN BUILD STEEL COMPONENTS SHALL BE DESIGNED, DETAILED, AND SUPPLIED BY THE STEEL FABRICATOR - SEE GENERAL STRUCTURAL NOTE 12. SUPPLY AND INSTALL COMPLETE STAIR SYSTEMS INCLUDING TREADS, RISERS, AND INTERMEDIATE LANDINGS. ANY NON-STEEL COMPONENTS INCLUDING FOOTINGS SHALL BE DESIGNED PER GENERAL STRUCTURAL NOTE 12 AND SHALL BE SUPPLIED AND INSTALLED BY SUPPLIERS AND SUBCONTRACTORS AS DIRECTED BY THE GENERAL CONTRACTOR.

0 4' 8' 16' 24'
1/8" = 1' - 0"

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
LEVEL 05-08 FLOOR FRAMING PLAN

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S2.05

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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2/5/2025 11:26:08 AM

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SHEAR WALL TYPE SCHEDULE				
mark	SW-A	SW-B	SW-C	SW-D
LEVEL 8	W6	W6	W4	W4
LEVEL 7	W6	W3	W2	2W3
LEVEL 6	W4	W2	2W3	2W2
LEVEL 5	W2	2W3	2W2	2W2
LEVEL 4	2W4	2W2	2W2	2W2
LEVEL 3	2W4	2W2	2W2	2W2

NOTES:
1. SHEAR WALL TYPES PER SCHEDULE OF 30/S6.05 .
2. TWO-SIDED SHEAR WALLS (INDICATED BY 2Wx) SHALL RECEIVE BOTH LAYERS ON SAME STUD WALL, (1) LAYER ON EA. SIDE.

STUD WALL TYPE SCHEDULE										
mark	Typical Demising Wall - Staggered Studs (4)		Typical Interior Unit Bearing Wall		(A)		(B)		(C)	
	2x4 studs	2x6 studs	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls	2x4 walls	2x6 walls
LEVEL 8	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 7	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 16"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 6	2x4 @ 12"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 5	2x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc	2x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 12"oc	2x6 @ 16"oc	2x4 @ 16"oc	2x6 @ 16"oc
LEVEL 4	3x4 @ 12"oc	2x6 @ 12"oc	3x4 @ 12"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 12"oc	2x6 @ 16"oc
LEVEL 3	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 16"oc	3x4 @ 8"oc	2x6 @ 12"oc	3x4 @ 8"oc	2x6 @ 12"oc	2x4 @ 8"oc	2x6 @ 16"oc

NOTE:
1. SEE PLAN NOTES FOR UNSCHEDUED WALLS.
2. A DOUBLE 2x STUD MAY BE SUBSTITUTED FOR EACH 3x STUD. (NAIL TOGETHER PER GENERAL STRUCTURAL NOTES)
3. 2x8 & LARGER STUDS WIDTHS SHALL MATCH THICKNESS AND SPACING AS REQUIRED FOR 2x6 WALLS.
4. SEE 16/S6.01 FOR SPACING AT STAGGERED STUD WALLS.

MULTI-STUD POST TYPE SCHEDULE							
mark	(a)		(b)		(c)		(d)
	2x4	2x6	2x4	2x6	2x4	2x6	2x6
LEVEL 8	2	2	2	2	2	2	2
LEVEL 7	2	2	3	2	2	2	2
LEVEL 6	2	2	4	2	3	2	3
LEVEL 5	2	2	6	3	3	2	4
LEVEL 4	3	2	-	3	4	3	4
LEVEL 3	3	3	-	4	5	3	6

NOTE:
1. SEE PLAN NOTES WHERE # OF STUDS NOT GIVEN.
2. 2x8 & LARGER POSTS SHALL MATCH NUMBER OF STUDS AS REQUIRED FOR 2x6 POSTS.

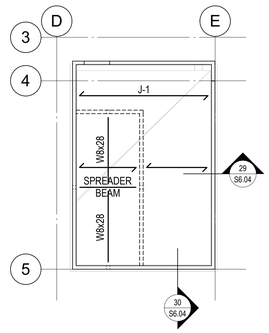
BEAM SCHEDULE	
mark	description
B-1	LSL 3 1/2x11 7/8
B-2	PSL 7x11 7/8
B-3	GL 5 1/2x6

WOOD JOIST SCHEDULE		
mark	description	hanger type, U.O.N. in details
J-1	11 7/8" I-110 @ 16"oc	ITS (BA AT SKEWED CONDITIONS)
J-2	(2) 11 7/8" I-230 @ 16"oc	ITS
J-3	11 7/8" I-110 @ 19.2"oc	ITS

NOTE:
ALL JOIST TYPES MAY NOT OCCUR THIS PLAN.

STRAP SCHEDULE		
mark	description	comments
(A)	CS16 x 6'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(B)	CMSTC16 x 8'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07
(C)	CMST12 x 13'-0"	NAIL HALF OF STRAP HOLES, SEE 18/S6.07

NOTES:
1. ALL SCHEDULED STRAP TYPES MAY NOT OCCUR THIS PLAN.
2. WHERE DIMENSIONS SHOWN ON PLAN, LAP STRAP WITH SHEAR WALL BY 1/2 OF LENGTH SHOWN IN SHEDULE



2 PENTHOUSE ROOF PLAN
1/8" = 1'-0"
N

WOOD PLAN LEGEND:

- POST THIS LEVEL (SEE PLAN NOTE 2)
- POST BELOW
- STRUCTURAL WALL BELOW THIS LEVEL
- STRUCTURAL WALL THIS LEVEL (SEE PLAN NOTE 1)
- (x) STUD WALL PER SCHEDULE THIS SHEET
- x NUMBER OF STUDS IN MULTI-STUD POST THIS LEVEL - NAIL TOGETHER PER GENERAL STRUCTURAL NOTES
- SPAN DIRECTION OF FLOOR JOISTS PER SCHEDULE THIS SHEET
- OVERFRAMING PER PLAN NOTE _
- DJ DOUBLE JOIST
- (D) DROPPED BEAM - JOISTS BEAR ON BEAM BELOW
- EXTENT OF NON-TYPICAL FRAMING MEMBERS

SEISMIC FORCE RESISTING SYSTEM LEGEND:

(SEE GENERAL STRUCTURAL NOTE 17)

- SW-x SHEAR WALL THIS LEVEL PER SCHEDULE OF THIS SHEET (SEE PLAN NOTE 10)
- HDx HOLDOWN RUN TYPE 'x' THIS LEVEL PER SCHEDULE OF 30/S6.06 (SEE PLAN NOTE 9)
- STRUT FRAMING MEMBER NAILED AS STRUT PER PLAN NOTES
- BLOCKED DIAPHRAGM PER PLAN NOTE 5
- 3x FLAT BLOCKING BETWEEN JOISTS
- DJS DOUBLE JOIST STRUT - NAIL AS STRUT PER PLAN NOTES

WOOD PLAN NOTES:

1. EXTERIOR STUD WALLS SHALL BE 2x6 STUDS AT 16 "oc, U.O.N. STUDS AND FRAMING IN EXTERIOR WALLS SHALL BE FIRE-TREATED, SEE DETAILS. CORRIDOR STUDS WALLS SHALL BE 2x4 @12 "oc STAGGERED ON A 2x6 PLATE PER 16/S6.01 , U.O.N. DEMISING WALLS SHALL BE PER "TYPICAL DEMISING WALL" IN THE STUD WALL TYPE SCHEDULE, U.O.N. INTERIOR UNIT BEARING WALLS SHALL BE PER "TYPICAL INTERIOR WALL " IN THE STUD WALL TYPE SCHEDULE, U.O.N.

   ALL OTHER STUD WALLS SHALL BE 2x STUDS @ 16"oc, U.O.N.

   AT LEVEL 3, ALL SRUCTURAL WALLS SHALL BE 2-HOUR RATED. AT OTHER FLOORS, SEE ARCHITECTURAL FOR WALL TYPES. SEE 30/S6.05 FOR SPECIAL STUD REQUIREMENTS AT HEAVILY NAILED SHEAR WALL PANEL EDGES. SEE 12/S6.01 , 3/S6.01 , AND 4/S6.01 FOR HOLES AND NOTCHES IN STUDS AND PLATES. SEE 15/S6.01 FOR EXAMPLE OF INTERIOR STUD WALL TYPE EXTENTS.

2. POSTS OR JAMB STUDS SUPPORTING BEAMS, OR POSTS ABOVE SHALL BE TYPE "a" PER THE MULIT-STUD POST SCHEDULE, U.O.N. NAIL STUDS TOGETHER PER GENERAL STRUCTURAL NOTES.

3. FLOOR AND ROOF SHEATHING SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   FLOOR SHEATHING SHALL CONSIST OF 3/4 " T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24). SEE ARCHITECTURAL FOR GYPCRETE TOPPING REQUIREMENTS (1 1/4" MAXIMUM THICKNESS).

   ROOF SHEATHING AT (NON-ROOF DECK AND NON-LANDSCAPED AREAS) SHALL CONSIST OF 5/8" SHEATHING, U.O.N. (PANEL SPAN RATING 32/16).

   ROOF SHEATHING AT ROOF DECK AND LANDSCAPED ROOF AREAS SHALL CONSIST OF 3/4" T&G SHEATHING, U.O.N. (PANEL SPAN RATING 48/24).

   NAIL SHEATHING AT ALL FRAMED PANEL EDGES, DIAPHRAGM BOUNDARIES AND BLOCKING W/ 10d @ 6"oc. NAIL SHEATHING TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ TWO ROWS OF 10d @ 6 "oc (STAGGER ROWS). NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. GLUE SHEATHING AT ALL SUPPORTS PER GENERAL STRUCTURAL NOTES.

4. SEE DETAIL 12/S6.07 FOR TYPICAL SHEATHING LAYOUT AND NAILING.

5. AT AREAS INDICATED AS BLOCKED DIAPHRAGM, INSTALL 2x FLAT BLOCKING AT ALL UNFRAMED PANEL EDGES. NAIL SHEATHING AT ALL INTERMEDIATE SUPPORTS W/ 10d @ 12"oc. NAILS SHALL BE LOCATED AT LEAST 3/8" FROM EDGES OF PANEL.

   NAIL SHEATHING AT ALL PANEL EDGES AND DIAPHRAGM BOUNDARIES W/ 10d @ 6"oc. NAIL SHEATHING IN PANEL FIELD TO ALL STRUTS, STRUT BLOCKING, AND INTERIOR SHEAR WALLS BELOW W/ (2) ROWS OF 10d @ 4 1/2"oc (STAGGER ROWS).

6. FLOOR JOISTS SHALL BE TYPE J-1 PER SCHEDULE THIS SHEET, U.O.N.

   ROOF JOISTS SHALL BE TYPE J-3 PER SCHEDULE THIS SHEET, U.O.N.

7. BEAMS SHALL CONSIST OF THE FOLLOWING, U.O.N.:

   INTERIOR BEAMS OVER DOORS SHALL BE (2) 2x8 AND DROPPED BELOW STUD WALL TOP PLATE PER 18/S6.01 (4'-0" MAX. SPAN). BEAMS ACROSS CORRIDORS SHALL BE B-3 PER 30/S6.01 , U.O.N. ALL OTHER BEAMS SHALL BE B-1 AND FLUSH FRAMED PER DETAILS, U.O.N.

   EXTERIOR BEAMS, AT FLOOR LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.03 AND 24/S6.03 , U.O.N. EXTERIOR BEAMS, AT ROOF LEVELS, SHALL CONSIST OF RIM BOARD PER DETAILS 30/S6.04 AND 24/S6.04 .

   BEAMS SHALL BE CONTINUOUS OVER WALL OPENINGS, U.O.N.

8. INSTALL HU (MAX.) HANGERS AT ALL FLUSH WOOD BEAM-TO-WOOD BEAM CONNECTIONS AND ALL FLUSH SKEWED FRAMING CONNECTIONS, U.O.N. INSTALL HUC HANGERS AT ALL FLUSH WOOD BEAM-TO-CONTINUOUS POST CONNECTIONS, U.O.N. HU AND HUC HANGERS SHALL BE SIZED TO MATCH NOMINAL DEPTH OF SUPPORTED MEMBERS, U.O.N.

9. SELF-TIGHTENING HOLDOWN SYSTEM SHALL BE DESIGNED TO RESIST NET UPLIFT AND COMPRESSION FORCES PER THE SCHEDULE OF 30/S6.06 . SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS.

10. AT SHEATHED WALLS, CONTRACTOR SHALL EXTEND SHEATHING TO ACHIEVE FULL COVERAGE OF ENTIRE WALL TO AVOID CONFLICTS BETWEEN VARYING STRUCTURAL SHEATHING AND GWB THICKNESSES.

11. RIM BOARD AT 2-HR RATED SHAFT WALLS SHALL BE PER 22/S6.01, U.O.N. SEE ARCHITECTURAL FOR LOCATIONS.

12. THE CONTRACTOR SHALL CONTROL EXPANSION OF THE FLOOR DIAPHRAGM DUE TO MOISTURE ABSORPTION BY INSTALLING TEMPORARY EXPANSION JOINTS IN ACCORDANCE WITH APA TECHNICAL FORM U425 OR BY OTHER ACCEPTABLE MEANS. COORDINATE LOCATION OF TEMPORARY JOINTS WITH THE ARCHITECT AND STRUCTURAL ENGINEER.

13. GENERAL CONTRACTOR SHALL COORDINATE PLUMBING, PIPING, DUCTING AND OTHER MECHANICAL SYSTEM SUPPORT CONFIGURATIONS, LOADS AND CONNECTION DETAILS WITH MECHANICAL CONTRACTOR, TRUSS MANUFACTURER AND JOIST MANUFACTURER PRIOR TO FABRICATION.

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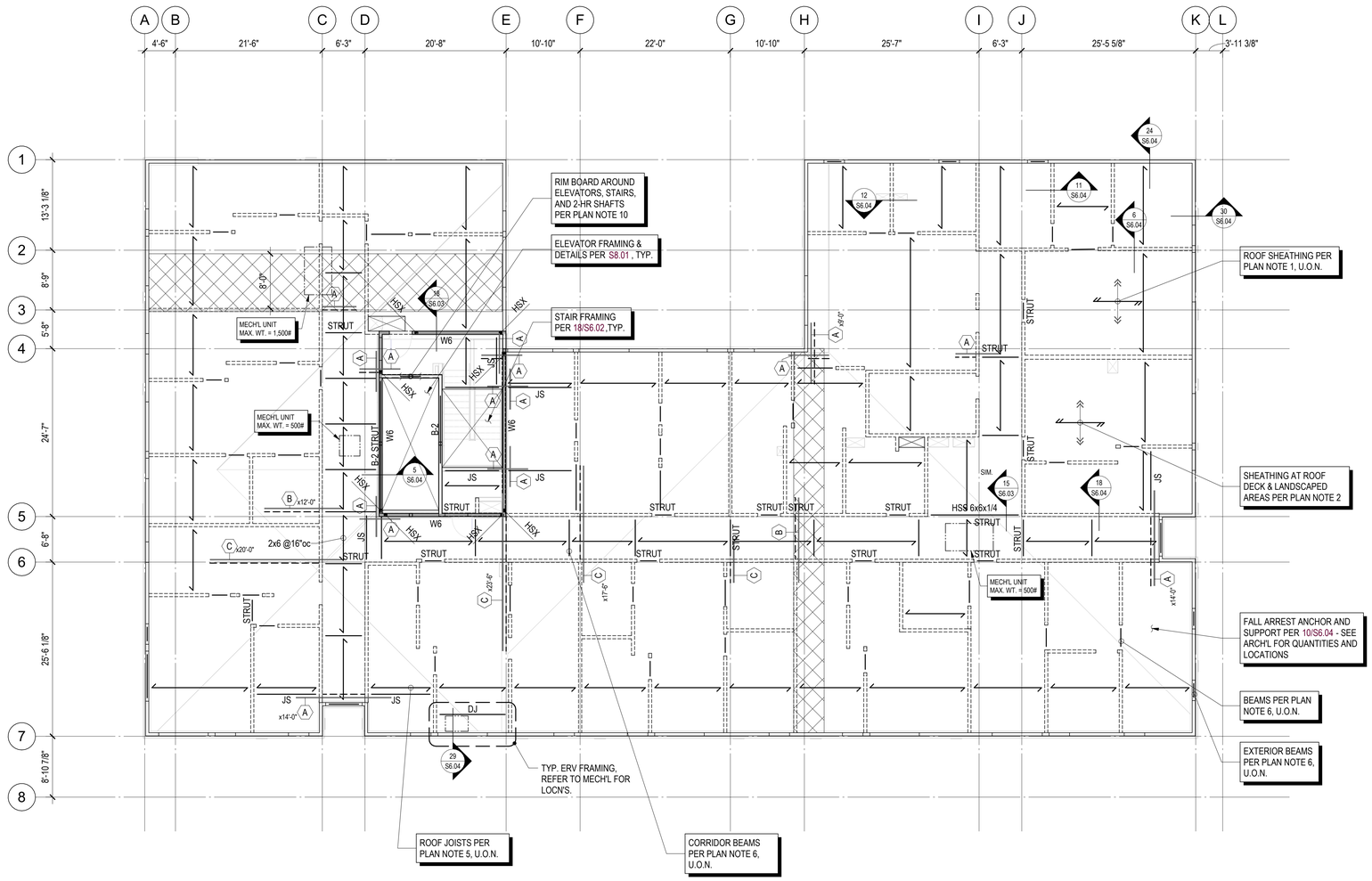

1 ROOF FRAMING PLAN
1/8" = 1'-0"
N

0 4' 8' 16' 24'
1/8" = 1' - 0"

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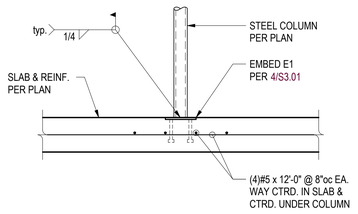
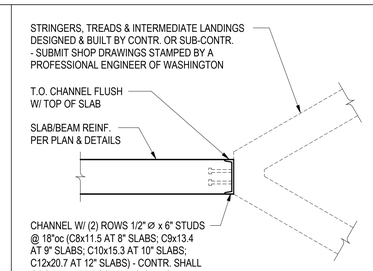
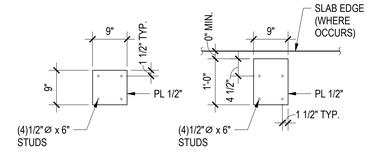


Reinforcing at TS Column 3009 2



Stair Landing Slab Embed 3005 3



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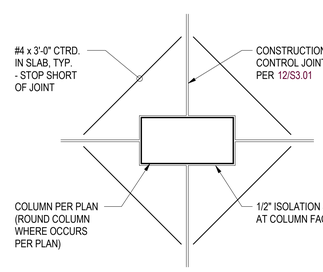

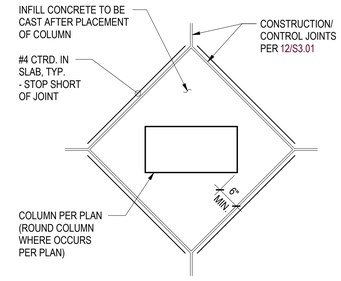

Isolation Joint at Concrete Column 3006 6

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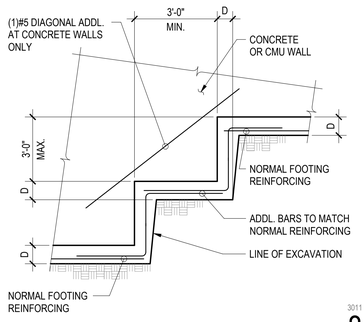
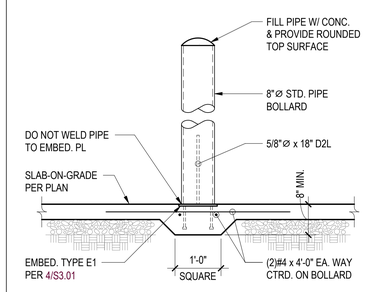
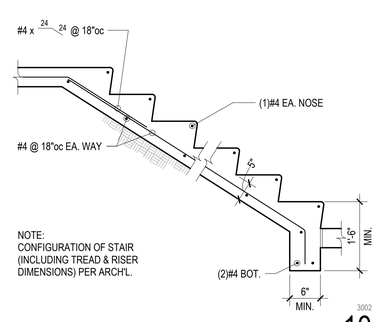


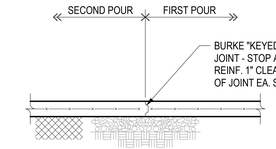
Stepped Footing 3011 8



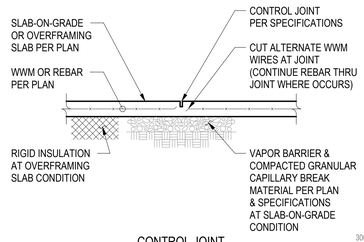
Bollard at Slab-on-Grade 3010 9



Stair-on-Grade 3002 10



CONSTRUCTION JOINT
(SEE CONTROL JOINT FOR CALLOUTS IN COMMON)



CONTROL JOINT

Slab Joint 3001 12

Pipe Sleeve 3007 14

STEPS OVER 3'-0" BUT NOT EXCEEDING 5'-0"

STEPS OVER 1'-0" BUT NOT EXCEEDING 3'-0"

STEPS 1'-0" OR LESS

Slab on Grade Steps 3003 17

Thickened Slab Edge 3004 18

19

Thickened Slab 3012 20

25

26

WHERE ℓ_d NOTED ON PLAN OR DETAILS PROVIDE APPLICABLE LENGTH PER CONDITIONS BELOW

WHERE ℓ_s NOTED ON PLAN OR DETAILS PROVIDE APPLICABLE LENGTH PER CONDITIONS BELOW

VERTICAL REINF. AT WALLS AND COLUMNS

NOTE: VERTICAL REINF. AT SHEAR WALLS SHALL BE SPLICED TO 125% OF THE VALUES IN THE TABLE.

WHERE ℓ_{dh} OR ℓ_{dt} NOTED ON PLAN OR DETAILS PROVIDE APPLICABLE LENGTH PER CONDITIONS BELOW

4 KSI ≥ f'_c < 6 KSI, GRADE 60

BAR SIZE	ℓ_{d1}	$\ell_{d1,high}$ & ℓ_{s1}	$\ell_{s1,high}$	ℓ_{s2}	$\ell_{s2,high}$	ℓ_{dh}	ℓ_{dt}
# 3	12"	12"	14"	12"	14"	7"	6"
# 4	12"	15"	19"	15"	19"	11"	8"
# 5	17"	22"	29"	18"	24"	15"	11"
# 6	23"	30"	39"	22"	29"	19"	14"
# 7	38"	49"	64"	32"	42"	24"	18"
# 8	47"	62"	80"	37"	48"	30"	22"
# 9	58"	75"	98"	46"	60"	36"	26"
# 10	70"	91"	119"	57"	74"	43"	31"
# 11	83"	108"	140"	68"	88"	50"	37"

4 KSI ≥ f'_c < 6 KSI, GRADE 80

BAR SIZE	ℓ_{d1}	$\ell_{d1,high}$ & ℓ_{s1}	$\ell_{s1,high}$	ℓ_{s2}	$\ell_{s2,high}$	ℓ_{dh}	ℓ_{dt}
# 3	13"	17"	22"	17"	22"	9"	7"
# 4	17"	23"	30"	23"	30"	14"	10"
# 5	26"	34"	44"	28"	37"	20"	14"
# 6	36"	46"	60"	34"	44"	26"	19"
# 7	58"	76"	98"	50"	65"	33"	24"
# 8	73"	95"	123"	57"	74"	40"	29"
# 9	89"	115"	150"	70"	91"	48"	35"
# 10	108"	140"	182"	87"	113"	57"	42"
# 11	127"	165"	215"	104"	136"	67"	49"

LEGEND:

ℓ_{d1}	MINIMUM STRAIGHT DEVELOPMENT LENGTH
$\ell_{d1,high}$	MINIMUM HIGH BAR STRAIGHT DEVELOPMENT LENGTH
ℓ_{s1}	MINIMUM LAP SPLICE LENGTH
$\ell_{s1,high}$	MINIMUM HIGH BAR LAP SPLICE LENGTH
ℓ_{s2}	REDUCED MINIMUM LAP SPLICE LENGTH FOR BARS WITH AT LEAST 2" OF COVER AND 4" CLEARANCE BETWEEN PARALLEL BARS
$\ell_{s2,high}$	REDUCED MINIMUM HIGH BAR LAP SPLICE LENGTH FOR BARS WITH AT LEAST 2" OF COVER AND 4" CLEARANCE BETWEEN PARALLEL BARS
ℓ_{dh}	MINIMUM EMBEDMENT LENGTH FOR STANDARD END HOOKS. WHERE SIDE COVER NORMAL TO THE PLANE OF THE HOOK IS ≤ $6d_b$, MULTIPLY VALUES IN THE TABLE BY 1.6.
ℓ_{dt}	MINIMUM EMBEDMENT LENGTH FOR HEADED BARS. WHERE SIDE COVER TO THE HEADED BAR IS ≤ $6d_b$, MULTIPLY VALUES IN THE TABLE BY 1.6.

Reinforcing Splice & Development Length Schedule 3000 30

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PROJECT
Little Saigon Landmark

LOCATION
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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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TITLE
TYPICAL CONCRETE DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S3.01

ORIGINAL SHEET SIZE: 36" x 42"

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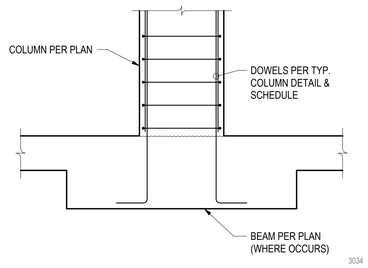
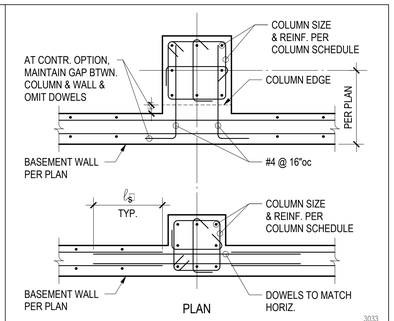


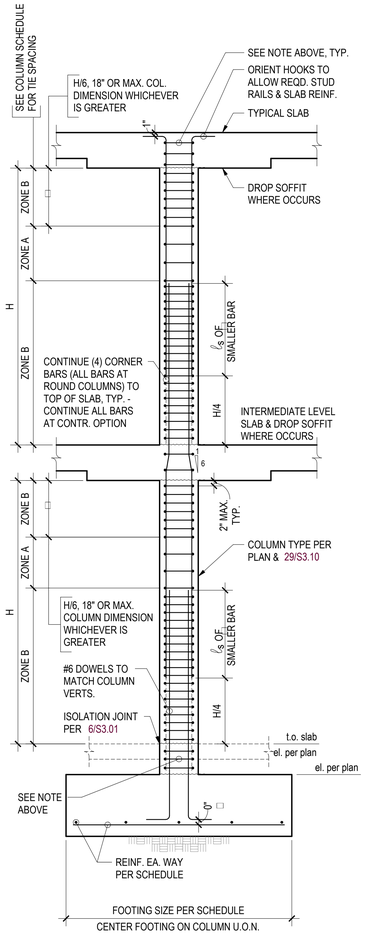
3034
Concrete Column Transfer 5



3033
Concrete Pilaster 6

7 8 9 10 11

NOTE:
WITHIN SLAB DEPTH SPACE TIES AT ZONE B SPACING.

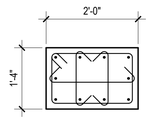


FOOTING SCHEDULE		
TYPE	SIZE	REINFORCING
A	9'-0"x9'-0"x22"dp.	(10)#6 EA. WAY BOT.
B	10'-0"x10'-0"x24"dp.	(12)#6 EA. WAY BOT.
C	12'-0"x12'-0"x28"dp.	(13)#7 EA. WAY BOT.
D	15'-0"x15'-0"x36"dp.	(15)#8 EA. WAY BOT.
E	15'-0"x8'-0"x26"dp.	#7@12"oc EA. WAY BOT.

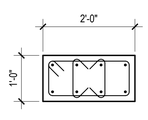
13 14 15

COLUMN SCHEDULE				
COLUMN TYPE / LEVEL	C3	C2	C1	COLUMN TYPE / LEVEL
LEVEL 03			MID-HEIGHT LAP SPLICE, TYP.	LEVEL 03
LEVEL 02		2-A	1-A	LEVEL 02
LEVEL 01	1-A	2-A	1-A	LEVEL 01
TOP OF FOOTING				TOP OF FOOTING
	CONFIGURATION / VERT. LAYOUT	CONFIGURATION / VERT. LAYOUT	CONFIGURATION / VERT. LAYOUT	COLUMN BASE LAP SPLICES, TYP.

REINFORCING SCHEDULE		
CONFIGURATION	2-A	1-A
f'c	6 KSI	6 KSI
VERT. REINF.	#7	#7
ZONE A TIES	#5@ 4.5"oc	#5@ 4.5"oc
ZONE B TIES	#5@ 3"oc	#5@ 3"oc



CONFIGURATION 2-x



CONFIGURATION 1-x

NOTES:
1. BASE CONDITIONS AND COLUMN HEIGHTS VARY; ADJUST TYPICAL REINFORCING FOR CONDITION SHOWN ON PLAN.
2. SEE 30/S3.10 FOR TYPICAL COLUMN ELEVATION.
3. f'c PER GENERAL STRUCTURAL NOTE 22, U.O.N.
4. SEE GENERAL STRUCTURAL NOTE 23 FOR SPECIAL MATERIAL REQUIREMENTS AT ALL VERTICAL BARS.

3032
Concrete Column Schedule 29

3035
Column Elev. W/ Ftg. Sched. (Mid-Height Lap) 30

19 20 21

25 26 27

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Seattle, Washington
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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION
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PROJECT MANAGER
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PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

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TYPICAL CONCRETE COLUMN SCHEDULE AND DETAILS

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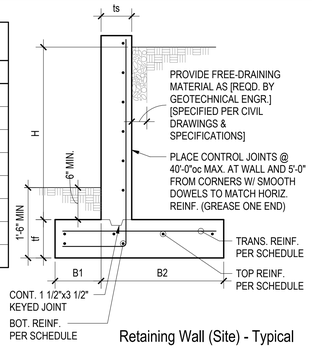
					STEM REINFORCEMENT		FOOTING REINFORCEMENT		
H	B1	B2	ts	tf	VERT.	HORIZ.	TRANS.	TOP	BOT.
UP TO 5'	6"	2'-6"	8"	12"	#4 @ 12"	#4 @ 12"	#5 @ 12"	(4)#5	(2)#5
6'	6"	3'-0"	8"	12"	#4 @ 12"	#4 @ 12"	#5 @ 12"	(4)#5	(2)#5
7'	9"	3'-9"	8"	12"	#5 @ 12"	#4 @ 12"	#5 @ 12"	(4)#5	(2)#5
8'	9"	4'-3"	8"	12"	#5 @ 9"	#4 @ 12"	#5 @ 12"	(4)#5	(2)#5
9'	1'-0"	5'-0"	8"	12"	#5 @ 6"	#4 @ 12"	#5 @ 12"	(5)#5	(3)#5
10'	1'-0"	5'-6"	8"	12"	#5 @ 6"	#4 @ 12"	#5 @ 9"	(5)#5	(3)#5
11'	1'-3"	6'-0"	8"	14"	#6 @ 6"	#4 @ 12"	#5 @ 9"	(7)#5	(3)#5
12'	1'-3"	6'-6"	10"	14"	#6 @ 6"	#4 @ 10"	#5 @ 6"	(8)#5	(3)#5

NOTE:

MAXIMUM HORIZ. DESIGN PRESSURE	= 35 PCF
MAXIMUM SEISMIC DESIGN PRESSURE	= 8H PSF
MINIMUM ALLOWABLE BEARING	= 3,000 PSF
COEFFICIENT OF FRICTION	= 0.35 (INCLUDING FACTOR OF SAFETY)
PASSIVE RESISTANCE	= 350 PCF



Retaining Wall (Site) - Typical 3037 6

5

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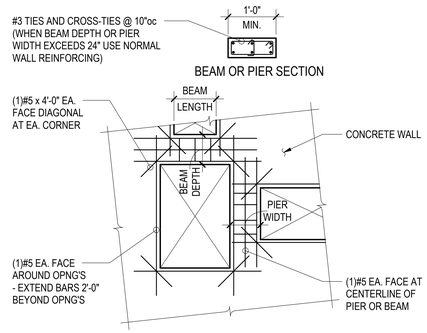
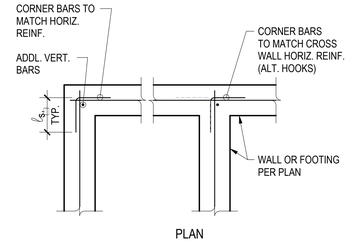


NOTES:
1. REINFORCING SHOWN IS IN ADDITION TO TYPICAL WALL REINFORCING SPECIFIED IN DETAILS AND ELEVATIONS.
2. PROVIDE FOR ANY OPENING SIX SQUARE FEET OR LARGER UNLESS OTHERWISE NOTED ON THE DRAWINGS.
3. OMIT VERTICAL TRIM STEEL IN SHEAR WALLS.
4. RATIO OF BEAM LENGTH TO BEAM DEPTH MAY NOT EXCEED 4.0 UNLESS SPECIFICALLY PERMITTED ON THE DRAWINGS.
5. FOR WALLS THICKER THAN 8" USE #6 BARS IN LIEU OF #5 BARS SHOWN.

Wall Opening Trim 3044 11



Corner Reinforcing - Single Curtain 3049 12

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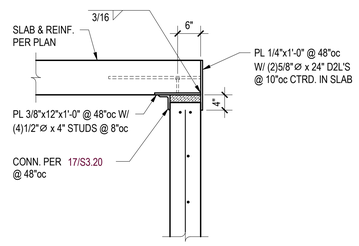
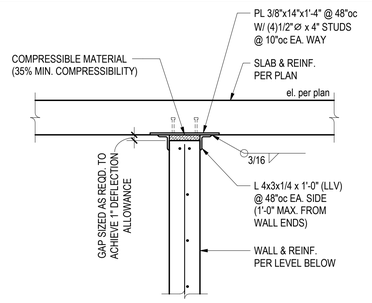
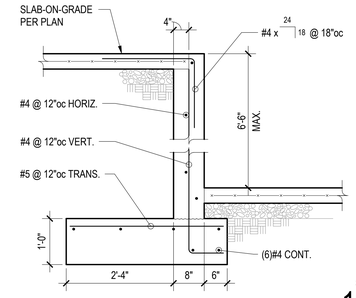


Non-Bearing Wall at PT Slab Edge 3060 16



Non-Bearing Concrete Wall at PT Slab Above 3049 17



3404 18

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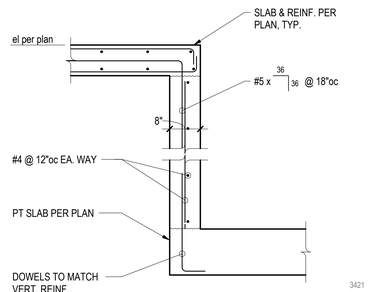
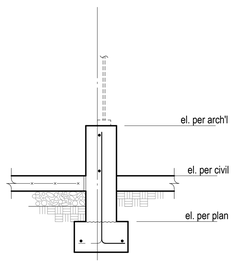
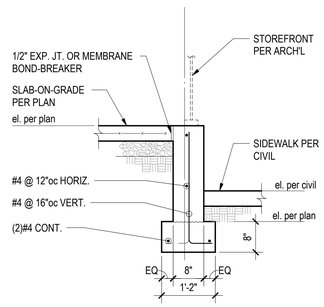


3421 21



FOR CALL-OUTS IN COMMON SEE DETAIL 23/S3.20

3419 22



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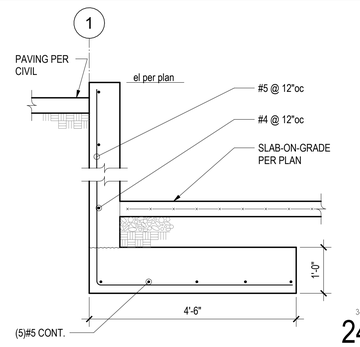

3402 24

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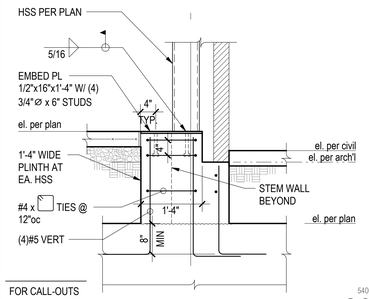

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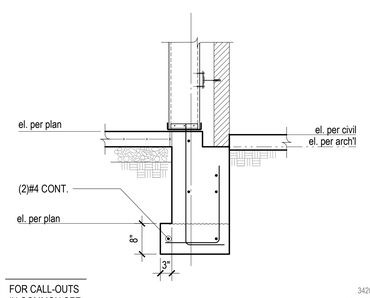
5400 26

27



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3420 27

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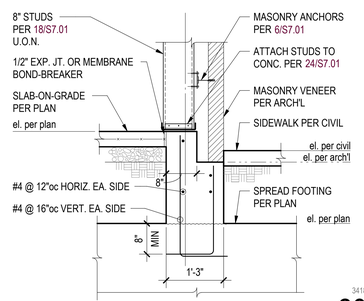

3418 28

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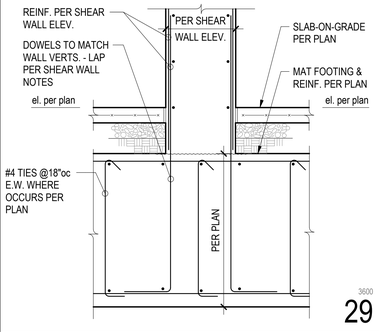
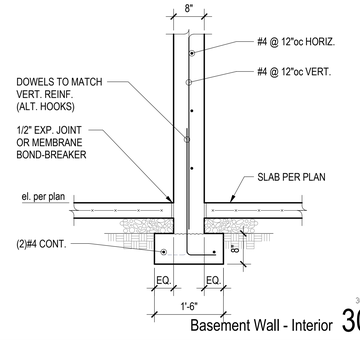


3600 29



Basement Wall - Interior 3046 30

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Seattle, Washington
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PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
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ADG, HES
DRAWN BY
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PROJECT TEAM MEMBERS

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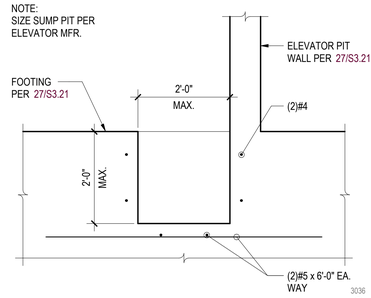
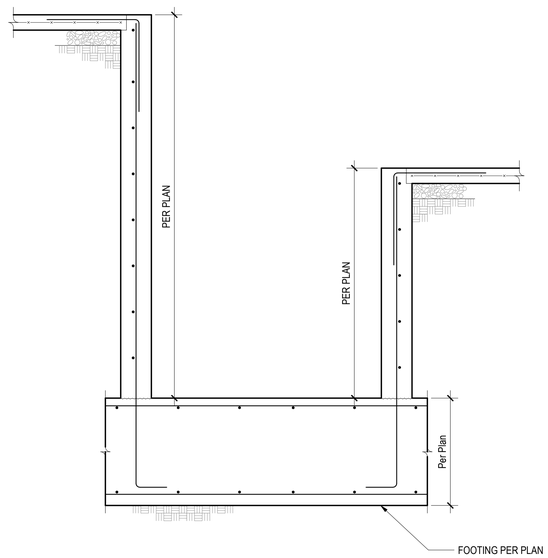
NOTE:
SIZE SUMP PIT PER ELEVATOR MFR.



3036
Sump Pit at Mat Footing

6

7



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3417
Elevator Pit

15

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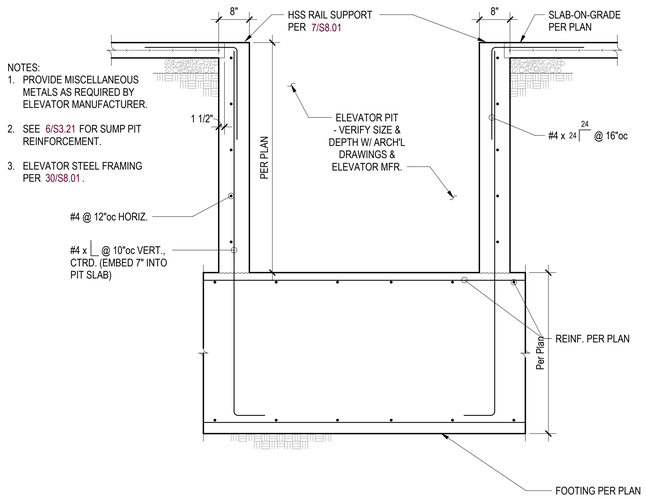

3403
Elevator Pit

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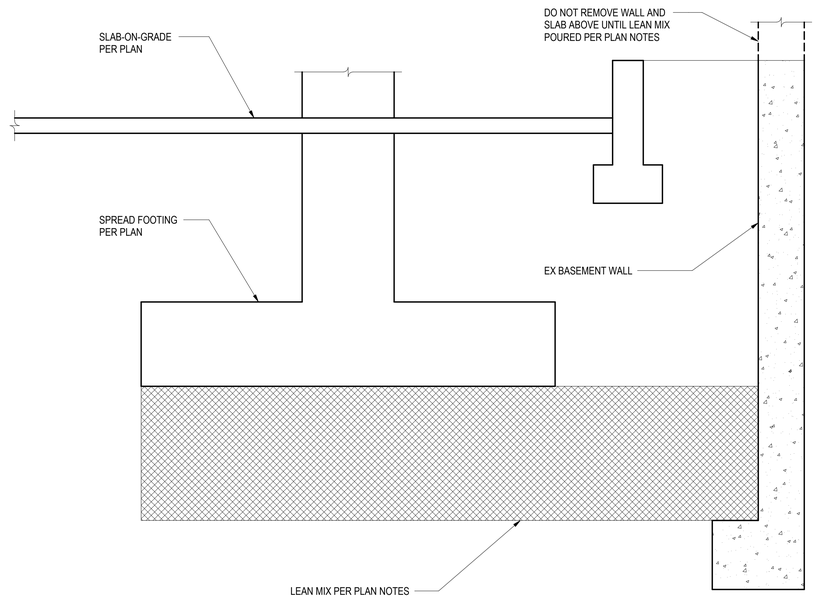

3400

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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CONCRETE DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S3.21

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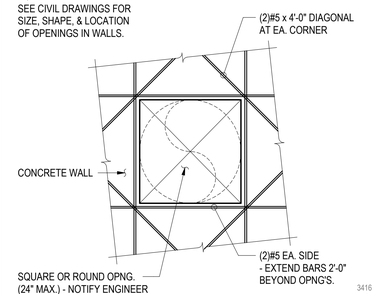
1

2

3

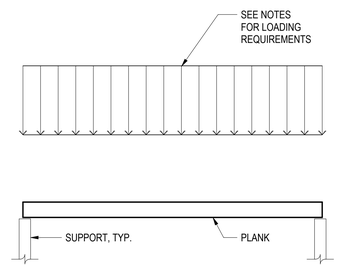
NOTE:
SEE CIVIL DRAWINGS FOR SIZE, SHAPE, & LOCATION OF OPENINGS IN WALLS.



3416
Miscellaneous Wall Opening 4

VAULT NOTES:
1. DESIGN HOLLOW CORE PLANKS FOR THE FOLLOWING LOADS:
   A. DEAD + SOIL* + 100 PSF LIVE

* SOIL WEIGHT IS 120 PCF. SEE PLAN NOTES FOR MIN. & MAX. DEPTHS.



3411
Hollow-Core Plank Loading 6

7

8

9

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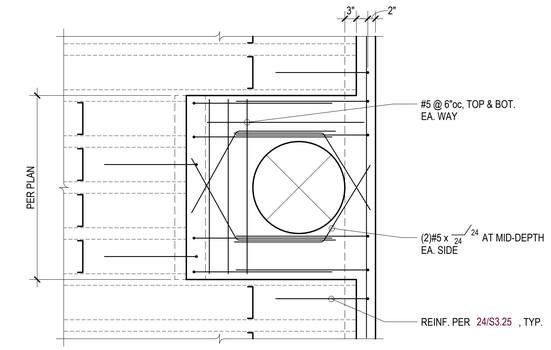

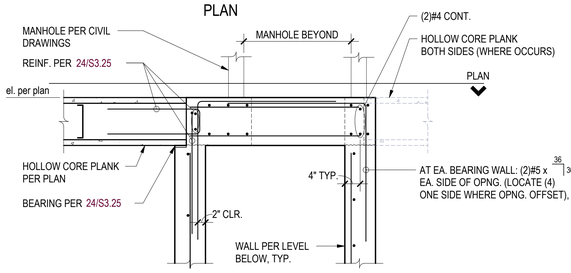

3412
Man-Hole Support 18

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14

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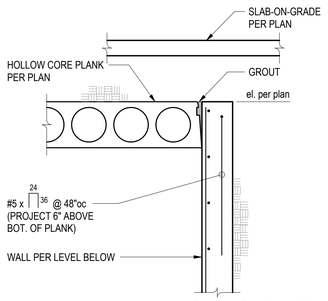
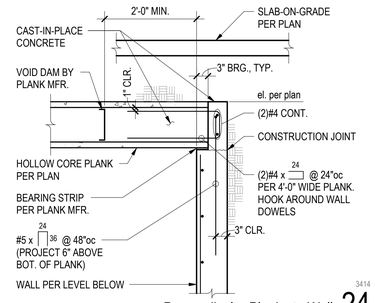


3413
Parallel Planks to Wall 23



3414
Perpendicular Planks to Wall 24

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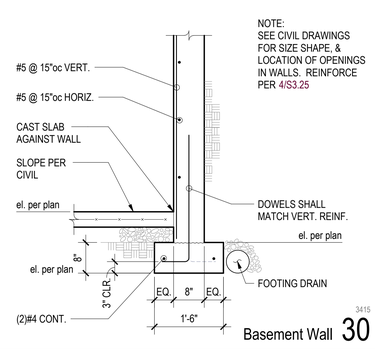
26

27

28

29



3415
Basement Wall 30

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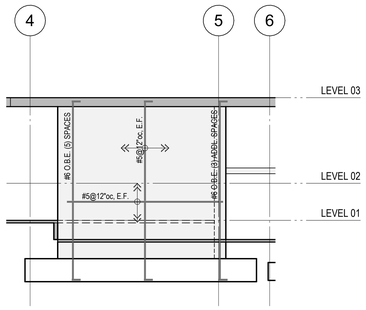
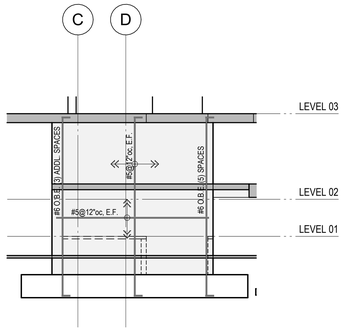


SW-1
(18" THICK)



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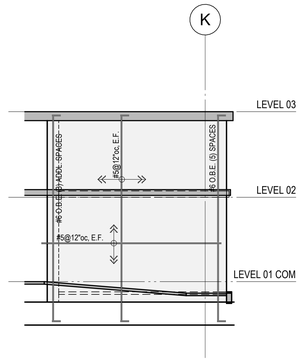
(18" THICK)



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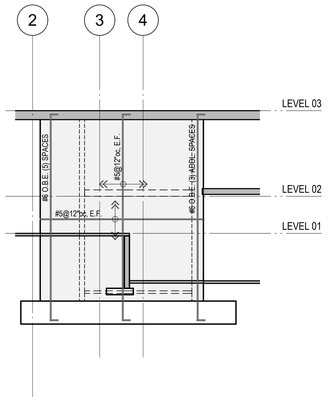

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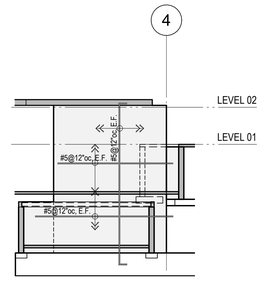
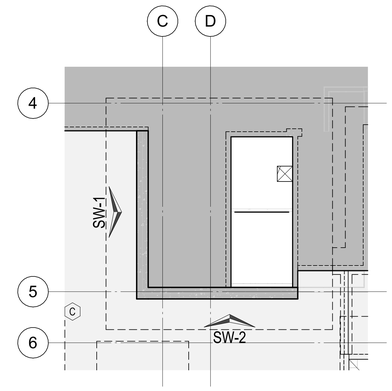
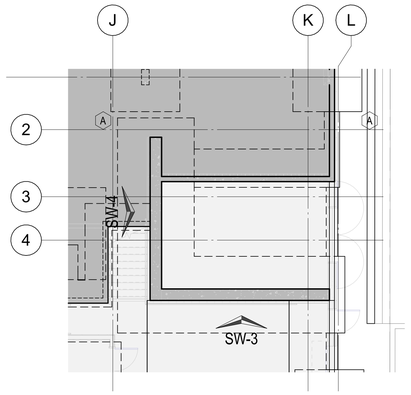


SW-5
(12" THICK)



1 SHEAR WALL NORTH KEY PLAN
1/8" = 1'-0"

N



2 SHEAR WALL WEST KEY PLAN
1/8" = 1'-0"

N

LEGEND:

O.B.E. ORDINARY BOUNDARY ELEMENT PER 27/S3.31

SHEARWALL ELEVATION NOTES

1. SHEAR WALL THICKNESS & REINFORCEMENT SHALL BE AS NOTED ON THE ELEVATIONS. PROVIDE MATCHING DOWELS TO FOOTINGS U.O.N.
2. REBAR DETAILING: HORIZONTAL REINFORCEMENT SHALL BE DEVELOPED AND SPLICED PER SCHEDULE OF 30/S3.01. HOOK FOOTING DOWELS AT BOTTOM OF FOOTING AND SPLICE TO VERTICAL REINFORCEMENT. VERTICAL REINFORCEMENT SHALL BE SPLICED FOR 125% OF THE REDUCED LAP SPLICE LENGTH PER 30/S3.01, SEE 8/S3.31.
3. PROVIDE HOOKS AT ENDS OF ALL HORIZONTAL BARS AT WALL ENDS, WALL INTERSECTIONS, AND FACES OF OPENINGS PER 14/S3.31, 9/S3.31, AND 15/S3.31 . ADDITIONAL REQUIREMENTS AT SPECIAL BOUNDARY ELEMENTS PER 27/S3.31. HOOK VERTICAL REINFORCEMENT ABOVE AND BELOW ALL OPENINGS, TYP.
4. REFER TO SCHEDULE FOR DOWELS REQUIRED AT INTERSECTIONS OF SLABS AND WALLS. SEE DETAIL 12/S3.31
5. SEE DETAIL 18/S3.31 & 11/S3.20 FOR TYPICAL OPENING REINFORCING NOT OTHERWISE NOTED ON ELEVATIONS. OMIT VERTICAL TRIM REINFORCEMENT IN SHEAR WALLS. VERIFY OPENING DIMENSIONS WITH ARCHITECTURAL DRAWINGS.
6. SEE GENERAL STRUCTURAL NOTE 25 FOR SPECIAL MATERIAL REQUIREMENTS OF ALL VERTICAL BARS.
7. SEE PLANS AND 30/S3.31 FOR STRUT REINF. WHERE OCCURS.
8. PROVIDE A MINIMUM OF 2" CLEAR COVER TO ALL VERTICAL SHEAR WALL REINFORCEMENT.

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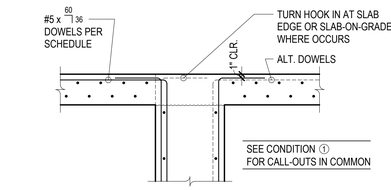
1

2

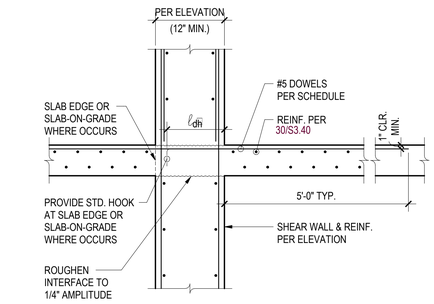
3

LEVEL	SHEAR WALL DOWELS				
	SW-1	SW-2	SW-3	SW-4	SW-5
LEVEL 02	70	65	75	70	-
LEVEL 01M	-	25	20	-	20

NOTES:
1. TABLE INDICATES MINIMUM NUMBER OF DOWELS (TO BE EQUALLY SPACED). MAXIMUM SPACING = 18".
2. DO NOT PLACE DOWELS IN COUPLING BEAMS.

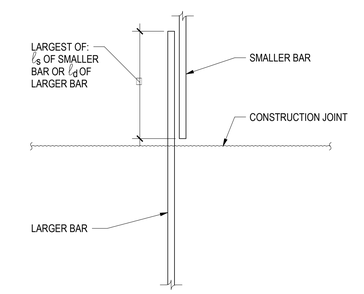


CONDITION 2
TOP OF WALL



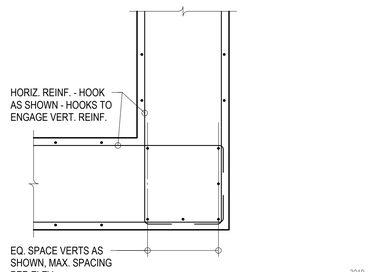
CONDITION 1
TYPICAL FLOOR
(HORIZONTAL JOINTS)

3021
Slab to Shear Wall Dowel Schedule 12



7

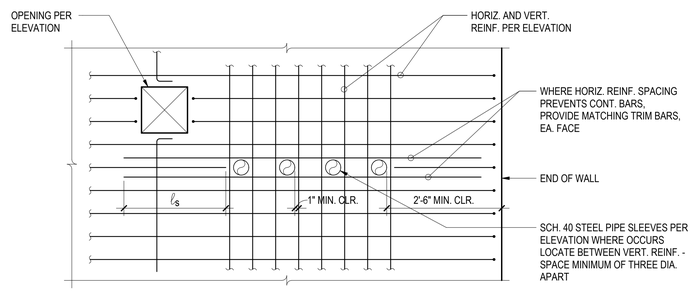
3029
Shear Wall Vertical Reinf. Lap 8



PLAN

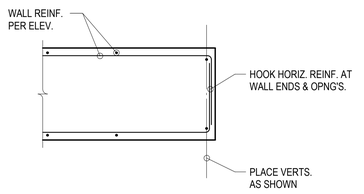
3019
Shear Wall Corner 9

NOTES:
1. SLEEVES MAY NOT BE PLACED WITHIN 2'-6" OF END OF WALL. UNLESS OTHERWISE SHOWN ON WALL ELEVATIONS.
2. REINF. IS IN ADDITION TO REINF. REQD. PER PLANS & WALL ELEVATIONS.
3. ALL SLEEVES SHALL BE SUBMITTED TO ENGINEER FOR REVIEW PRIOR TO CONSTRUCTION.



16

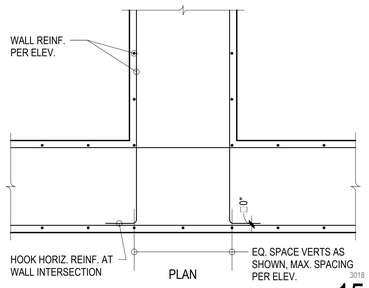
3028
Reinforcing at Pipe Sleeves Through Shear Wall 18



PLAN

13

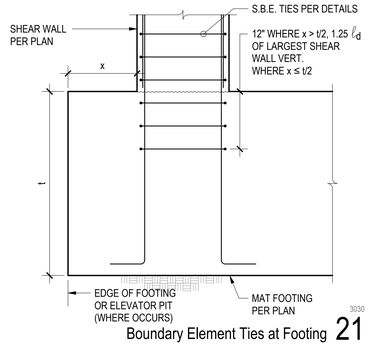
3020
Shear Wall End 14



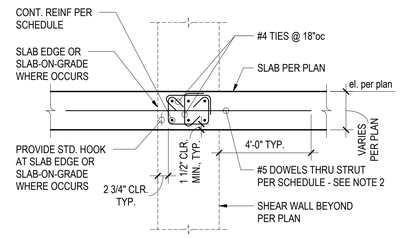
PLAN

3018
Shear Wall Intersection 15

19



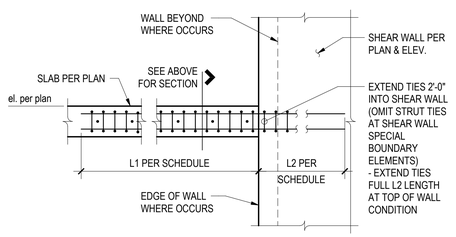
3030
Boundary Element Ties at Footing 21



CONFIGURATION A

STRUT SCHEDULE						
CALLOUT	CONFIGURATION	SLAB DROP	REINFORCEMENT	EXTENT L1	EXTENT L2	STRUT DOWELS
STRUT 1	A	-	(6)#9	15'-0"	10'-0"	15
STRUT 2	A	-	(9)#10	15'-0"	10'-0"	20

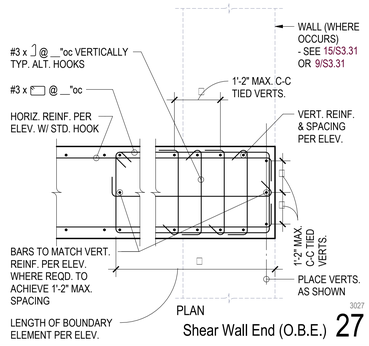
NOTES:
1. ALL STRUT LONGITUDINAL REINFORCING SHALL BE ASTM A706 PER GENERAL STRUCTURAL NOTE _.
2. SCHEDULE NOTES MINIMUM NUMBER OF DOWELS TO BE EQUALLY SPACED ALONG LENGTH L1.



ELEVATION

25

26



PLAN

3027
Shear Wall End (O.B.E.) 27

28

3023
Strut Reinforcement Schedule 30

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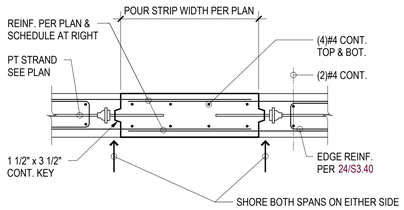
1

2



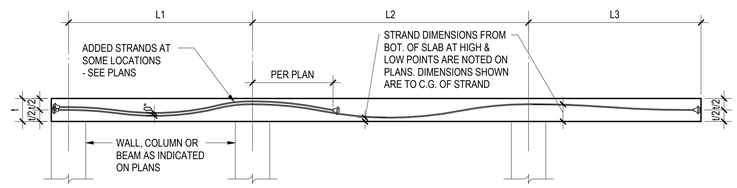
NOTE: POUR STRIP SHALL REMAIN OPEN FOR 4 WEEKS.

MARK	REINFORCING
Ⓐ	#4 x 7'-0" @ 12"oc TOP
Ⓑ	#6 x 10'-0" @ 12"oc BOT.
Ⓒ	#5 x 10'-0" @ 12"oc TOP
Ⓓ	#5 x 10'-0" @ 12"oc BOT.

NOTE:
SEE PLAN FOR EXTENT OF REINFORCING; SEE DETAIL AT LEFT FOR LAYOUT.

PLAN CALLOUT

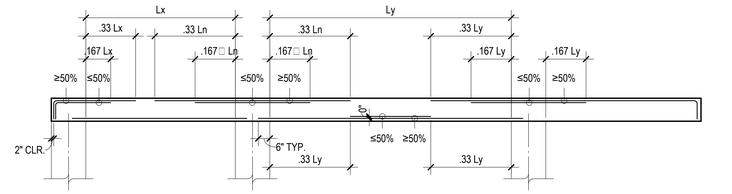
3069
Interior Closure Pour 4



POST-TENSIONING

DROP PANELS (WHERE OCCUR) NOT SHOWN FOR CLARITY

NOTES:
1. PT REQUIREMENTS AND STRAND DIMENSIONS PER PLAN AND GENERAL NOTES.
2. STRAND LOW POINTS ARE LOCATED MIDWAY BETWEEN HIGH POINTS UNLESS OTHERWISE NOTED.
3. DRAPE STRAND IN PARABOLIC PROFILE BETWEEN HIGH AND LOW POINTS.
4. WHERE CLOSURE POUR OCCURS, DRAPE TENDONS WITH PARABOLIC PROFILE WITH LOW POINT PER NOTE 2 AND ANCHOR POINT AS SHOWN ON PLAN AT THE CLOSURE POUR. TENDONS SHALL NOT BE PROFILED AS DOUBLE-CANTILEVER.



MILD-REINFORCING

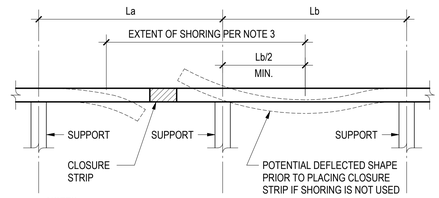
NOTES:
1. MILD REINFORCING REQUIREMENTS PER PLAN.
2. REINFORCE SINGLE SPAN CONDITIONS W/ LENGTHS PER EXTERIOR SPANS.

KEY:
Lx = CLEAR SPAN
Ly = CLEAR SPAN
Ln = GREATER of Lx or Ly

3/8" = 1'-0"
3084
Post-Tensioned Slab Elevation 12

7

8

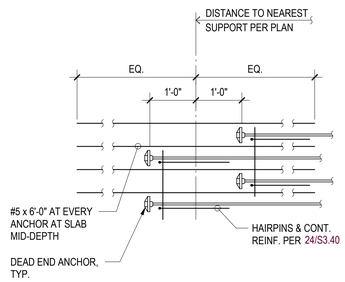


NOTES:
1. SHORING MUST BE SIZED FOR WEIGHT OF SLAB PLUS ALL CONSTRUCTION LOADS.
2. RE-SHORING CAN BE DONE PROVIDED THE RE-SHORE SYSTEM DOES NOT DEFLECT AXIALLY AND IF THE RE-SHORING PROCEDURE DOES NOT ALLOW THE SLAB TO DEFLECT VERTICALLY.
3. SHORING EXTENTS TO BE DETERMINED BY SHORING CONTRACTOR AS REQUIRED TO PREVENT SLAB DEFLECTIONS AND CURLING.

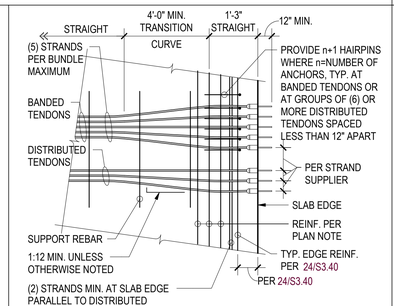
3068
Closure Pour Strip Shoring 10

13

14



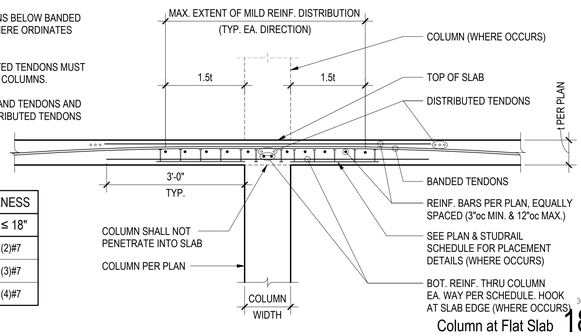
3071
Reinforcing at Added Tendons 15



3070
Reinf. at End of Tendons 16

NOTES:
1. DROP DISTRIBUTED TENDONS BELOW BANDED TENDONS AT SUPPORTS WHERE ORDINATES ARE IDENTICAL.
2. A MINIMUM OF (2) DISTRIBUTED TENDONS MUST BE PLACED DIRECTLY OVER COLUMNS.
3. SPACING BETWEEN REBAR AND TENDONS AND MAXIMUM SPACING OF DISTRIBUTED TENDONS PER 30/S3.41 .

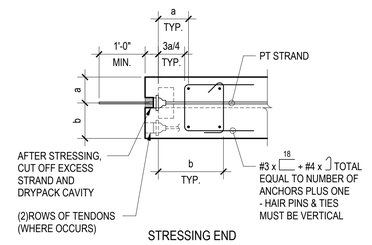
COLUMN WIDTH	SLAB THICKNESS	
	t ≤ 10"	t ≤ 18"
12"	(2)#5	(2)#7
18"	(3)#5	(3)#7
24"	(4)#5	(4)#7



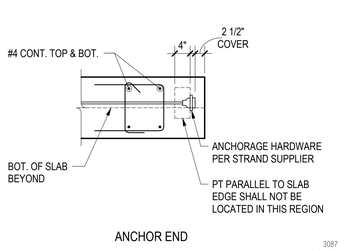
3085
Column at Flat Slab 18

19

20

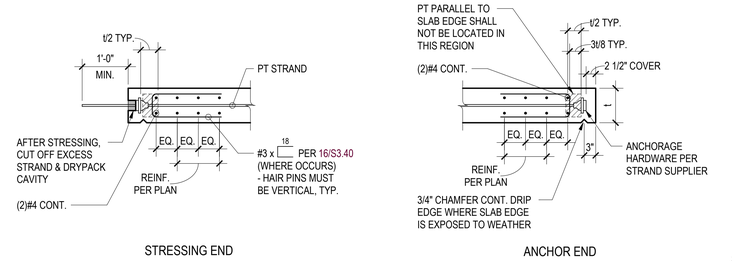


STRESSING END



ANCHOR END

3087
PT Slab Section, Banded Tendons at Wide Shallow Beam 22



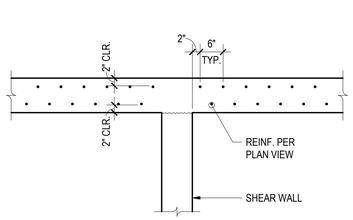
STRESSING END

ANCHOR END

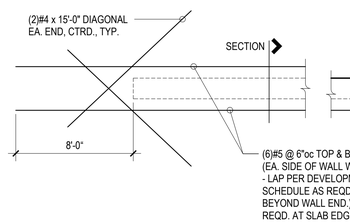
3083
Post-Tensioned Anchorage Section 24

25

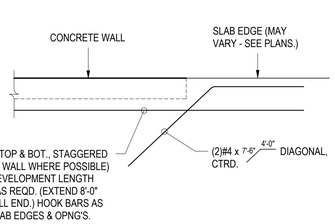
26



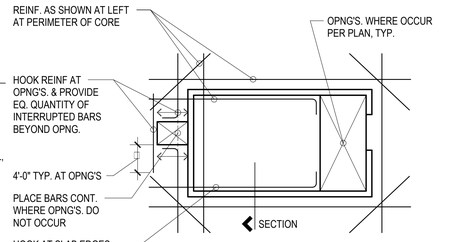
SECTION



TYPICAL INTERIOR WALLS
PLAN VIEW



WALLS AT SLAB EDGE
PLAN VIEW



AT INTERSECTING SHEAR WALLS
PLAN VIEW

3072
Slab Reinforcing Along Shear Walls 30

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Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

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CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / OPCD APPROVAL STAMP

TITLE
TYPICAL POST-TENSIONING SLAB DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S3.40

90% CD SET

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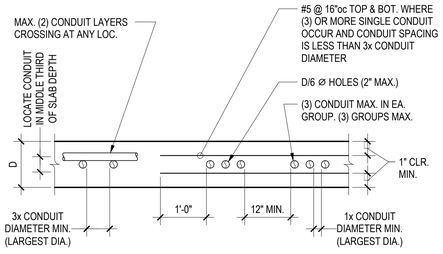
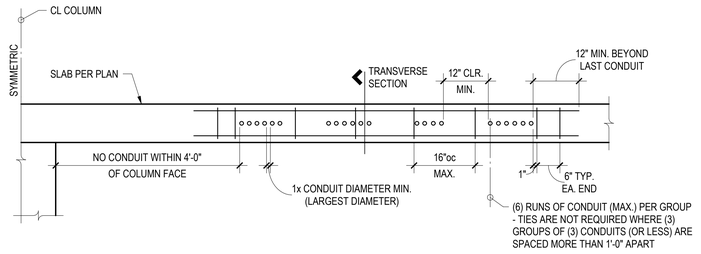


SINGLE CONDUIT CONDUIT GROUP

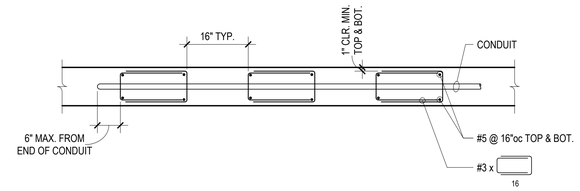
NOTES:

1. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR PLACEMENT OF CONDUIT IN POST-TENSIONED SLAB. SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS.
2. SEE POST-TENSIONING NOTES FOR GENERAL PROVISIONS FOR CONDUIT IN POST-TENSIONED SLAB.
3. SEE DIAGRAM AT LEFT FOR CONDUIT PLACEMENT RESTRICTIONS. PROVIDE REINFORCING AS REQUIRED IN DIAGRAM. CONDUIT PLACEMENT NOT MEETING CRITERIA SHOWN IN DIAGRAM SHALL BE SUBMITTED TO ENGINEER FOR REINFORCING DESIGN.
4. PROVIDE 1" MIN. VERTICAL CLEARANCE BETWEEN CONDUIT AND PERPENDICULAR TENDONS. PROVIDE 4" MIN. HORIZONTAL CLEARANCE BETWEEN CONDUIT AND PARALLEL TENDONS.
5. SEE 12/S3.41 FOR REINFORCING LARGER CONDUIT GROUPS.

3078
Conduit Placement & Reinforcing 4



LONGITUDINAL SECTION

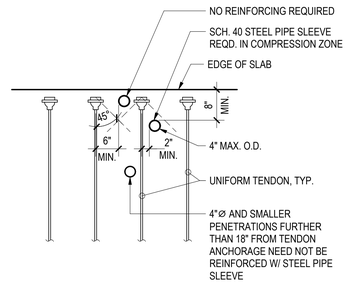


TRANSVERSE SECTION

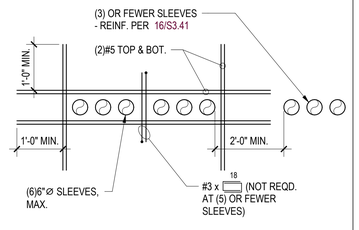
3090
Reinforcing at Tightly Spaced Conduit Groups 12

7

8



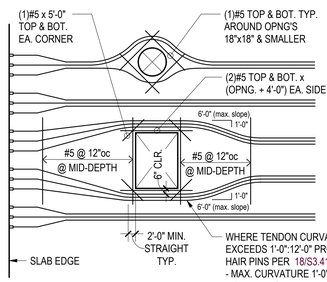
3081
Penetrations at Tendon Anchorage 9



3082
Reinforcing at Sleeved Penetrations 10

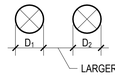
13

14



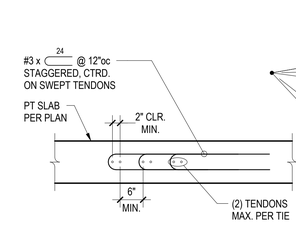
NOTES:

1. OPENINGS SHALL NOT BE PLACED WITHIN 4' OF ANY COLUMN WITHOUT ENGINEER APPROVAL. (SEE 30/S3.42 FOR ADDL. REQUIREMENTS AT STUDRAILS.)
2. ROUND OPNG'S MAY BE GROUPED & REINFORCED SIMILAR TO RECTANGULAR OPNG'S. SEE 10/S3.41 .

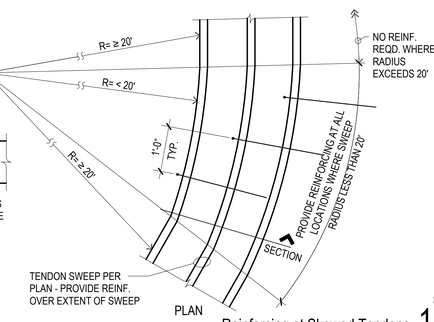


3. MAX. OPNG. SIZE IF LOCATED NEAR MIDSPAN U.O.N. ON PLAN:
   ROUND: 48" ⌀
   RECTANGULAR: 36" x 36"
4. REINF. OPNG. W/ LARGEST DIM. OF 10" OR GREATER AS SHOWN. NO REINF. REQD. FOR INDIVIDUAL OPNG'S SMALLER THAN 10"x10".
5. FOR SLABS THICKER THAN 12" USE #6 BARS IN LIEU OF #5 BARS SHOWN.

3074
P.T. & Additional Reinforcing at Slab Openings 16



SECTION



PLAN

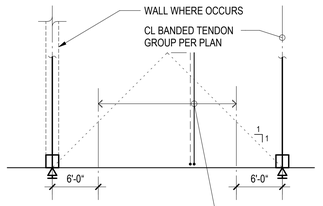
3075
Reinforcing at Skewed Tendons 18

19

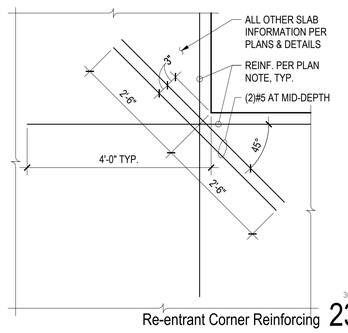
20

21

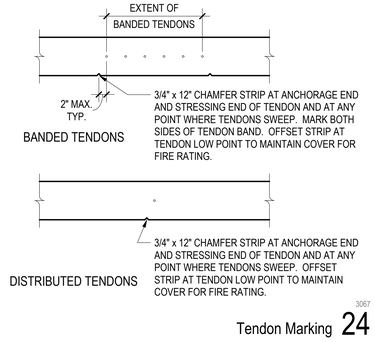
NOTE:
THIS DETAIL APPLIES AT ALL SPANS BETWEEN BANDED TENDON GROUPS, AND BETWEEN BANDED TENDONS AND WALLS.



3073
PT Slab Reinf. Between Banded Tendon Groups 22



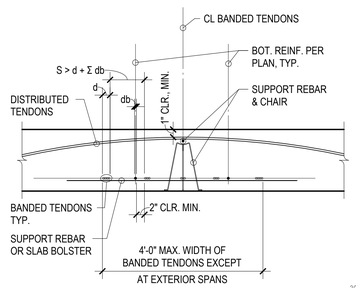
3077
Re-entrant Corner Reinforcing 23



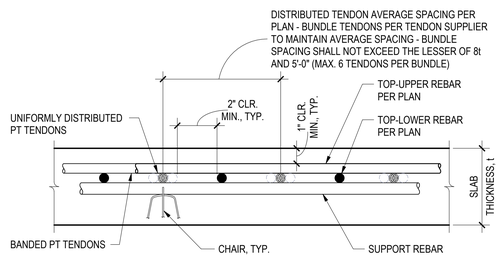
3067
Tendon Marking 24

25

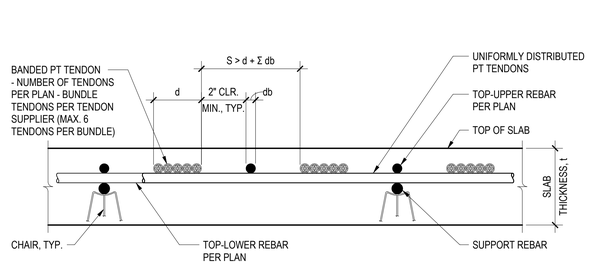
26



3079
Section at Banded Tendons at Mid-span 27



SECTION THRU UNIFORMLY DISTRIBUTED PT TENDONS



SECTION THRU BANDED PT TENDONS

3080
Section thru Tendons at Column 30

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PROJECT
Little Saigon Landmark

LOCATION
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Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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TITLE
TYPICAL POST-TENSIONING SLAB DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S3.41

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STUDRAIL SCHEDULE

TYPE	CONFIGURATION	STUDRAIL LAYOUT
1	A	SR-A
2	B	SR-B
3	C	SR-A
4	A	SR-C
5	B	SR-D
6	C	SR-C

STUDRAIL LAYOUT

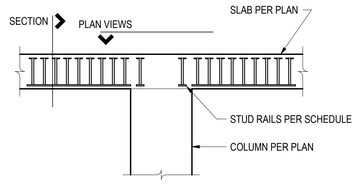
LAYOUT	NUMBER OF STUDS PER RAIL	So (in.)	S (in.)	STUD DIAMETER	OVERALL LENGTH (in.)
SR-A	12	3 1/8	2 7/8	1/2	37 7/8
SR-B	15	3 1/8	3 1/8	1/2	50
SR-C	15	6 1/8	4 1/2	3/4	75 1/4
SR-D	26	6 1/8	5	3/4	137 1/4

STUDRAIL QUANTITY

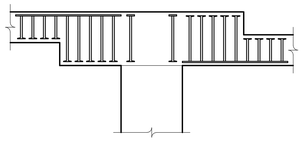
COLUMN WIDTH	# OF STUDRAILS EA. FACE
≤1'-0"	2
1'-4"	2
2'-0"	3

NOTES:

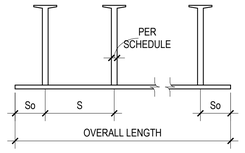
1. ALIGN STUDRAILS W/ FACE OF COLUMN BELOW, U.O.N.
2. STUDRAILS SHALL BE 2" MIN. CLR. FROM OPENINGS AND SLAB EDGES.
3. STUDRAILS SHALL BE EVENLY SPACED ACROSS COLUMN FACE.
4. STUDRAILS MUST BE VERTICAL.
5. STUDRAIL HEIGHT IS DETERMINED BY THE THICKNESS OF THE SLAB. ADJUST HEIGHT AS NECESSARY WHERE SLABS STEP AND SLOPE.
6. CONTRACTOR SHALL SUBMIT FINAL SHOP DRAWINGS SHOWING ALL SLAB PENETRATIONS FOR MECHANICAL, PLUMBING, AND ELECTRICAL PER NOTE "P" OF THE POST-TENSIONED CONCRETE GENERAL STRUCTURAL NOTES FOR FINAL APPROVAL.
7. APPROVED PENETRATIONS SHALL BE REINFORCED PER 16/S3.41 .
8. STUDRAILS MAY BE INVERTED AT CONTR. OPTION.
9. STUDRAILS MAY BE FIELD CUT INTO SEGMENTS AT CLOSURE POURS AT CONTRACTOR'S OPTION. MAINTAIN 1 1/2" BETWEEN CUT AND BASE OF STUD AND ALIGN SEGMENTS TO MAINTAIN STUD SPACING.
10. SUBMIT TECHNICAL INFORMATION FOR STUDRAILS TO ENGINEER OF RECORD FOR APPROVAL. SUBMITTAL MUST INCLUDE CURRENT ICC-ES REPORT. SPECIAL INSPECTION IS REQUIRED FOR ALL STRUCTURAL INSTALLATIONS.



COLUMN SECTION



SECTION AT SLAB STEP



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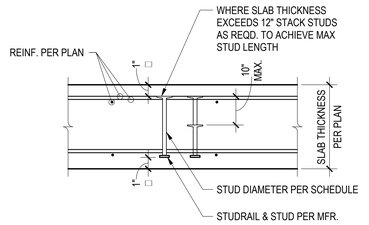
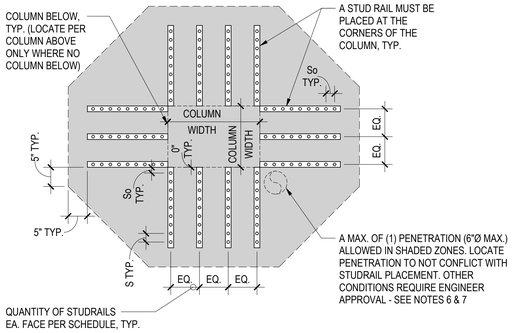
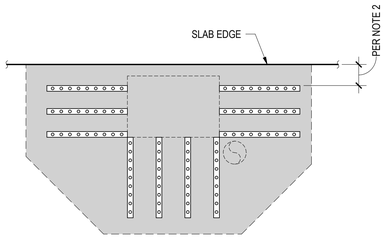


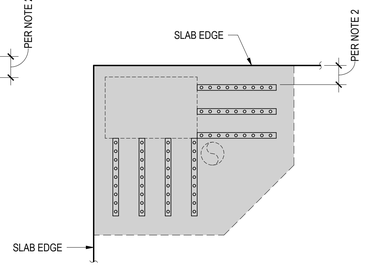
STUD SECTION



CONFIGURATION A - RECTANGULAR COLUMN
(CALL-OUTS APPLY TO ALL CONFIGURATIONS UNLESS NOTED OTHERWISE)



CONFIGURATION B - RECTANGULAR COLUMN



CONFIGURATION C - RECTANGULAR COLUMN

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(206) 343-0460 www.cplinc.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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TITLE
STUDRAIL DETAILS

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S3.42
90% CD SET

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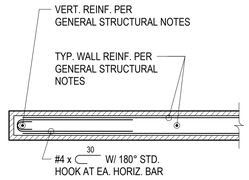

PLAN VIEW

Typical Reinforcing at Jambs & Free Ends of Walls 4007

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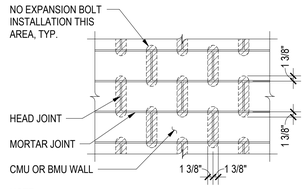

NOTE:
NOTIFY ENGINEER FOR DIRECTION PRIOR TO INSTALLATION IF EXPANSION BOLT LOCATIONS FALL WITHIN RESTRICTED ZONES.

Expansion Bolt Restrictions at CMU/BMU Wall 4008

4

SPLICING & DEVELOPMENT OF REINFORCEMENT IN GROUTED MASONRY CONSTRUCTION

BAR SIZE	LENGTH
#4	25"
#5	40"
#6	54"
#7	63"
#8	72"

NOTE:
SEE GENERAL STRUCTURAL NOTES FOR REQUIREMENTS OF GROUT POURS EXCEEDING 5'-4" IN HEIGHT.

Lap Splice Table 4006

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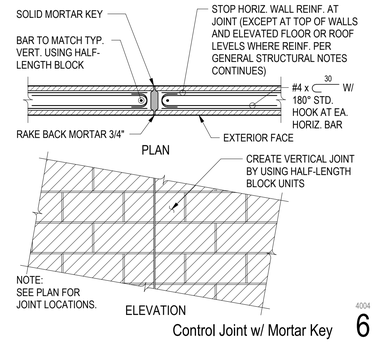

Control Joint w/ Mortar Key 4004

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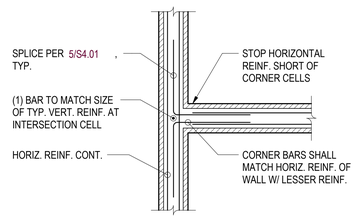

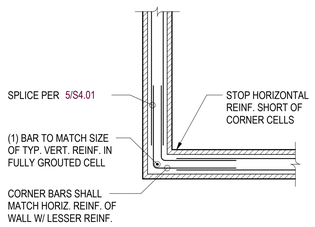

Typical Corner Bar Reinforcement 4003

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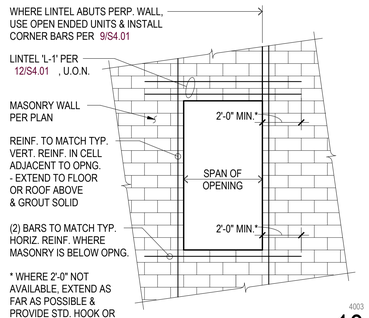

* WHERE 2'-0" NOT AVAILABLE, EXTEND AS FAR AS POSSIBLE & PROVIDE STD. HOOK OR MATCHING CORNER BARS

Typical Opening Reinforcement 4003

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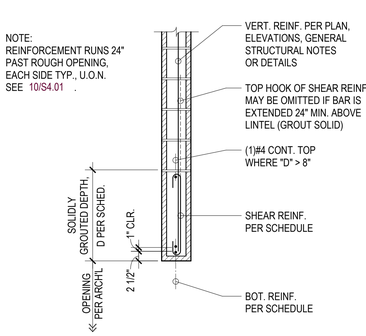

LINTEL	BOTTOM REINF.	SHEAR REINF.	D
L-1	#5	*	8"
L-2	-	*	-
L-3	-	*	-

* SHEAR REINFORCEMENT NOT REQUIRED. HOOK VERTICAL REINFORCEMENT AROUND BOTTOM REINFORCEMENT.

SCHEDULE NOTES:
1. SEE 10/S4.01 FOR TYPICAL REINFORCEMENT AT OPENINGS.
2. WHERE SHEAR REINFORCEMENT REQUIRED, PLACE FIRST BAR HALF THE GIVEN SPACING OR 1/4 OF 'D' FROM FACE OF SUPPORT, WHICHEVER IS LESS.

Typical Lintel Reinforcement Schedule 4006

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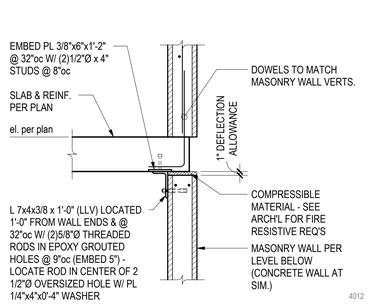
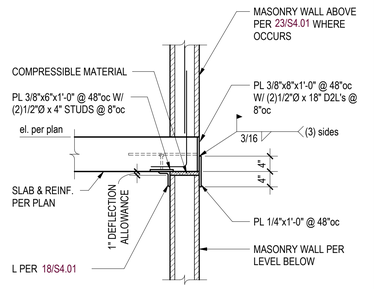


Non-Bearing CMU Wall at PT Slab Edge Above 4012

16



Non-Bearing CMU Wall at PT Slab Edge Above 4009

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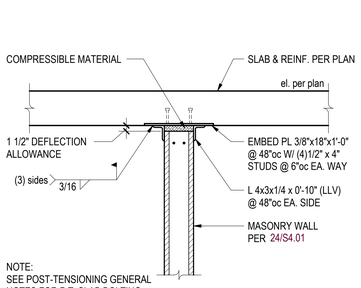

Non-Bearing CMU Wall at PT Slab Above 4001

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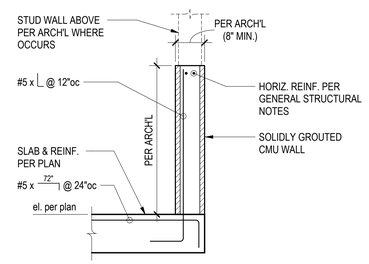
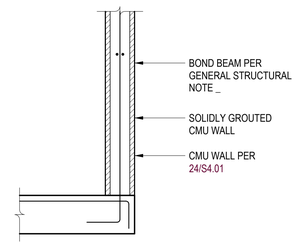


CONDITION 1
PARTIAL HEIGHT CMU WALL
ADJACENT TO SLAB OPENING



CONDITION 2
FULL HEIGHT CMU WALL ADJACENT TO SLAB OPENING
(SEE CONDITION 1 FOR CALLOUTS IN COMMON)

CMU Wall on PT Slab Edge 4011

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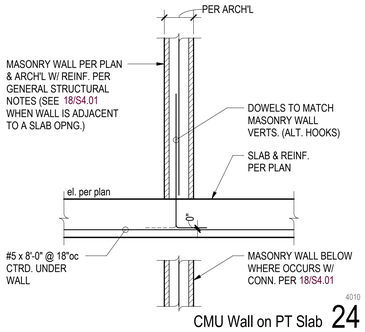

CMU Wall on PT Slab 4010

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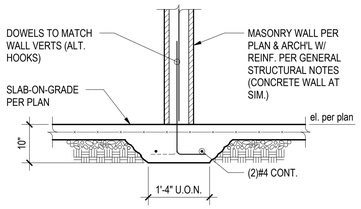
NOTE:
AT CONTRACTOR OPTION, CMU WALL DOWELS MAY BE DRILLED & EPOXIED INTO THE SLAB ON GRADE. EMBED PER THE GENERAL STRUCTURAL NOTES.



Architectural CMU Wall Footing 4000

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson Seattle, Washington 98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

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TITLE
TYPICAL MASONRY DETAILS

PROJECT NO.
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02/07/25
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S4.01

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ATTACHMENT LOCATIONS

DECK TYPE = ASC B-36 OR VERCO HSB-36, G60 GALVANIZED W/ FOLLOWING MIN. PROPERTIES: ①

Fy = 50ksi, PANEL WIDTH = 36"

20GA.	18GA.	16GA.
I_e = +0.197/-0.231 in.^{4}	I_e = +0.287/-0.306 in.^{4}	I_e = ±0.377/-0.381 in.^{4}
S_e = +0.228/-0.236 in.^{3}	S_e = +0.311/-0.329 in.^{3}	S_e = +0.392/-0.404 in.^{3}

MAXIMUM ALLOWABLE SPANS ②			
SPAN CONDITION	20GA.	18GA.	16GA.
SINGLE SPAN	7'-0"	8'-0"	8'-6"
DOUBLE OR TRIPLE SPAN	9'-0"	10'-0"	10'-6"

DECK ATTACHMENT AT SUPPORTS ③			
FASTENER TYPE	FASTENER PATTERN PERP. TO DECK FLUTES	FASTENER SPACING PARALLEL TO DECK FLUTES	SIDE SEAM CONN. SPACING ④
1/2"Ø (EFFECTIVE) PUDDLE WELDS	36/7	18"oc	18"oc
POWDER ACTUATED FASTENERS (PAF)	36/7	18"oc	18"oc

DECK NOTES:

① DECK MUST STRICTLY MEET CRITERIA LISTED, INCLUDING ICC-ES RESEARCH REPORT ALLOWABLE SHEAR LOADS. SUBMIT DECK INFORMATION TO ENGINEER PRIOR TO BEGINNING SHOP DRAWINGS. SEE DRAWINGS FOR LOCATIONS WHERE ACOUSTIC DECK IS REQUIRED (PERFORATED AT WEBS ONLY, U.O.N). SEE SPECIFICATIONS FOR ACOUSTIC REQUIREMENTS.

② USE GAGE OF DECK PER SPAN TABLE, U.O.N PER PLAN.

③ USE DECK ATTACHMENTS AT SUPPORTS PER THE TABLE U.O.N. PER PLAN. CONTRACTOR MAY ELECT TO USE EITHER PUDDLE WELDS OR POWDER ACTUATED FASTENERS, CONTRACTOR TO UTILIZE ONLY ONE DECK ATTACHMENT TYPE PER CONTINUOUS DECKING AREA.

④ CONNECT DECK SEAMS WITH THE PUNCHLOK SYSTEM FOR VERCO DECK OR THE DELTAGRIP SYSTEM FOR ASC DECK, U.O.N PER PLAN.

⑤ POWDER ACTUATED FASTENERS SHALL BE PER HILTI (ICC-ESR 2197) OR PNEUTEK (ICC-ESR 2941).

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ASC B-36 or Verco HSB-36 Roof Deck

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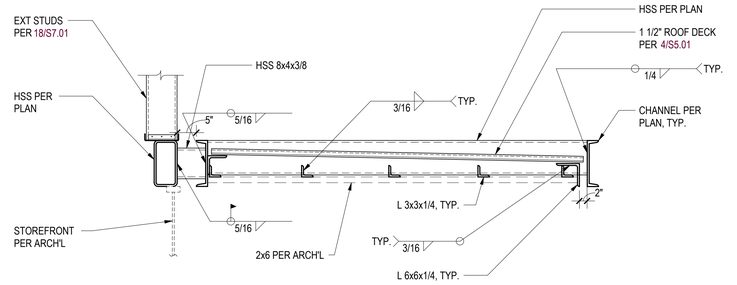

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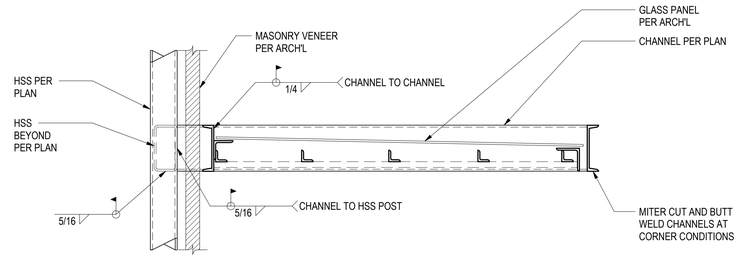

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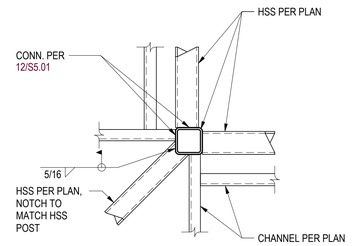

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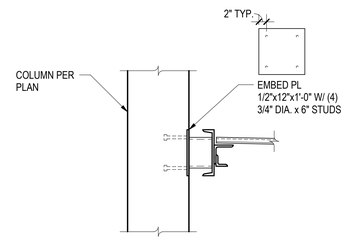

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DRAWN BY
KF
PROJECT TEAM MEMBERS

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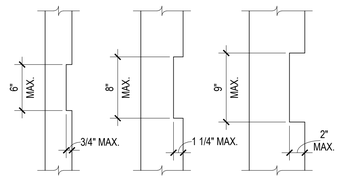
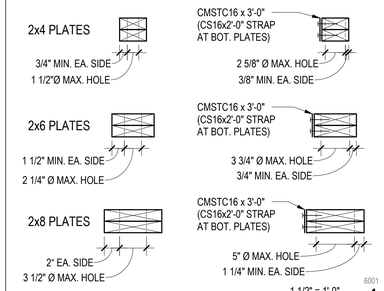
NOTCHES SHALL NOT OCCUR IN MORE THAN (2) SUCCESSIVE STUDS.

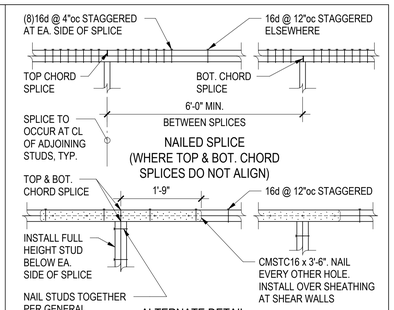


1 1/2" = 1'-0" 6003
Allowable Notches in Studs 3



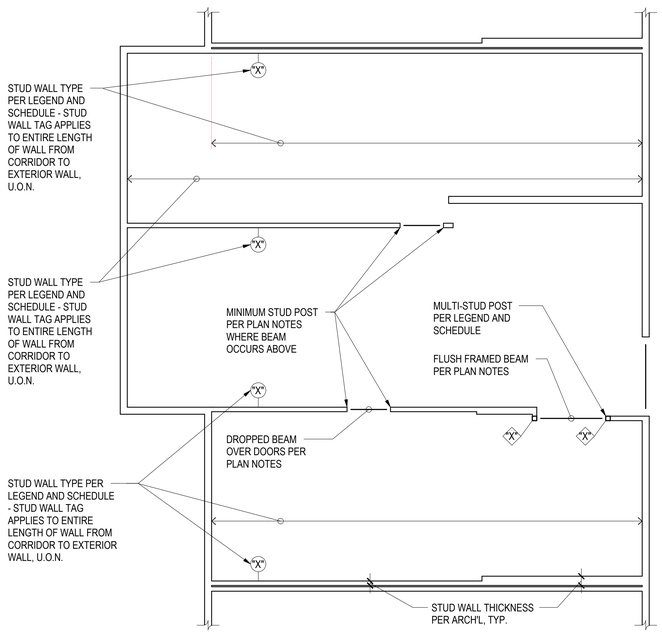
1 1/2" = 1'-0" 6001
Allowable Holes Through Plates 4

5

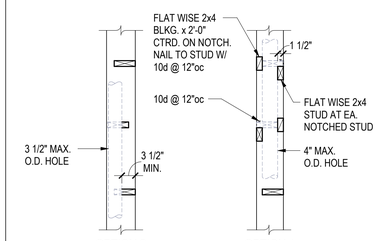


Top Plate Splice 6

7

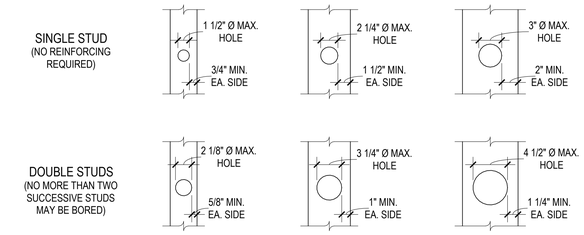


1/4" = 1'-0" 6057
Example of Interior Stud Wall Type Extents 15

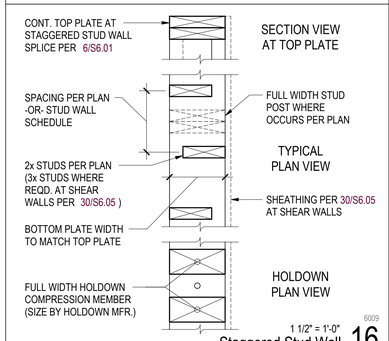


NOTES:
1. NO MORE THAN (2) CONSECUTIVE STUDS MAX.
2. DO NOT DRILL OR NOTCH BUILT UP STUD POSTS OR HOLDOWN STUDS.

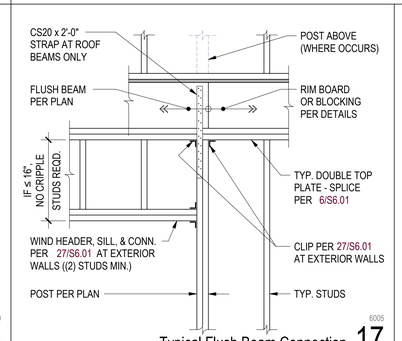
6064
Allowable Holes/Notches at 2x8 Staggered Plumbing Walls 10



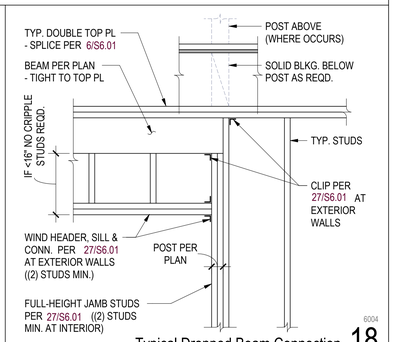
1 1/2" = 1'-0" 6002
Allowable Holes Through Studs 12



1 1/2" = 1'-0" 6009
Staggered Stud Wall 16



6005
Typical Flush Beam Connection 17

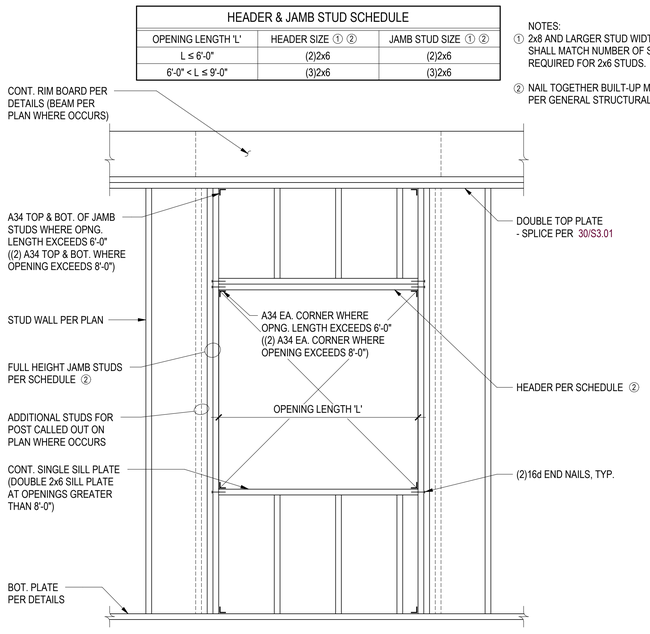


6004
Typical Dropped Beam Connection 18

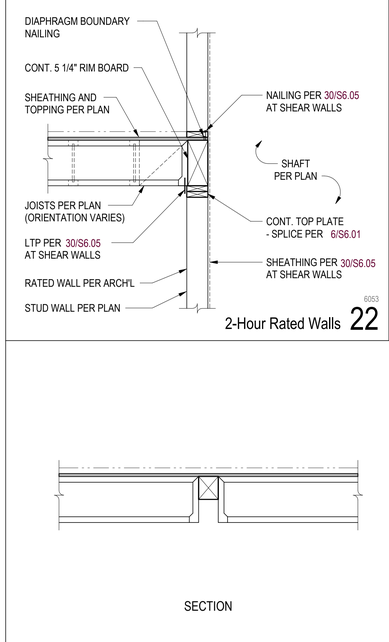
19

HEADER & JAMB STUD SCHEDULE		
OPENING LENGTH 'L'	HEADER SIZE ① ②	JAMB STUD SIZE ① ②
L ≤ 6'-0"	(2)2x6	(2)2x6
6'-0" < L ≤ 9'-0"	(3)2x6	(3)2x6

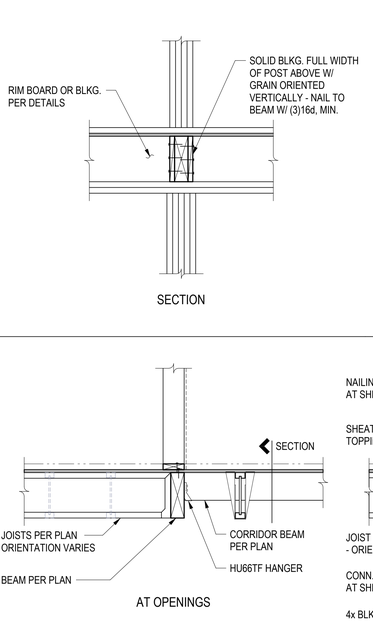
NOTES:
① 2x8 AND LARGER STUD WIDTHS SHALL MATCH NUMBER OF STUDS REQUIRED FOR 2x6 STUDS.
② NAIL TOGETHER BUILT-UP MEMBERS PER GENERAL STRUCTURAL NOTES.

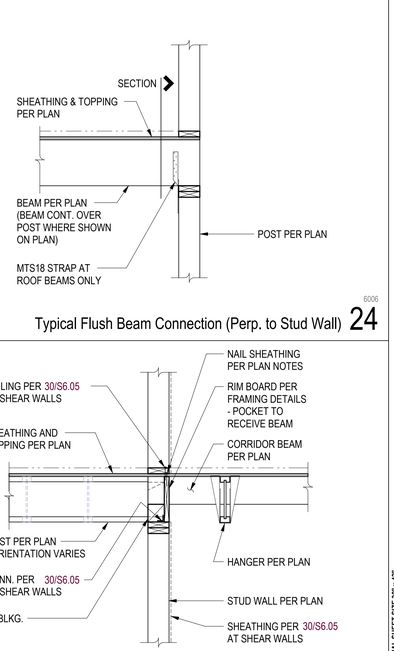


6055
Exterior Wall Framing 27



6063
2-Hour Rated Walls 22





6006
Typical Flush Beam Connection (Perp. to Stud Wall) 24

25

6007
Typical Corridor Framing 30

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
TYPICAL WOOD FRAME DETAILS

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S6.01

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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2/5/2025 11:26:19 AM

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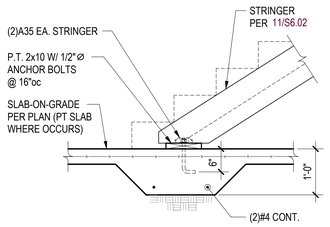
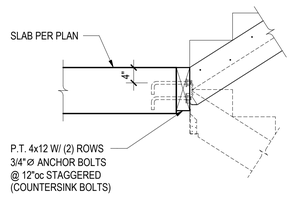
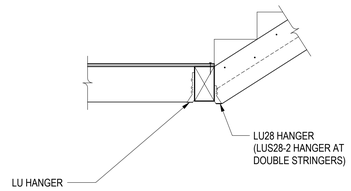


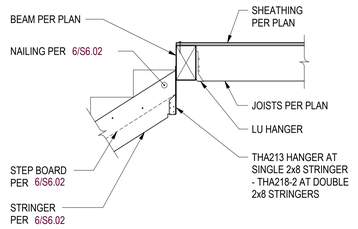
FOR CALL-OUTS IN COMMON SEE DETAIL 11/S6.02

Stair Foundation 2 (6066)

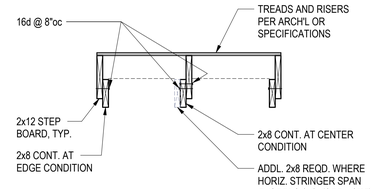


Stair Landings at Conc. Slab 3 (6010)

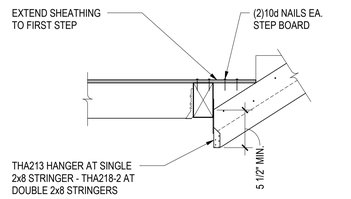


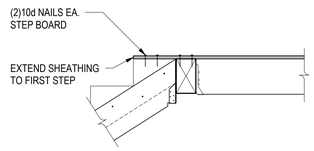


NOTE:
DO NOT EXCEED MAXIMUM HORIZONTAL STRINGER SPAN OF 10'-6". CONTACT ENGINEER FOR DIRECTION IF EXCEEDED.

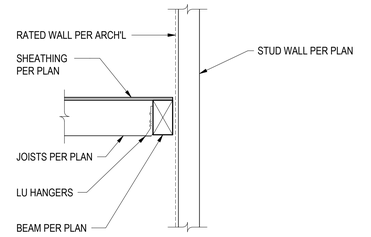


Typical Stair Stringers 6 (6011)



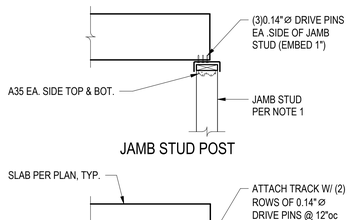


Stair Landings 11 (6012)

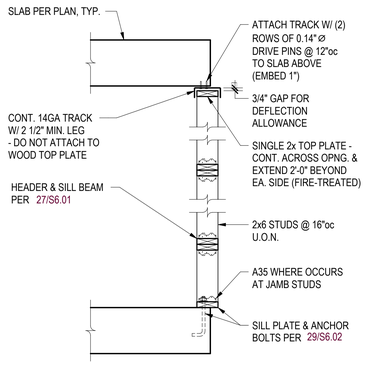


Stair Landings 12 (6013)

7

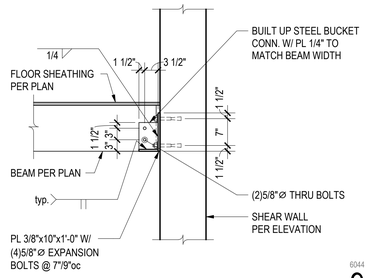


JAMB STUD POST

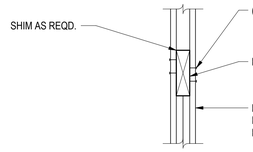


NOTES:
1. REFER TO 27/S6.01 FOR FRAMING REQUIREMENTS AT OPENINGS IN STUD WALL MINIMUM (2) STUD POST AT EACH SIDE OF OPENING. NAIL TOGETHER PER GENERAL STRUCTURAL NOTES
2. INSTALL CRIPPLE STUD WALL ABOVE AND BELOW OPENING.
3. ALL EXTERIOR WALL FRAMING BELOW 3-HR CONCRETE SLABS SHALL BE FIRE-TREATED. REFER TO ARCH'L & SPEC'S.

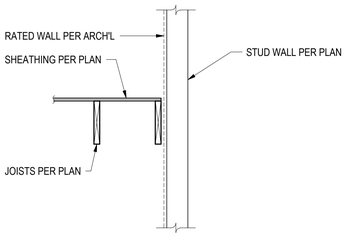
Non-Bearing Exterior Wall 14 (6056)



Stair Landing Beam in Concrete Shaft 9 (6044)

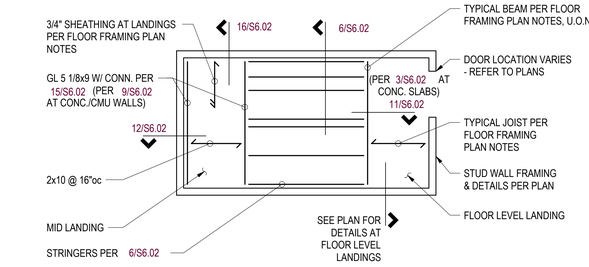


Stair Intermediate Landing Beam Conn. 15 (6008)



Stair Landings 16 (6014)

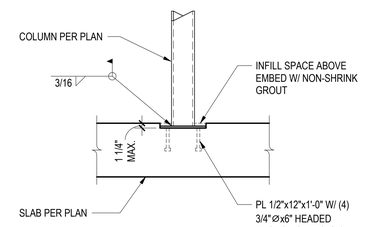
NOTE:
SEE 2/S6.02 WHERE STAIR BEARS ON SLAB-ON-GRADE OR PT SLAB



Typical Stair Framing Plan 18 (6045)

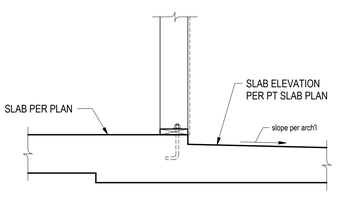
19

20



5605

21



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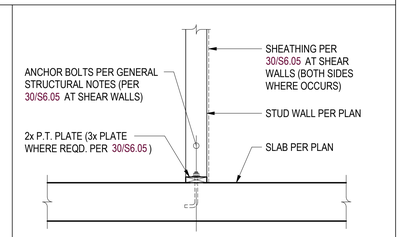
Exterior Sill at Step 22 (6018)

23



SINGLE WALL

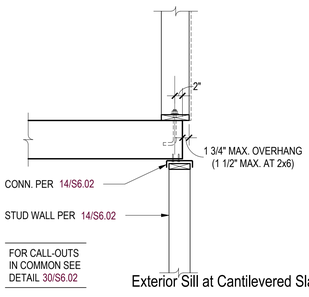
Interior Sill 24 (6017)

25

26

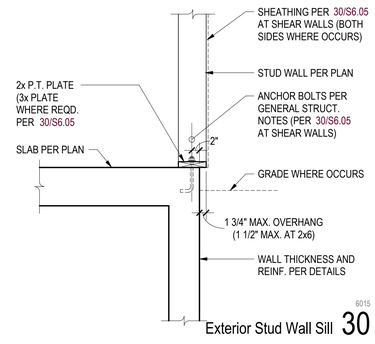
27

28



FOR CALL-OUTS IN COMMON SEE DETAIL 30/S6.02

Exterior Sill at Cantilevered Slab 29 (6016)



Exterior Stud Wall Sill 30 (6015)

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PROJECT
Little Saigon Landmark

LOCATION
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Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

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TITLE
TYPICAL WOOD FRAME DETAILS

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S6.02

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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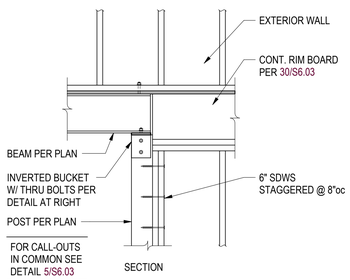

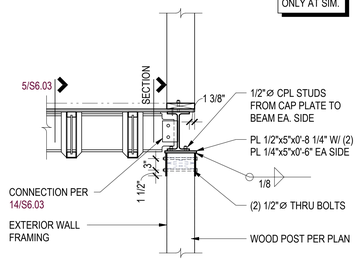

5606
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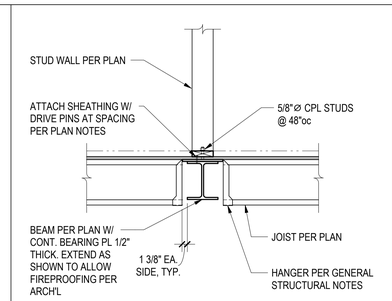
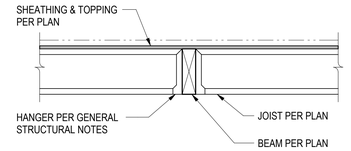
3

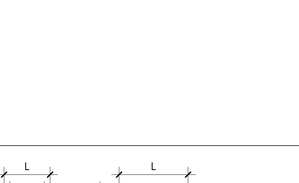
4



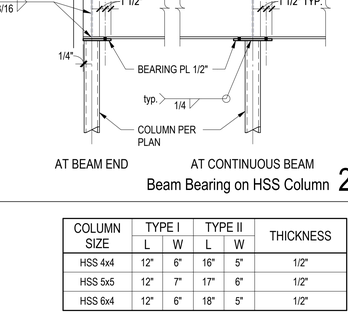
Beam Below Wall
6023
5



TJI to Flush Beam Connection
6022
6



Beam to Beam Connection
5604
7

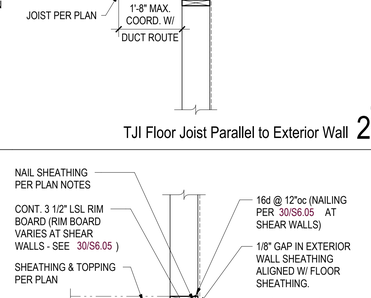


FOR CALL-OUTS IN COMMON SEE DETAIL 2/S6.03

5603
8

9

10



FOR CALL-OUTS IN COMMON SEE DETAIL 18/S6.03

TJI Floor Joist Parallel to Interior Wall
6024
12

STANDARD BEAM CONNECTION SCHEDULE				
BEAM SIZE	BOLT SIZE (A325N)	NO. OF BOLTS U.O.N.	PL THICKNESS	WELD SIZE
W10	3/4"ø	2	1/4"	3/16"

Shear Plate Connection Schedule
5602
14

6607
15

FOR CALL-OUTS IN COMMON SEE DETAIL 24/S6.03

TJI Floor Joists Parallel/Perpendicular
6030
16

17

TJI Floor Joist Perpendicular to Interior Wall
6029
18

SECTION 1 AT INCOMING BEAMS W/ STANDARD CONNECTIONS

Beam Bearing on HSS Column
5601
20

FOR CALL-OUTS IN COMMON SEE DETAIL 22/S6.03

6606
21

FOR CALL-OUTS IN COMMON SEE DETAIL 24/S6.03

Typical Recessed ERV Unit at Joists
6603
22

FOR CALL-OUTS IN COMMON SEE DETAIL 30/S6.03

AT WALL OPENINGS

TJI Floor Joist Parallel to Exterior Wall
6031
24

COLUMN SIZE	TYPE I L	TYPE I W	TYPE II L	TYPE II W	THICKNESS
HSS 4x4	12"	6"	16"	5"	1/2"
HSS 5x5	12"	7"	17"	6"	1/2"
HSS 6x4	12"	6"	18"	5"	1/2"

NOTES:
1. INSTALL OFFSET BASE PLATE AT WALL ENDS AND CORNER BASE PLATE AT WALL CORNERS WHERE REQUIRED.
2. WHERE OFFSET TYPE II BASE PLATE IS REQUIRED, TRUNCATE (1) SIDE AND INSTALL (2) BOLT CONNECTION AT OPPOSITE SIDE AS SHOWN.

Base Plate - HSS or Pipe Column
5600
26

27

28

AT WALL OPENINGS

TJI Floor Joist Perpendicular to Exterior Wall
6033
30

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801 SECOND AVENUE, SUITE 900
SEATTLE, WA 98104

(206) 343-0460 www.cplinc.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
TYPICAL WOOD FRAME DETAILS

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S6.03

ORIGINAL SHEET SIZE 30" x 42"

90% CD SET

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TITLE
TYPICAL ROOF FRAMING DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S6.04

90% CD SET

ORIGINAL SHEET SIZE 30" x 42"

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1

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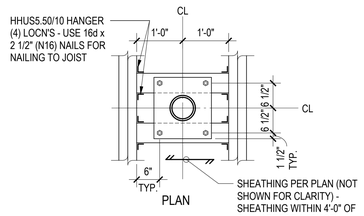
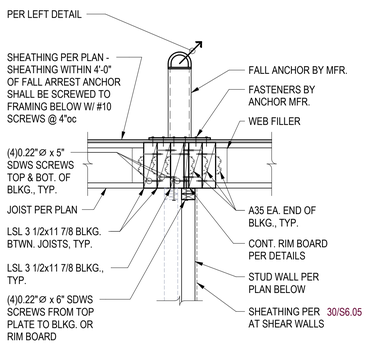


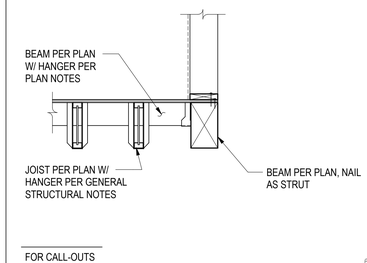
FALL ARREST ANCHORS AT I-JOISTS

*NOTE:
CONTRACTOR SHALL VERIFY DESIGN BUILD FALL-ARREST ANCHOR SYSTEM IS COMPATIBLE W/ FRAMING & CONNECTIONS SHOWN. COORDINATE ANCHOR LOCATIONS & SUPPORT CONFIGURATION W/ JOIST MANUFACTURER PRIOR TO JOIST FABRICATION.



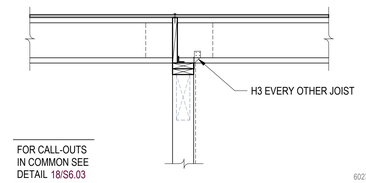
FALL ARREST ANCHORS OVER BEARING WALLS

6060
Fall Arrest Anchor @ Joists 10



FOR CALL-OUTS IN COMMON SEE DETAIL 24/S6.03

6605
TJI Roof Joists Parallel/Perpendicular 5



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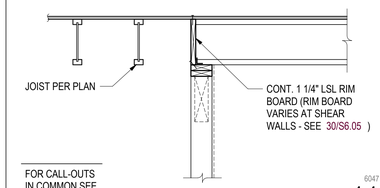
6027
TJI Roof or Floor Joists Perpendicular to Wall Below 6

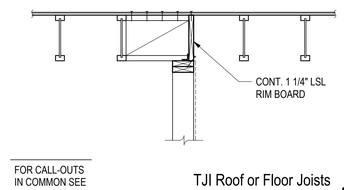
7

8



FOR CALL-OUTS IN COMMON SEE DETAIL 24/S6.03

6047
TJI Roof Joists Parallel/Perpendicular 11



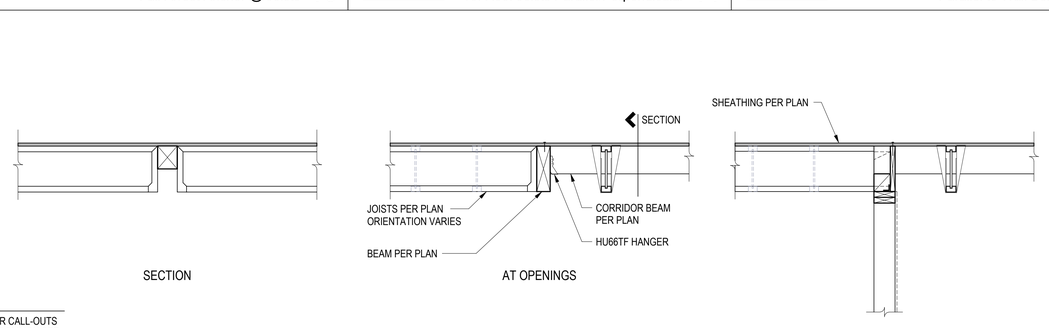
FOR CALL-OUTS IN COMMON SEE DETAIL 12/S6.03

6028
TJI Roof or Floor Joists Parallel to Wall Below 12

13

14

15



FOR CALL-OUTS IN COMMON SEE DETAIL 30/S6.01

6608
Typical Corridor Framing at Roof 18

19

20

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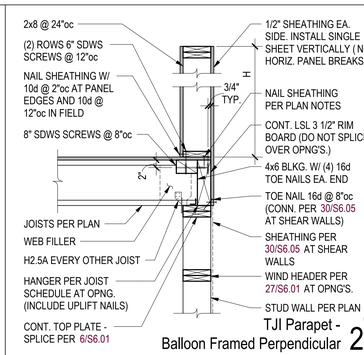
22

23



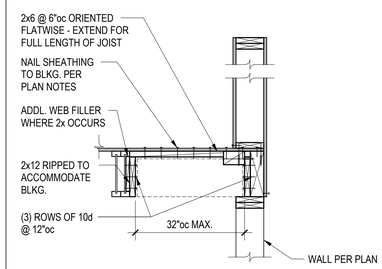
6051
TJI Parapet - Balloon Framed Perpendicular 24

25

26

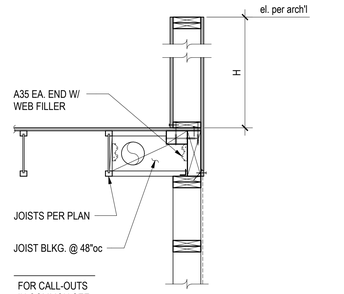
27

28



FOR CALL-OUTS IN COMMON SEE DETAIL 24/S6.04

6604
Typical Recessed ERV Unit at Joists 29



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6052
TJI Parapet - Balloon Framed Parallel 30

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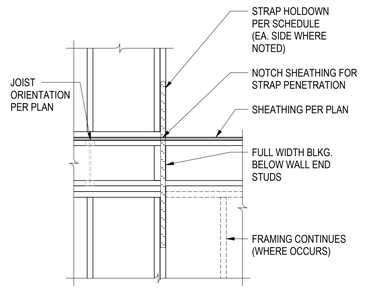


6602

Strap Holdown - TJI Joists 9

4

5

6

7

8

9

13

14

MARK	HOLDOWN ①	MIN. NUMBER STUDS, U.O.N. ②	LOAD (ASD)	DETAIL REF.
HSX	CMSTC16	2	4.7k	9/S6.05
HDB	-	-	-	-
HDC	-	-	-	-

HOLDOWN SCHEDULE NOTES :
① HOLDOWN TYPES REFER TO SIMPSON STRONG-TIE CATALOG CALLOUTS.
② NAIL SHEATHING TO STUDS RECEIVING HOLDOWN W/ SCHEDULED PANEL EDGE NAILING. STAGGER NAILS SO THAT EACH STUD IS NAILED.

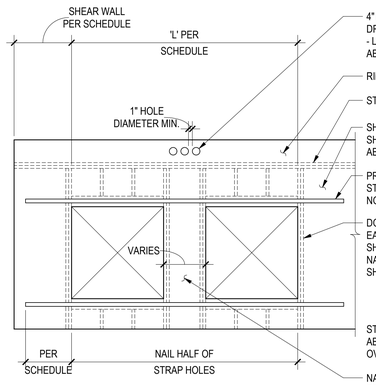
6601

Simpson Strong Tie Holdown Schedule 15

19

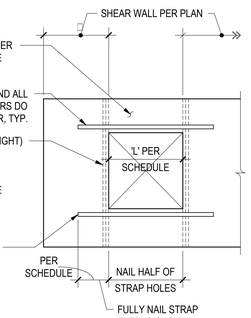
25

NOTE:
THIS DETAIL APPLIES AT OPENINGS IN ALL SHEAR WALLS.



MULTIPLE OPENINGS
(2 OR 3 OPENINGS DEPENDING ON LOCATION)

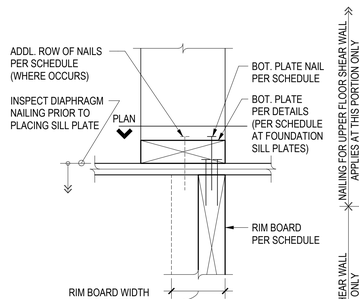
STRAPS AT SHEAR WALLS		
OPENING SPAN	STRAP TYPE	STRAP EXTENSION
'L' ≥ 1'-4"	CS16	16"
1'-4" ≤ 'L' ≤ 7'-0"	CMSTC16	20"
7'-0" < L ≤ 13'-0"	CMSTC14	24"



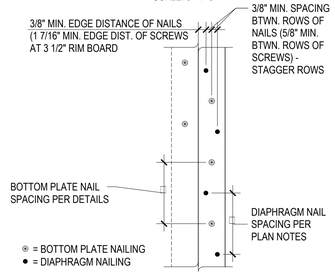
TYPICAL OPENING

6502

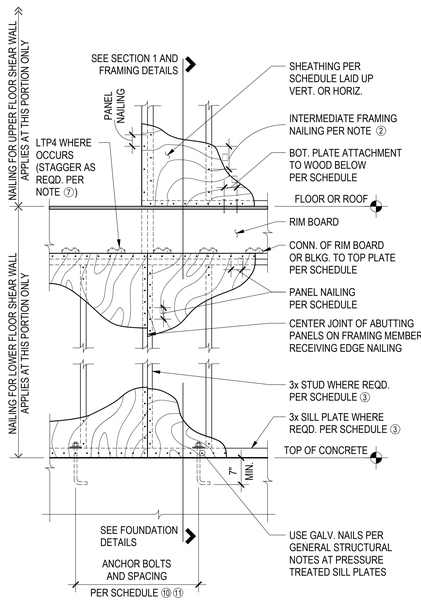
Typical Opening in Shear Walls 27



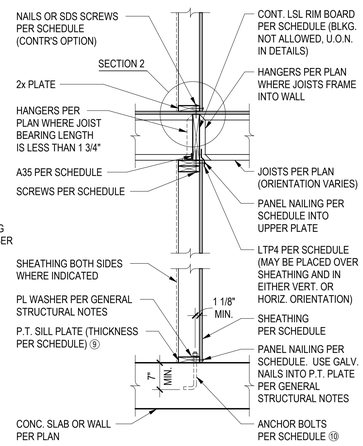
SECTION 2
SCALE: 3"=1'-0"



PLAN
SCALE: 3"=1'-0"



ELEVATION
TYPICAL SHEAR WALL NAILING CONVENTION



SECTION 1

	MARK	SHEATHING ①	0.148" x 2 1/2" PANEL NAILING ②	THICKNESS OF STUD OR BLOCKING AT ABUTTING PANEL EDGES, AND THICKNESS OF FOUNDATION SILL PLATE ③	MINIMUM LSL OR LVL RIM BOARD THICKNESS (BASED ON SHEAR WALL BELOW RIM BOARD) ④	CONNECTION OF RIM BOARD OR BLOCKING TO TOP PLATE (BASED ON SHEAR WALL BELOW RIM BOARD) ⑧			BOTTOM PLATE ATTACHMENT ⑧		ANCHOR BOLTING TO CONCRETE ⑨ ⑩ ⑪		LRFD CAPACITY (PLF)
						A35 CLIPS	LTP4 CLIPS ⑦	0.220"Ø x 5" SDWS SCREWS ⑤	0.148" x 3 1/4" NAILS ⑤	0.220"Ø x 5" SDWS SCREWS ⑤	5/8"Ø	3/4"Ø	
DOUGLAS FIR FRAMING	W6	1/2"	6"oc	2x	1 3/4"	22"oc	23"oc	14"oc	5"oc	14"oc	48"oc	48"oc	495
	W4	1/2"	4"oc	3x	1 3/4"	15"oc	15"oc	9"oc	4"oc	9"oc	47"oc	48"oc	735
	W3	1/2"	3"oc	3x	3 1/2"	12"oc	12"oc	10"oc	(2) ROWS @ 5"oc	10"oc	36"oc	47"oc	960
	W2	1/2"	2"oc	3x	3 1/2"	9"oc	9"oc	8"oc	(2) ROWS @ 4"oc	8"oc	28"oc	36"oc	1230
	W2-5/8	5/8"	2"oc	3x	3 1/2"	8"oc	8"oc	(2) ROWS @ 14"oc	(2) ROWS @ 3"oc	(2) ROWS @ 14"oc	25"oc	32"oc	1390
	2W4	1/2" EA. SIDE ⑥	4"oc	3x	3 1/2"	7"oc	7"oc	(2) ROWS @ 12"oc	(2) ROWS @ 3"oc	(2) ROWS @ 12"oc	23"oc	30"oc	1470
	2W3	1/2" EA. SIDE ⑥	3"oc	3x	3 1/2"	6"oc	6"oc	(2) ROWS @ 10"oc	NOT ALLOWED	(2) ROWS @ 10"oc	18"oc	23"oc	1920
	2W2	1/2" EA. SIDE ⑥	2"oc	3x	3 1/2"	9"oc EA. SIDE	9"oc EA. SIDE	(2) ROWS @ 8"oc	NOT ALLOWED	(2) ROWS @ 8"oc	14"oc	18"oc	2465
	2W2-5/8	5/8" EA. SIDE ⑥	2"oc	3x	3 1/2"	8"oc EA. SIDE	8"oc EA. SIDE	(2) ROWS @ 7"oc	NOT ALLOWED	(2) ROWS @ 7"oc	12"oc	16"oc	2785

SHEAR WALL SCHEDULE NOTES :
① SHEATHING SHALL CONSIST OF 15/32" OSB (19/32" OSB AT W2-5/8) AT INTERIOR WALLS, AND 1/2" PLYWOOD AT EXTERIOR WALLS. OSB SHALL NOT BE SUBSTITUTED FOR PLYWOOD OR VICE VERSA . SHEATHING SHALL HAVE A MINIMUM SPAN RATING OF 24/0.
② PANEL NAILING APPLIES TO ALL SHEATHING PANEL EDGES. INSTALL BLOCKING AT ALL UNFRAMED PANEL EDGES. NAIL SHEATHING TO INTERMEDIATE FRAMING WITH PANEL NAILS AT 12"oc. NAIL TO BE PLACED AT LEAST 3/8" FROM PANEL EDGES AND THE EDGE OF CONNECTING MEMBERS.
③ DOUBLE 2x MEMBERS MAY BE SUBSTITUTED FOR 3x MEMBERS AND 3x FOUNDATION PLATES. WALL STUDS SHALL BE FACE NAILED TOGETHER PER THE BOTTOM PLATE ATTACHMENT COLUMN OF THE SCHEDULE. DOUBLE 2x FOUNDATION SILL PLATES SHALL BE NAILED TOGETHER W/ 10d @ 4"oc, STAGGERED.
④ SEE PLANS AND DETAILS FOR LOCATIONS WHERE THICKER RIM BOARD MAY BE REQUIRED.
⑤ SEE PLAN VIEW FOR MINIMUM ROW SPACING AND MINIMUM EDGE DISTANCE.
⑥ WHERE PANELS ARE APPLIED TO EACH FACE OF A WALL, PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING MEMBERS.
⑦ CLIPS SHALL BE INSTALLED W/ 0.131 x 2 1/2" NAILS IN ALL HOLES. WHERE CLIPS ARE REQUIRED EACH SIDE, CLIPS SHALL BE STAGGERED TO AVOID NAIL INTERFERENCE.
⑧ CONTRACTOR MAY USE EITHER OF THE CONNECTION OPTIONS INDICATED AND MAY COMBINE A35 CLIPS ON ONE SIDE OF WALL WITH LTP4 ON THE OPPOSITE SIDE.
⑨ PLATE WASHERS IN 2x4 STUD WALLS AND ALL SINGLE SIDED SHEAR WALLS SHALL BE 3"x3"x0.229". DOUBLE SIDED 2x6 SHEAR WALLS SHALL HAVE 4 1/2"x3"x0.229" PLATE WASHERS. DOUBLE SIDED 2x8 SHEAR WALL SHALL HAVE 6 1/4"x3"x0.229" PLATE WASHERS. PLATE WASHER SHALL HAVE A STANDARD HOLE. THE HOLE IN THE PLATE WASHER IS PERMITTED TO BE DIAGONALLY SLOTTED WITH A WIDTH OF UP TO 3/16" LARGER THAN THE BOLT DIAMETER AND A SLOT LENGTH NOT TO EXCEED 1 3/4" PROVIDED A STANDARD CUT WASHER IS PLACED BETWEEN THE PLATE WASHER AND NUT. THE EDGE OF PLATE WASHERS SHALL BE LOCATED WITHIN 1/2" (1" WHERE THE FOUNDATION SILL PLATE IS A 3x) OF THE EDGE OF THE BOTTOM PLATE ON THE SIDE(S) WITH SHEATHING.
⑩ INSTALL ADDITIONAL ANCHOR BOLTS EACH SIDE OF PLATE BREAKS AND PENETRATIONS EXCEEDING THE "NO REINFORCING" HOLE SIZE PER 4/S6.01 .
⑪ ANCHOR BOLTS IN CONFLICT WITH HOLDOWN COMPRESSION STUDS SHALL BE INSTALLED OUTSIDE THE STUD PACK, AND LOCATED NO CLOSER THAN 6" FROM AN ADJACENT ANCHOR BOLT.

6500

Shear Wall Schedule - Plywood 30

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DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / OPCD APPROVAL STAMP

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SHEARWALL SCHEDULE AND DETAILS

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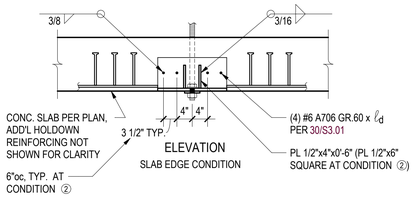
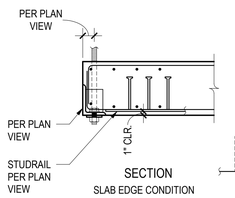
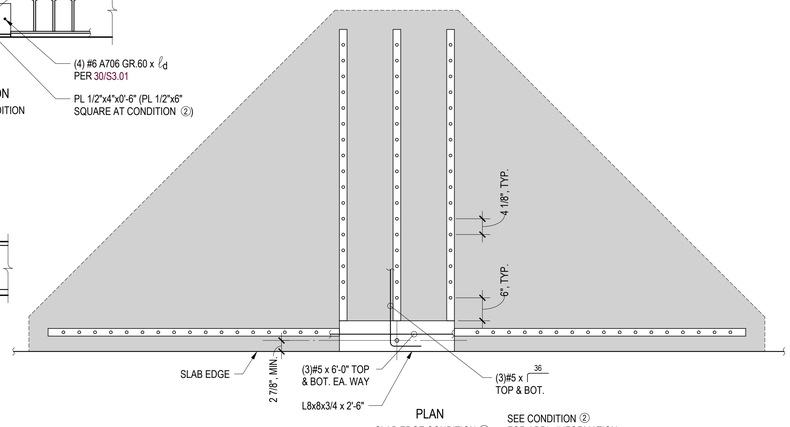


ELEVATION
SLAB EDGE CONDITION



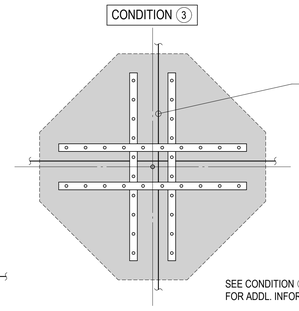
SECTION
SLAB EDGE CONDITION



PLAN
SLAB EDGE CONDITION ②
(5) RAILS W/ (17)3/4"Ø STUDS

SEE CONDITION ② FOR ADDL. INFORMATION

CONDITION ③

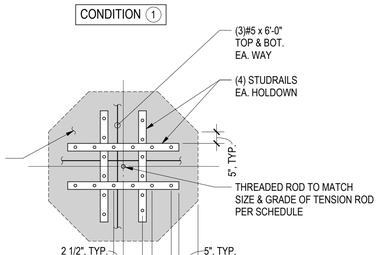


PLAN

SEE CONDITION ① FOR ADDL. INFORMATION

SLAB PENETRATIONS ARE NOT ALLOWED IN SHADED REGION AT STUD RAIL REINF. SHEAR ZONES WITHOUT ENGINEER APPROVAL, TYP. AT ALL STUDRAIL CONFIGURATIONS

CONDITION ①



PLAN
MID SLAB CONDITION ①
(4) RAILS W/ (6)1/2"Ø STUDS EA.

7

NOTE:
PROVIDE 1" COVER TOP AND 1" COVER BOTTOM OF STUD RAIL.

SECTION
(MID-SLAB CONDITION)

SECTION
(SLAB EDGE)

SEE CONDITION ① FOR ADDL. INFORMATION

PLAN
SLAB EDGE CONDITION ①
(4) RAILS W/ (7)3/4"Ø STUDS

SECTION
(CONCRETE WALL OR COLUMN CONDITION)

PLAN
NEAR SLAB EDGE CONDITION ②
(2) RAILS W/ (12)1/2"Ø STUDS &
(2) RAILS W/ (14)1/2"Ø STUDS

PLAN
NEAR SLAB EDGE CONDITION ①
(4) RAILS W/ (6)1/2"Ø STUDS EA.
(SEE MID SLAB CONDITION ① FOR CALLOUTS IN COMMON)

HOLDOWN LOAD TABLE								
NET TENSION (T) & COMPRESSION (C) LOADS KIPS ⑤								
LOCATION	RUN TYPE							
	A		B		C		D	
	T	C	T	C	T	C	T	C
7	1	2	3	7	4	8	6	10
6	2	4	5	22	10	26	20	37
5	3	6	10	36	20	44	41	68
4	6	10	17	52	35	66	61	99
3	10	15	28	70	50	92	82	130
2	18	25	43	90	68	116	102	156
ANCHOR ROD SIZE	3/4" Ø F1554 GR.55		7/8" Ø A193 B7		1 1/8" Ø A193 B7		1 1/2" Ø A193 B7	
HOLDOWN CONDITION	**		①		①		②	

** CONTRACTOR MAY OMIT STUDRAILS PER NOTE AT RIGHT.

HOLDOWN NOTES:
1. HOLDOWN FORCES PROVIDED ARE LRFD VALUES. SEE GENERAL STRUCTURAL NOTES FOR MORE INFORMATION.
2. STUDRAIL ASSEMBLIES ARE SUBJECT TO REVIEW BY THE ENGINEER FOR ADEQUACY WHERE THE ACTUAL EMBED HOLDOWN ROD HAS A MATERIAL GRADE OR ROD DIAMETER THAT DIFFERS THAN THOSE NOTED ABOVE.
3. CHUBBY SMACK ANCHORS ARE MANUFACTURED BY EARTHBOUND CORPORATION. SPECIFIC ANCHOR SEATS SHALL BE SELECTED BASED ON FINAL TENSION ROD SIZE AND MATERIAL GRADE. CONTRACTOR MAY SUBMIT ALTERNATE ANCHOR SEAT FOR REVIEW AND APPROVAL BY THE ENGINEER OF RECORD.
4. ANCHOR ROD SIZES SHALL BE INSTALLED AS SHOWN. SUBSTITUTIONS ARE NOT ACCEPTABLE. NOTIFY ENGINEER IF EXACT ROD SIZE IS NOT AVAILABLE.
5. THE COMPRESSION STUD QUANTITY TABLE IS FOR BIDDING PURPOSES ONLY. THE CONTRACTOR SHALL SELECT THE NUMBER OF STUDS FOR EACH HOLDOWN RUN BASED ON THE HOLDOWN LOAD TABLE. COMPRESSION CAPACITIES PROVIDED ARE ASSUMING A STUD HEIGHT OF 8'-5" OR LESS. FINAL DESIGN SHALL BE COMPLETED PER GENERAL STRUCTURAL NOTE [GSN-W14].
6. STUDRAILS MAY BE INVERTED AT CONTRACTOR'S OPTION.
7. STUDRAILS MAY BE FIELD CUT INTO SEGMENTS AT CLOSURE POURS AT CONTRACTOR'S OPTION. MAINTAIN 1 1/2" BETWEEN CUT AND BASE OF STUD AND ALIGN SEGMENTS TO MAINTAIN STUD SPACING.

COMPRESSION STUD QUANTITY TABLE							
COMPRESSION LOAD (k)	APPROXIMATE COMPRESSION STUD QUANTITY ⑤						
	2x4	2x6	2x8	3x4	4x4	4x6	4x8
20	6	3	2	4	3	2	1
40	11	6	4	7	5	3	2
60	17	8	6	10	7	5	3
80	22	11	8	13	10	6	4
100	27	13	10	17	12	8	5
120	33	16	12	20	14	9	6
140	38	19	14	23	17	11	6
160	43	21	16	26	19	12	7

**STUDRAILS MAY BE OMITTED WHERE TENSION LOAD IN SCHEDULE IS LESS THAN 18 KIPS (LRFD) AND ROD IS 1'-6" MIN. FROM SLAB EDGE. INSTALL 3/4" Ø GR. 55 ROD AT THESE CONDITIONS. ADDITIONAL MILD REINFORCEMENT STILL REQUIRED.

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mithun.com

COUGHLIN PORTER LUNDEEN

801 SECOND AVENUE, SUITE 900
SEATTLE, WA 98104

(206) 343-0460 www.cplinc.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / OPCD APPROVAL STAMP

TITLE
SELF TIGHTENING HOLDOWN DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S6.06

90% CD SET

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ORIGINAL SHEET SIZE 24"X 36"

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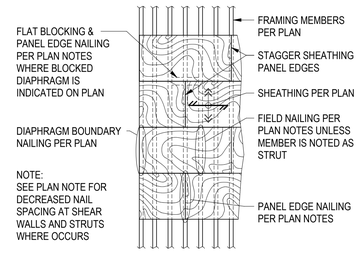


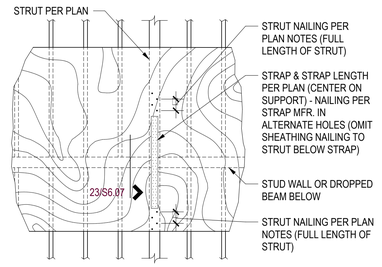
TYPICAL SHEATHING LAYOUT & NAILING

6060

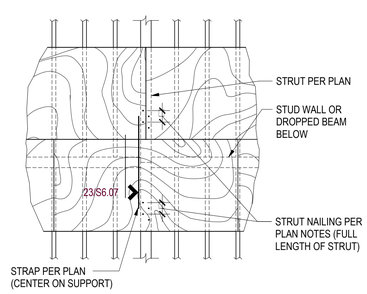
Typical Diaphragm Nailing 12

13

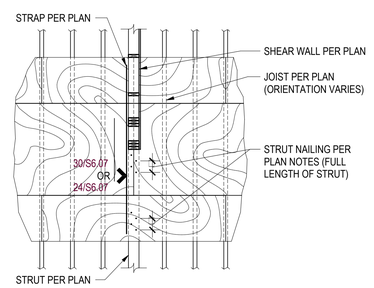
14



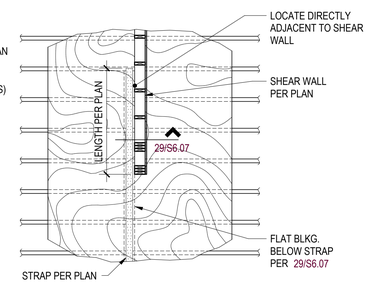
STRUT TO STRUT
(STRAP ON TOP OF SHEATHING)



STRUT TO STRUT
(PLACED ON SIDE OF STRUT)



STRUT TO SHEAR WALL



STRAP PARALLEL TO SHEAR WALL

6061

Diaphragm Partial Plans 18

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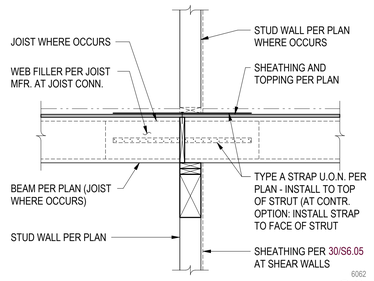
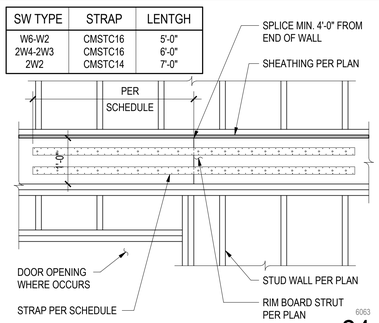


6062

Strut to Strut Connection 23

SW TYPE	STRAP	LENTGH
W6-W2	CMSTC16	5'-0"
2W4-2W3	CMSTC16	6'-0"
2W2	CMSTC14	7'-0"



6063

Rimboard Strut Connection 24

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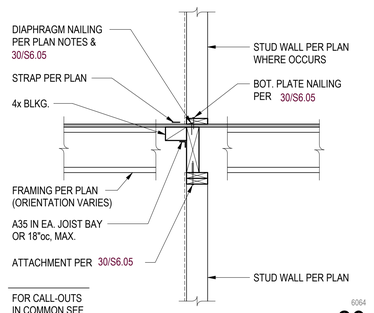
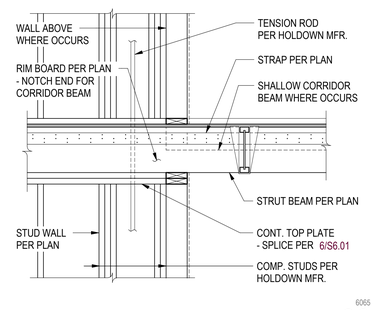


FOR CALL-OUTS IN COMMON SEE DETAIL 18/S6.03

6064

Offset Strut Connection 29



6065

Strut to Shear Wall 30

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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

DESIGN PARTNER
CSD
PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

SEAL

SEATTLE DCI / DPCD APPROVAL STAMP

TITLE
MULTI-FAMILY-DIAPHRAGM NAILING AND STRUT DETAILS

PROJECT NO.
S23138
DATE
02/07/25
SHEET NUMBER
S6.07

ORIGINAL SHEET SIZE 36" x 42"

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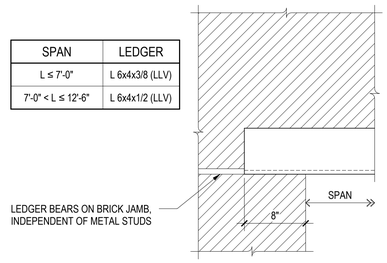
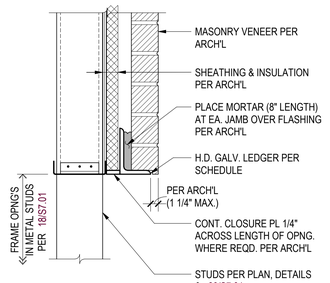
SPAN	LEDGER
L ≤ 7'-0"	L 6x4x3/8 (LLV)
7'-0" < L ≤ 12'-6"	L 6x4x1/2 (LLV)

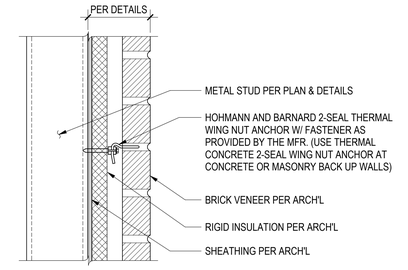




1 1/2" = 1'-0" 7011
Independent Masonry Veneer Angle Lintel 4

HORIZ. ANCHOR SPACING	MAX. VERT. SPACING OF ANCHORS ①
12"oc	18"oc
16"oc	18"oc
24"oc	12"oc

① PLACE ANCHORS @ 8"oc AT VERT. EDGES OF ALL OPNG'S. ANCHORS SHALL BE LOCATED 12" MAX. FROM EDGE OF OPNG. IN PLAN (ADD ADDL. WALL STUDS AS REQD.).



BRICK VENEER

1 1/2" = 1'-0" 7010
Masonry Veneer Anchors w/ Metal Stud Backing 6

7

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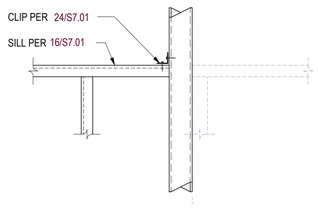
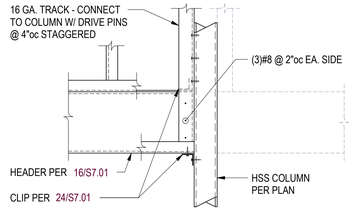
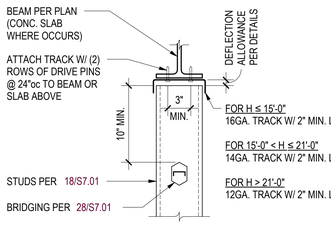


SILL CONNECTION AT STEEL COLUMNS

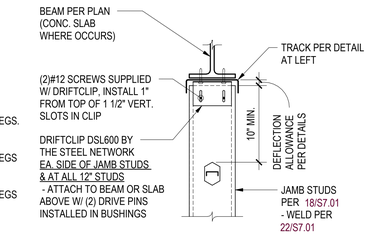


HEADER CONNECTION AT STEEL COLUMNS

7008
Header Connections to HSS Columns 10



TYP. 6", 8" & 10" WALL STUDS



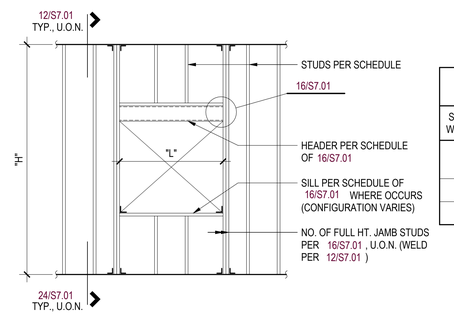
JAMB STUDS & TYP. 12" STUDS

NOTES:
1. CONNECTIONS SHOWN ON THIS DETAIL APPLY TO THE TOP OF TYPICAL SIMPLE SPANNING WALL STUDS WHERE DEFLECTION ALLOWANCE OCCURS.
2. SEE DETAILS FOR OTHER CONNECTIONS WHERE STUDS BYPASS SLAB EDGE OR SUPPORTING BEAMS OR WHERE HANGING SPANDREL TYPE CONDITIONS OCCUR.

1 1/2" = 1'-0" 7007
Typical Exterior Stud Head Conn's 12

13

16



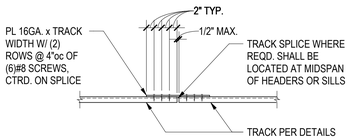
TYPICAL SIMPLE SPANNING STUD WALL SCHEDULE		
STUD WIDTH	CLEAR HEIGHT "H"	STUD WALL TYPE PER 30/S7.01 , U.O.N.
6"	H ≤ 14'-0"	S-618
	14'-0" < H ≤ 15'-6"	S-616
8"	H ≤ 15'-0"	S-818
8"	15'-0" < H ≤ 20'-0"	S-816

1 1/2" = 1'-0" 7006
Typ. Wind Header Schedule 16

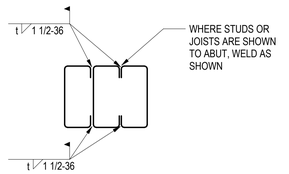
3/8" = 1'-0" 7001
Exterior Wall Schedule 18

19

20

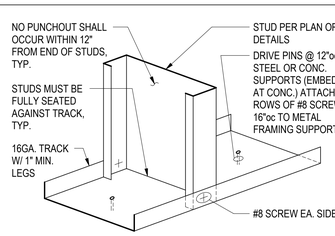


7004
Track Splice 21

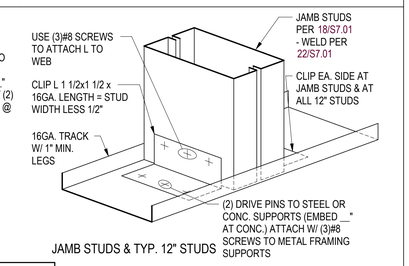


t = GAGE OF MATERIAL CONNECTED

3" = 1'-0" 7005
Multiple Stud or Joist Connection 22



TYP. 6", 8" & 10" WALL STUDS



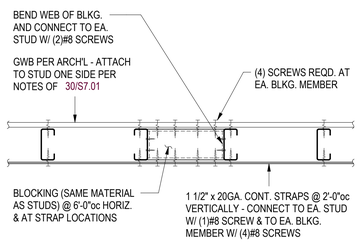
JAMB STUDS & TYP. 12" STUDS

NOTES:
1. CONNECTIONS SHOWN ON THIS DETAIL APPLY TO THE TOP OR BOTTOM OF TYPICAL SIMPLE SPANNING WALL STUDS SUBJECT TO WIND LOADING. SEE FOR CONNECTIONS AT TOP OF WALLS WHERE DEFLECTION ALLOWANCE OCCURS.
2. SEE DETAILS FOR OTHER CONNECTIONS WHERE STUDS BYPASS SLAB EDGE OR SUPPORTING BEAMS OR WHERE HANGING SPANDREL TYPE CONDITIONS OCCUR.

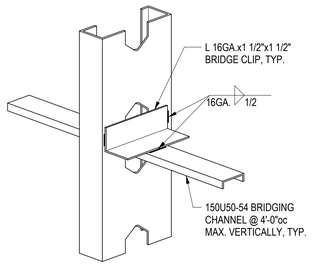
7003
Typical Exterior Stud Sill Conn's 24

25

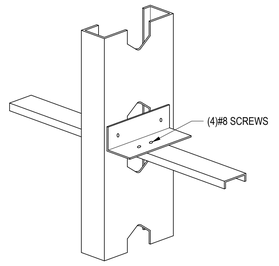
26



7013
Alternate Bridging for Metal Stud Wall 26



WELDED OPTION



SCREWED OPTION

7002
Bridging for Metal Stud Wall 28

METAL FRAMING NOTES:

1. METAL FRAMING USED SHALL CONFORM TO THE SPECIFICATIONS OUTLINED IN THE GENERAL NOTES IN ADDITION TO REQUIREMENTS NOTED HERE.
2. METAL FRAMING & STRAP BRACING SHALL BE G60 GALVANIZED UNLESS OTHERWISE NOTED, CONFORMING AS FOLLOWS:

   12, 14, AND 16 GAGE — ASTM A653 OR A1003, GRADE 50
   18 AND 20 GAGE — ASTM A653 OR A1003, GRADE 33
3. ALL STUDS & STUD GROUPS SHALL BE LATERALLY SUPPORTED TO PREVENT WEAK AXIS BUCKLING BY CONNECTING EACH FLANGE TO GYPSUM WALLBOARD PER ASTM C1280.
4. WALLS WHICH HAVE SHEATHING CONNECTED ON ONE SIDE ONLY IN EITHER A TEMPORARY OR PERMANENT CONDITION SHALL BE LATERALLY SUPPORTED BY DETAIL 28/S7.01 OR 26/S7.01.

   BRIDGING PROVIDES RESISTANCE TO ROTATION CAUSED BY WIND LOADING, AND RESISTANCE TO BOTH ROTATION AND MINOR AXIS BENDING CAUSED BY AXIAL LOADING.
5. TRACK SECTIONS SHALL BE UNPUNCHED AND HAVE AT LEAST 1" FLANGES. USE OF SLOTTED TRACK IS NOT PERMITTED UNLESS SPECIFICALLY APPROVED BY ENGINEER OF RECORD.
6. WELDING OF COLD-FORMED METAL FRAMING SHALL CONFORM TO AWS D1.3 AND SHALL BE PERFORMED BY WELDERS QUALIFIED TO PRODUCE THE SPECIFIED CLASSES OF WELD.
7. WALL FRAMING: TWO STUDS MINIMUM SHALL BE PROVIDED AT THE END OF ALL WALLS AND AT EACH SIDE OF ALL OPENINGS. SEE 18/S7.01 FOR WALL SCHEDULE & FRAMING OF OPENINGS, U.O.N.
8. SEE ARCH'L FOR SIZING & DETAILING OF INTERIOR, NON-BEARING WALLS.
9. SEE 7009/--- FOR CONNECTION OF STUDS TO INTERIOR OR EXTERIOR BRACED FRAME BRACES.

METAL STUD WALL TYPES:

WALL DESIGNATION	STUD TYPE	SPACING
S-418	400S137-43	16"oc
S-616	600S137-54	16"oc
S-616-12	600S137-54	12"oc
S-618	600S137-43	16"oc
S-816	800S162-54	16"oc
S-818	800S162-43	16"oc

NOTE:
SEE PLAN FOR LOCATIONS OF STRUCTURAL STUD GROUPS DESIGNATED <X> WHICH SUPPORT BEAMS OR JOISTS. WELD STUD GROUPS TOGETHER PER 22/S7.01 .

7000
Metal Framing Notes 30

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PREPARED FOR
SCIDpda / Friends of Little Saigon

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PROJECT MANAGER
AVA
PROJECT ENGINEER
ADG, HES
DRAWN BY
KF
PROJECT TEAM MEMBERS

CHECK
AVA

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TITLE
TYPICAL METAL STUD DETAILS

PROJECT NO.
S23138

DATE
02/07/25

SHEET NUMBER
S7.01

90% CD SET

ORIGINAL SHEET SIZE 30" x 42"

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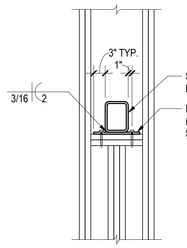
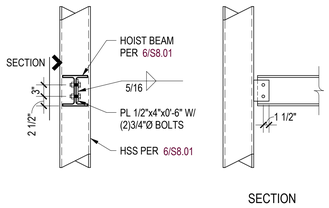


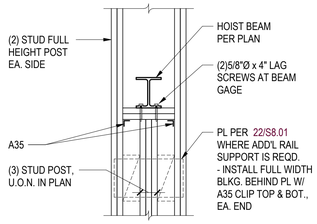
FOR CALL-OUTS IN COMMON SEE DETAIL 22/S8.01

HOIST BEAM BEARING ON WOOD WALL CONDITION

HSS Hoist Beam Support Framing 8014 **2**



HOIST BEAM CONNECTING TO HSS COLUMN CONDITION
(WHERE "H" > 5'-0")



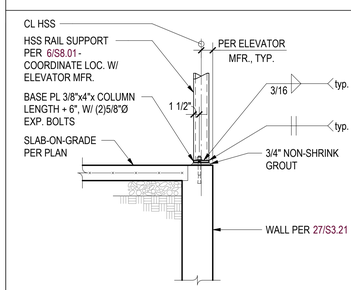
HOIST BEAM BEARING ON WOOD WALL CONDITION
(WHERE "H" ≤ 5'-0")

Hoist Beam Support Framing 8007 **4**

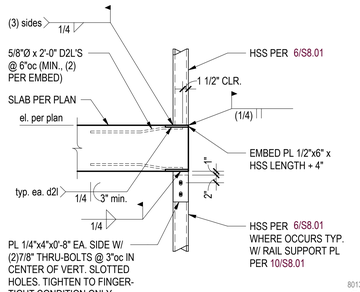
ELEVATOR SUPPORT MEMBER SCHEDULE				
ELEVATOR COMPONENT	ALLOWABLE MEMBER WIDTH	FLOOR TO FLOOR HEIGHT		
		0' < H ≤ 10'	10' < H ≤ 14'	14' < H ≤ 16'
COUNTERWEIGH T (CWT) COLUMN	4"	HSS 10x4x1/4	HSS 14x4 1/2	(2)HSS 10x4x3/8
	6"	HSS 6x6x1/4	HSS 8x6x5/16	HSS 10x6x3/8
CART (CAR) COLUMN	4"	HSS 10x4x1/4	HSS 14x4x1/2	(2)HSS 10x4x3/8
	6"	HSS 6x6x1/4	HSS 8x6x5/16	HSS 10x6x3/8
SPREADER BEAM	4"	« HSS 8x4x5/16 »		
	6"	« HSS 8x6x5/16 »		
HOIST BEAM	-	« W8x28 »		

NOTES:
1. COLUMNS AND SPREADER BEAM HAVE BEEN DESIGNED FOR 2.3 KIP SEISMIC LOAD WITH 1/4" MAX DEFLECTION, AND 0.6 KIP SERVICE LOAD WITH 1/8" MAX DEFLECTION. LOAD HAS BEEN ASSUMED TO OCCUR AT MID-SPAN (H/2) OF COLUMNS. AT CONTRACTORS OPTION, ELEVATOR SHOP DRAWINGS SHOWING LOAD VALUE(S), DEFLECTION REQUIREMENTS, AND LOAD LOCATION(S) SHALL BE SUBMITTED TO DESIGN TEAM FOR CONFIRMATION OF ELEVATOR SUPPORT MEMBERS.
2. PROVIDE RAIL SUPPORT PLATE PER 10/S8.01 AT ALL COLUMNS; COORDINATE ELEVATION OF PLATE(S) WITH ELEVATOR MANUFACTURER.
3. SEE 19/S8.01 FOR WELD DETAIL OF MULTI-POST COLUMNS.

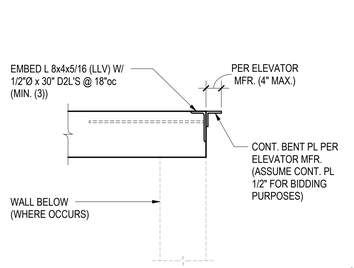
Partial Support Schedule 8001 **6**



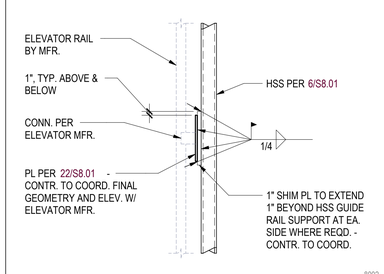
HSS Rail Support 8015 **7**



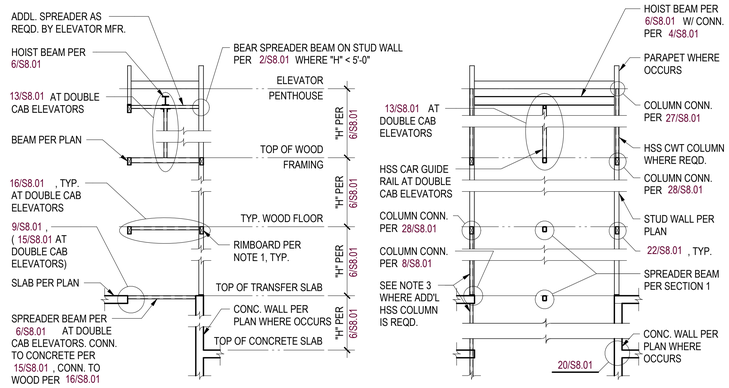
Rail Support Connection at Concrete 8013 **8**



Elevator Door Sill at Concrete Slab 8008 **9**



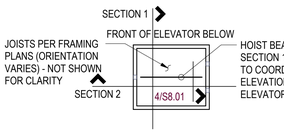
Rail Support Plate 8002 **10**



SECTION 1

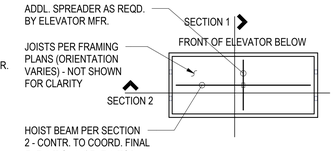
SECTION 2
(WIDTH VARIES)

SINGLE CAB

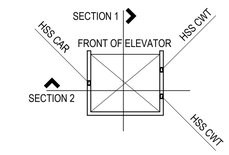


PENTHOUSE ROOF PLAN

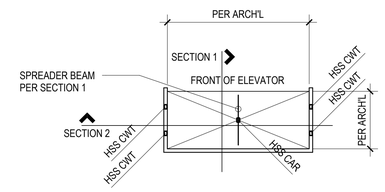
DOUBLE CAB



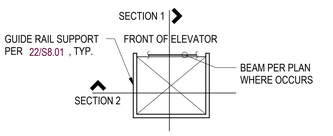
PENTHOUSE ROOF PLAN



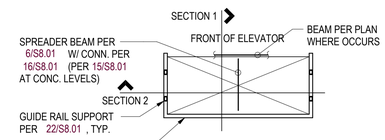
ATYPICAL PLAN
(WHERE RAIL ATTACHMENT DOES NOT ALIGN W/ FLOOR)



ATYPICAL PLAN
(WHERE RAIL ATTACHMENT DOES NOT ALIGN W/ FLOOR)



TYPICAL FLOOR PLAN
(WHERE RAIL ATTACHMENT ALIGNS W/ FLOOR)



TYPICAL FLOOR PLAN
(WHERE RAIL ATTACHMENT ALIGNS W/ FLOOR)

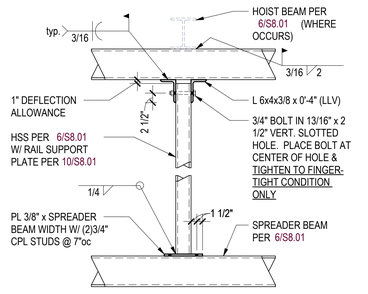
NOTES:
1. PROVIDE CONTINUOUS RIMBOARD PER 22/S6.01 AT 2 HOUR RATED SHAFT(S).
2. CONTRACTOR TO COORDINATE THE FINAL HSS CWT AND HSS CAR GUIDE RAIL COLUMN LOCATIONS AND QUANTITY WITH THE ELEVATOR MANUFACTURER.
3. ADDITIONAL HSS CWT AND HSS CAR COLUMNS WILL BE REQUIRED WHERE FLOOR-TO-FLOOR HEIGHT(S) EXCEED THE MAX. RAIL BRACKET SPACING PER ELEVATOR MANUFACTURER (12'-0" ASSUMED) - SEE 28/S8.01 WHERE THIS CONDITION IS APPLICABLE.
4. PROVIDE RAIL SUPPORT PLATE PER 10/S8.01 AT ALL HSS CWT AND CAR COLUMNS - COORDINATE ELEVATION OF PLATE(S) WITH ELEVATOR MANUFACTURER.

LEGEND:

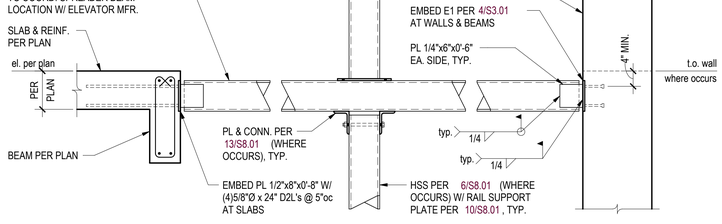
HSS CWT COUNTERWEIGHT GUIDE RAIL COLUMN PER SCHEDULE 10/S8.01 (SEE NOTES 2-4)

HSS CAR CART GUIDE RAIL COLUMN PER SCHEDULE 10/S8.01 (SEE NOTES 2-4)

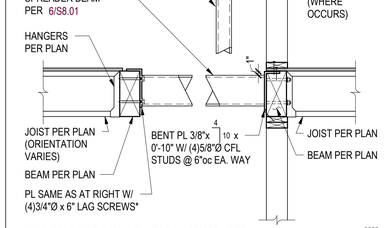
Partial Elevator Framing Plan 8000 **30**



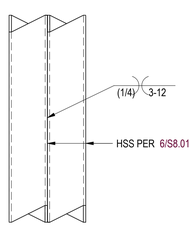
Guide Rail Support at Spreader Beam 8012 **13**



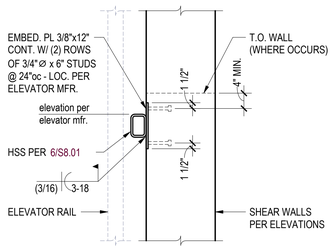
Spreader Beam Connection at Concrete 8009 **15**



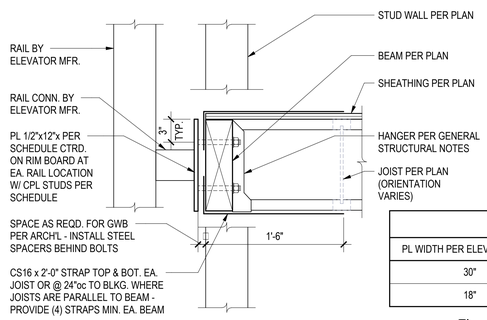
Spreader Beam Connection at Wood Framing 8003 **16**



Multiple Elevator Guide Rail Connection 8011 **19**



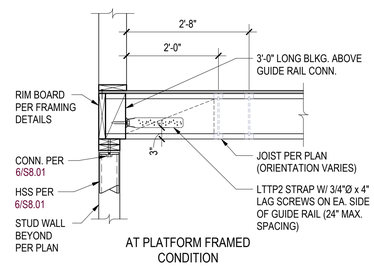
Elevator Rail Attachment - Concrete Wall 8010 **20**



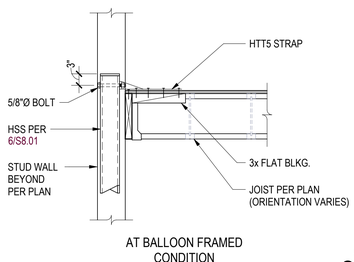
RAIL PL SCHEDULE	
PL WIDTH PER ELEVATOR MFR.	ATTACHMENT
30"	(6)5/8"Ø CPL STUDS @ 6"/10"oc
18"	(4)5/8"Ø CPL STUDS @ 6"/10"oc

1 1/2" = 1'-0"

Elevator Rail Attachment - Wood Framing 8004 **22**

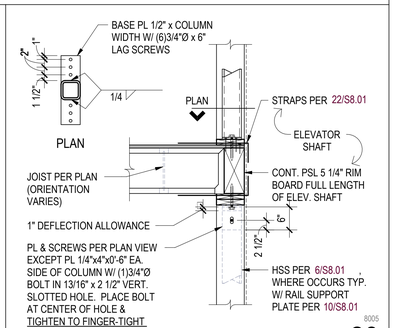


AT PLATFORM FRAMED CONDITION



AT BALLOON FRAMED CONDITION

Top of Guide Rail Support Connection 8006 **27**



Elevator Guide Rail - Conn at Floor - Wood 8005 **28**

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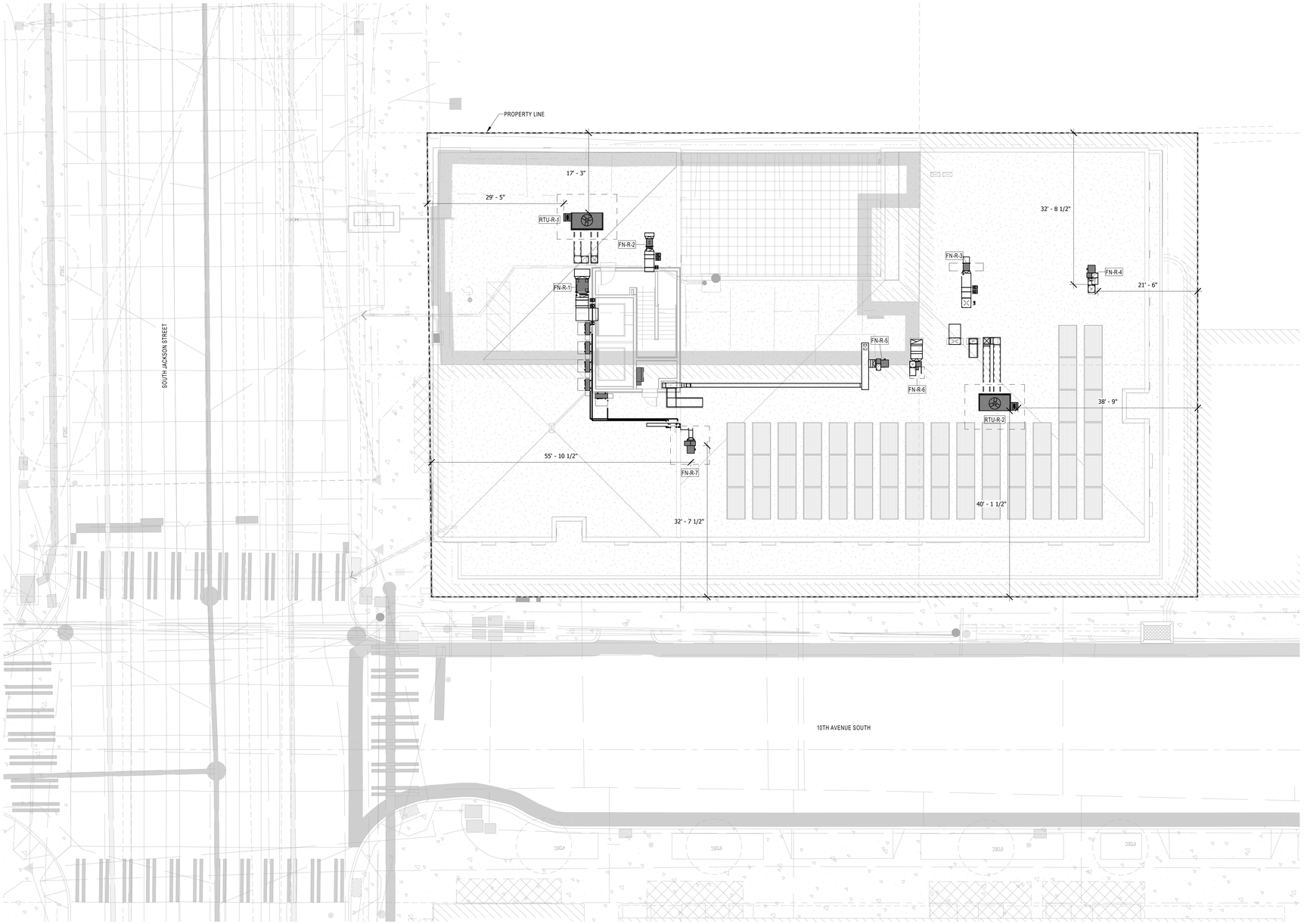

1 MECHANICAL SITE PLAN
1" = 10'-0"

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PROJECT
Little Saigon Landmark

LOCATION
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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE ISSUE

NO. DATE REVISION

PARTNER IN CHARGE

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

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TITLE
MECHANICAL SITE PLAN

PROJECT NO
2324000

DATE
02/07/25

SHEET NUMBER
M2.00

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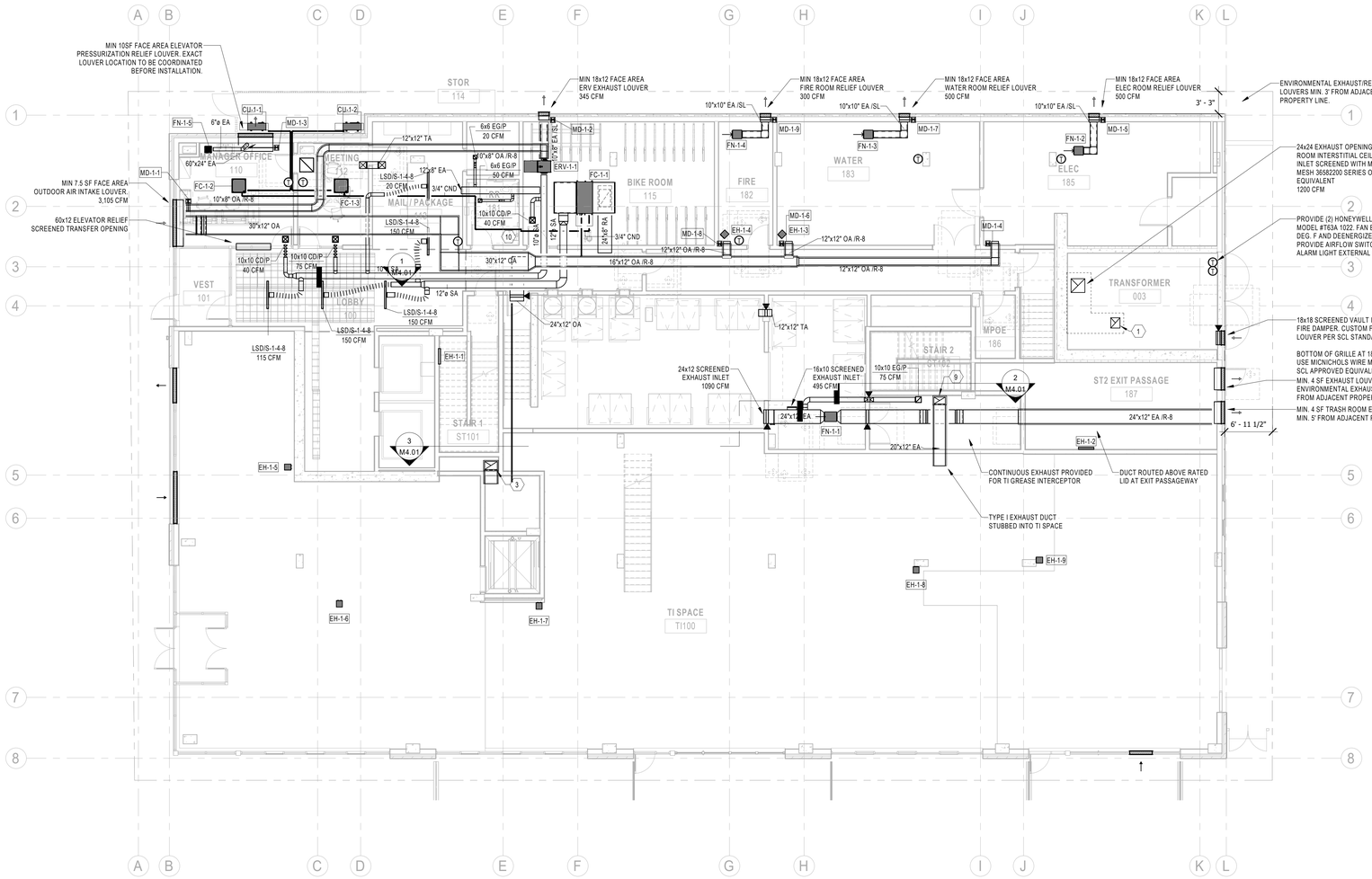

1 LEVEL 01 MECHANICAL PLAN

GENERAL NOTES:

1. PROVIDE REMOTELY OPERATED DAMPERS AND MECHANICAL OPERATORS FOR ALL MANUAL VOLUME DAMPERS SHOWN ABOVE GYPSUM HARDLID CEILINGS OR PROVIDE ACCESS PANEL.
2. ALL AMENITY SPACES ON LEVEL 1 TO HAVE PLENUM RETURN. USE ONLY PLENUM RATED MATERIALS.
3. SOUND LINING ON FIRST 4 FEET OF SUPPLY AIR DISCHARGE DUCTWORK ON HORIZONTALLY DUCTED AMENITY FAN COIL UNIT.
4. PROVIDE FULL-SIZE ACCESS PANEL BENEATH HORIZONTALLY DUCTED FAN COIL UNIT AND AMENITY ENERGY RECOVERY VENTILATOR.

KEYED NOTES:

1. 16x18 TRANSFORMER EXHAUST DUCT RISER IN MIN. 20x22 CLEAR ID INSULATED SHAFT.
2. 14x14 CORRIDOR SUPPLY/RETURN RISER SHAFTS IN MIN. 22x40 CLEAR ID SHAFT. (2 LOCATIONS)
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PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	02/07/25	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

CHECK

ARCHITECT SEAL

TITLE
LEVEL 01 LOBBY MECHANICAL PLAN

PROJECT NO.
2324000

DATE
02/07/25

SHEET NUMBER
M2.01

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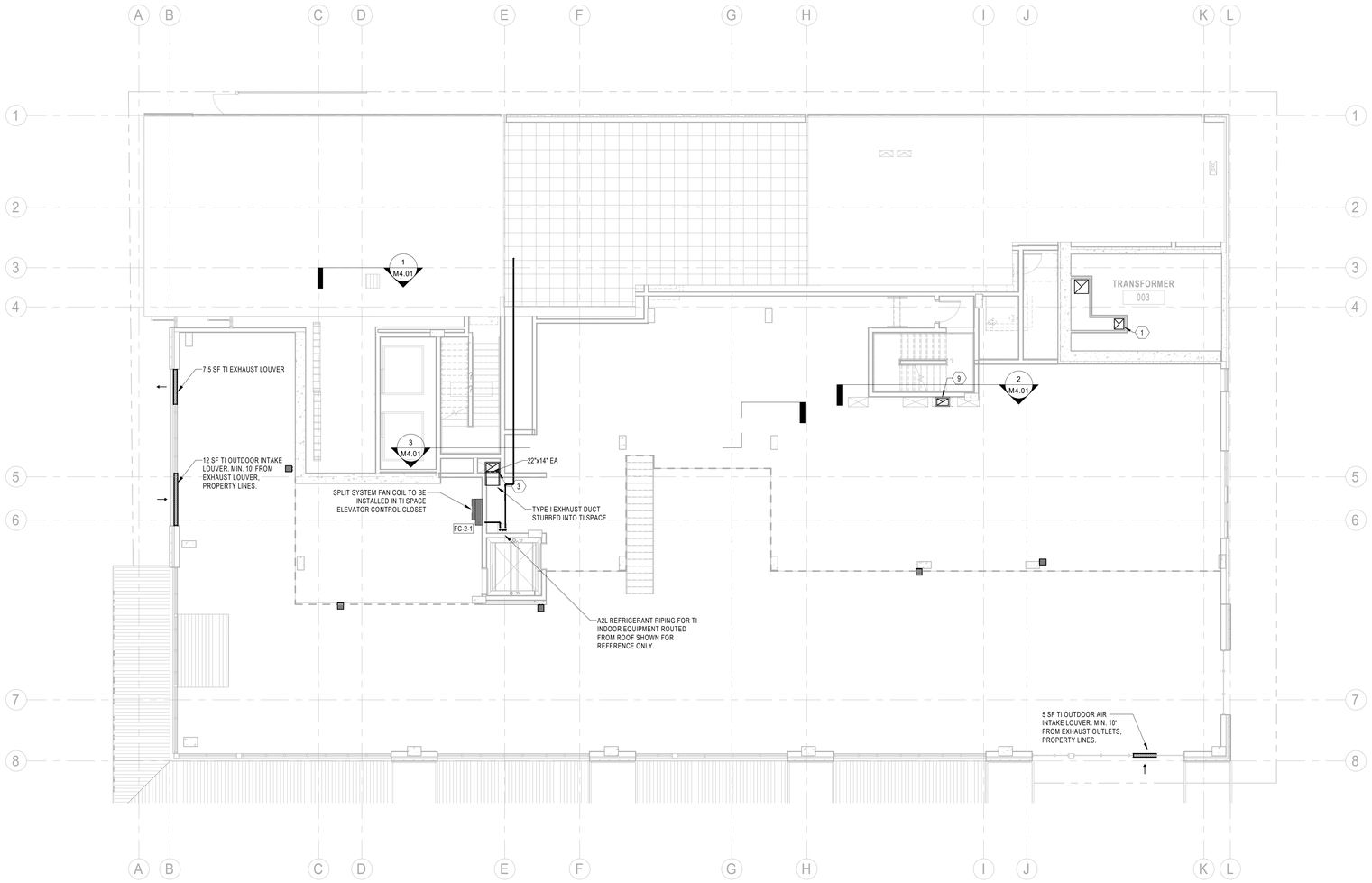

1 LEVEL 02 MECHANICAL PLAN

GENERAL NOTES:

1. PROVIDE REMOTELY OPERATED DAMPERS AND MECHANICAL OPERATORS FOR ALL MANUAL VOLUME DAMPERS SHOWN ABOVE GYPSUM HARDLID CEILINGS OR PROVIDE ACCESS PANEL.
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PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE

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PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

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TITLE
LEVEL 2 MECHANICAL PLAN

PROJECT NO.
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DATE
02/07/25

SHEET NUMBER
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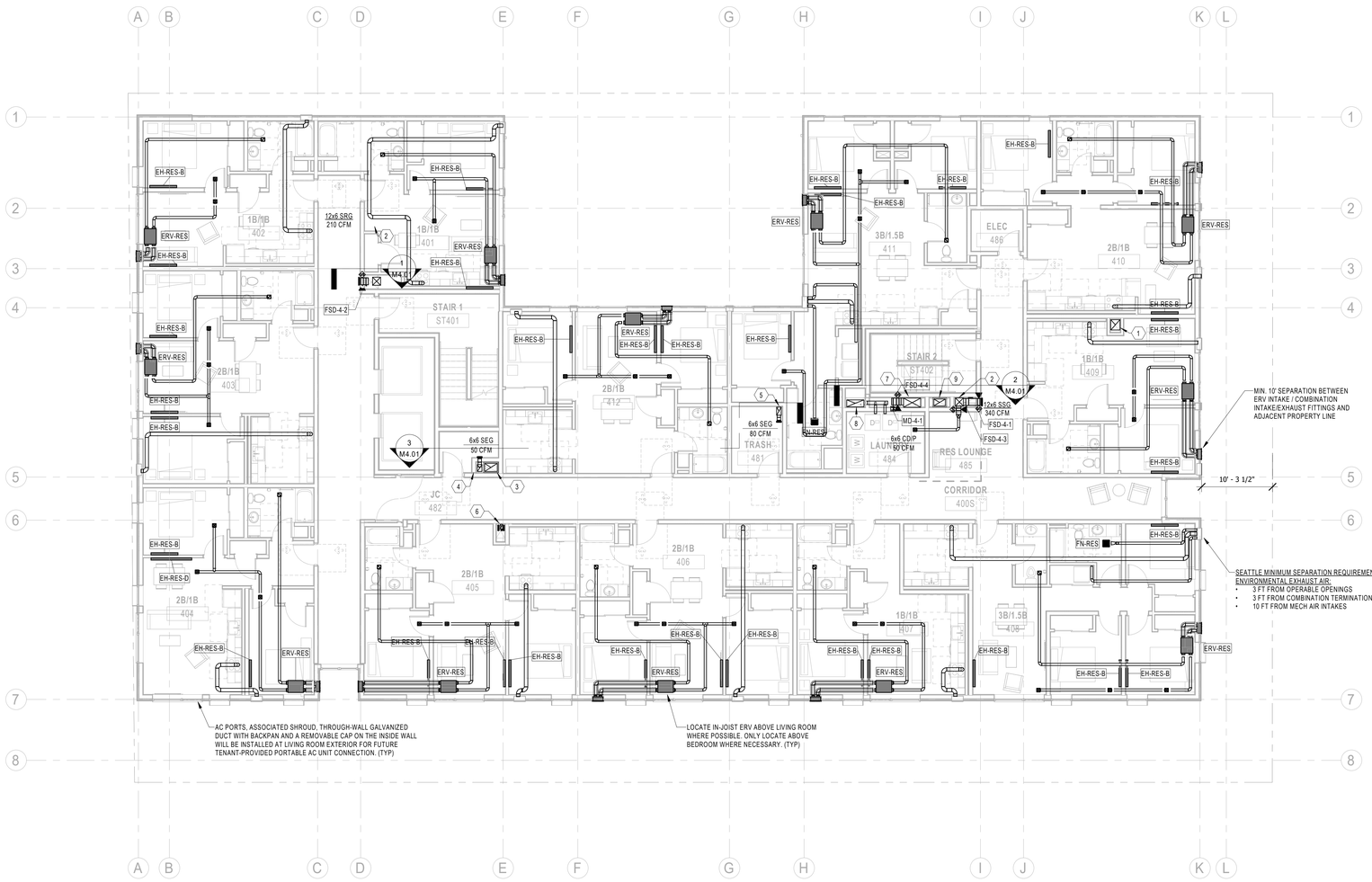

1 LEVEL 04-08 MECHANICAL PLAN

GENERAL NOTES:

1. PROVIDE REMOTELY OPERATED DAMPERS AND MECHANICAL OPERATORS FOR ALL MANUAL VOLUME DAMPERS SHOWN ABOVE GYPSUM HARDLID CEILINGS OR PROVIDE ACCESS PANEL.
2. OUTDOOR AIR TO EACH RESIDENTIAL UNIT IS PROVIDED BY ENERGY RECOVERY VENTILATORS (ERV) PER SMC 403.4. ERVS TO BE INSTALLED IN LAST JOIST BAY. LOCATE ABOVE LIVING ROOM WHERE POSSIBLE FOR ACOUSTICAL REASONS. ONLY LOCATE ABOUT A BEDROOM WHERE ABSOLUTELY NECESSARY.
3. RESIDENTIAL ERV:
   A. SUPPLY AND RETURN DUCTWORK TO BE ROUTED IN JOISTS
      a. INSULATED INTAKE AND EXHAUST DUCTWORK TO BE IN LAST JOIST BAY
      b. REFER TO DUCT MATERIALS SCHEDULE FOR SYSTEM REQUIREMENTS FOR ROUTING IN RATED FLOOR/CEILING / ROOF/CEILING ASSEMBLY.
   B. COMBINATION FITTING (BOD: REVERSOMATIC DVS100, ALT: BROAN V14695) TO BE MIN 3' FROM ENVIRONMENTAL EXHAUST AND OTHER COMBINATION FITTINGS PER EXCEPTION TO SMC 401.3.3.4
   C. PROVIDE FULL SIZE ACCESS PANEL BELOW ERV. MIN 36x24, DIMENSIONS ROTATED TO MATCH ERV CONFIGURATION. ACCESS PANEL ON WOOD FRAME LEVELS TO BE RATED.
   D. RADIATION DAMPERS ARE REQUIRED AT ALL CEILING MEMBRANE PENETRATION WHERE DUCTS ARE ROUTED IN-JOISTS.
   E. BATHROOM EXHAUST GRILLE: 6x6 EG/P, UNO
   F. LIVING ROOM AND BEDROOM DIFFUSER: 6x6 CD/P, UNO
   G. BEDROOM/LIVING ROOM SIDEWALL: 6x6 SSG, UNO
   H. BALANCING SHALL BE DONE ON A TOTAL AIRFLOW PER UNITS BASIS AND NOT AT INDIVIDUAL OUTLETS.
   I. IN-UNIT ERV TO HAVE HARDWIRED POWER CONNECTION.
   J. ALL RESIDENTIAL ERV SUPPLY DUCTWORK TO HAVE MIN 5' OF INSULATED FLEX DUCT AT ALL CONNECTIONS TO DIFFUSERS. ALL ERV EXHAUST DUCTWORK TO HAVE MIN 3' OF INSULATED DUCT TO ALL GRILLES.
4. RESIDENTIAL EXHAUST
   A. RANGE, DRYER VENT, AND 2ND BATH EXHAUST TO BE ROUTED IN FLOOR/CEILING / ROOF/CEILING ASSEMBLY TO EXTERIOR. REFER TO DUCT MATERIALS SCHEDULE FOR SYSTEM REQUIREMENTS FOR ROUTING IN RATED ASSEMBLY.
   B. THE ELECTRICAL CONTRACTOR WILL PROVIDE AND INSTALL ALL RESIDENTIAL FANS. DUCTWORK SHALL BE PROVIDED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
   C. ALL ENVIRONMENTAL AIR EXHAUST DUCTS MUST TERMINATE A MINIMUM OF 3' FROM ANY OPERABLE OPENINGS INTO THE BUILDING IN ACCORDANCE WITH SMC SECTION 501.3.1, ITEM 3.
5. INTERMITTENT EXHAUST MAKEUP AIR FOR DWELLING UNITS IS PROVIDED THROUGH OPERABLE WINDOWS.
6. DOOR UNDERCUT: GC TO UNDERCUT ALL RESIDENTIAL BATHROOM DOORS BY 1/2" MINIMUM FOR TRANSFER OF MAKEUP AIR FOR THE EXHAUST SYSTEM.
7. ENERGY RECOVERY VENTILATORS (ERV) REQUIRE HARDWIRED POWER CONNECTIONS. PROVIDE FULL SIZE RATED ACCESS PANEL UNDER ERVs (TYP).
8. CLOSET DOORS CONTAINING DRYERS SHALL BE LOUVERED OR PROVIDED WITH A MINIMUM 100 SQUARE INCHES OF FREE AREA IN ACCORDANCE WITH THE MANUFACTURER'S REQUIREMENTS AND 2021 SMC 504.8.
9. MC TO PROVIDE PHENOLIC TAG IN EACH DRYER CLOSET WITH THE EQUIVALENT LENGTH OF THE ASSOCIATED DRYER EXHAUST VENT IN ACCORDANCE WITH SMC SECTION 504.8.5.

2021 SMC SEPARATION REQUIREMENTS FOR ERV COMBINATION INTAKE/EXHAUST FITTINGS:

- 3' CLEARANCE TO OTHER COMBINATION FITTINGS
- 3' CLEARANCE TO OPERABLE WINDOWS FROM OTHER DWELLINGS
- 3' CLEARANCE TO OTHER ENVIRONMENTAL AIR EXHAUST OUTLETS (DRYER, RANGE, 2ND BATH FAN)
- NO CLEARANCE REQUIRED TO OPERABLE OPENINGS WITHIN THE SAME DWELLING UNIT

KEYED NOTES:

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PROJECT
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LOCATION
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Seattle, Washington
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PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION
1	02/07/25	6982286-CN Cycle 1 Correction

PARTNER IN CHARGE

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

CHECK

ARCHITECT SEAL

TITLE
LEVEL 04-08 MECHANICAL PLAN

PROJECT NO.
2324000

DATE
02/07/25

SHEET NUMBER
M2.04

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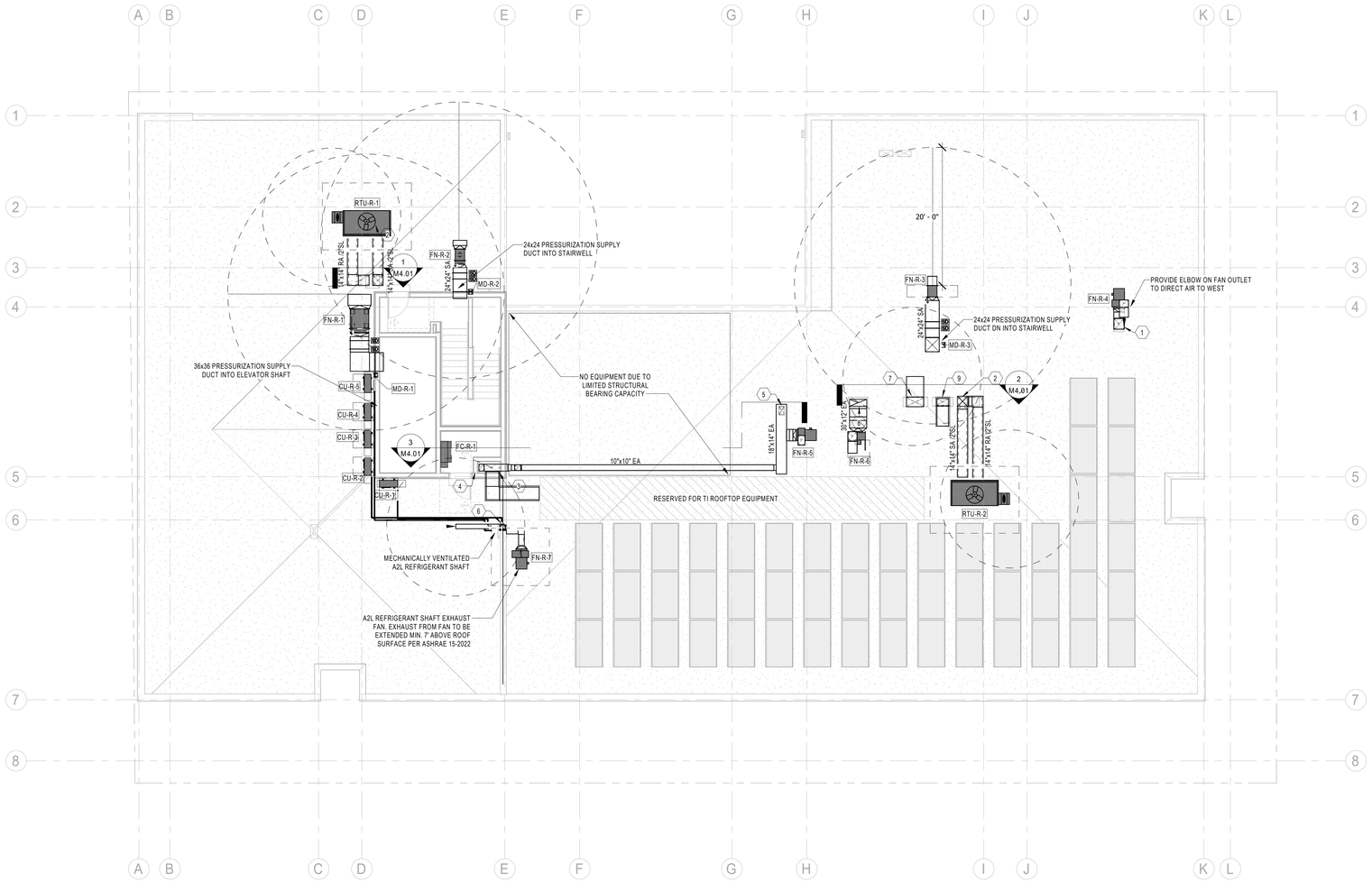

1 ROOF MECHANICAL PLAN

GENERAL NOTES:

1. EQUIPMENT LOCATED WITHIN 10 FT OF ROOF EDGE WILL REQUIRE FALL RESTRAINTS UNLESS PARAPET IS MIN 42" TALL.
2. ALL OUTDOOR REFRIGERANT PIPING TO INCLUDE INSULATION WITH INTEGRAL WEATHER JACKET.
3. PROVIDE FLEX CONNECTORS AT EACH DUCT CONNECTION TO RTUS AND FANS.

KEYED NOTES:

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PREPARED FOR
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NO.	DATE	REVISION
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PARTNER IN CHARGE

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

CHECK

ARCHITECT SEAL

TITLE
ROOF MECHANICAL PLAN

PROJECT NO
2324000

DATE
02/07/25

SHEET NUMBER
M2.09

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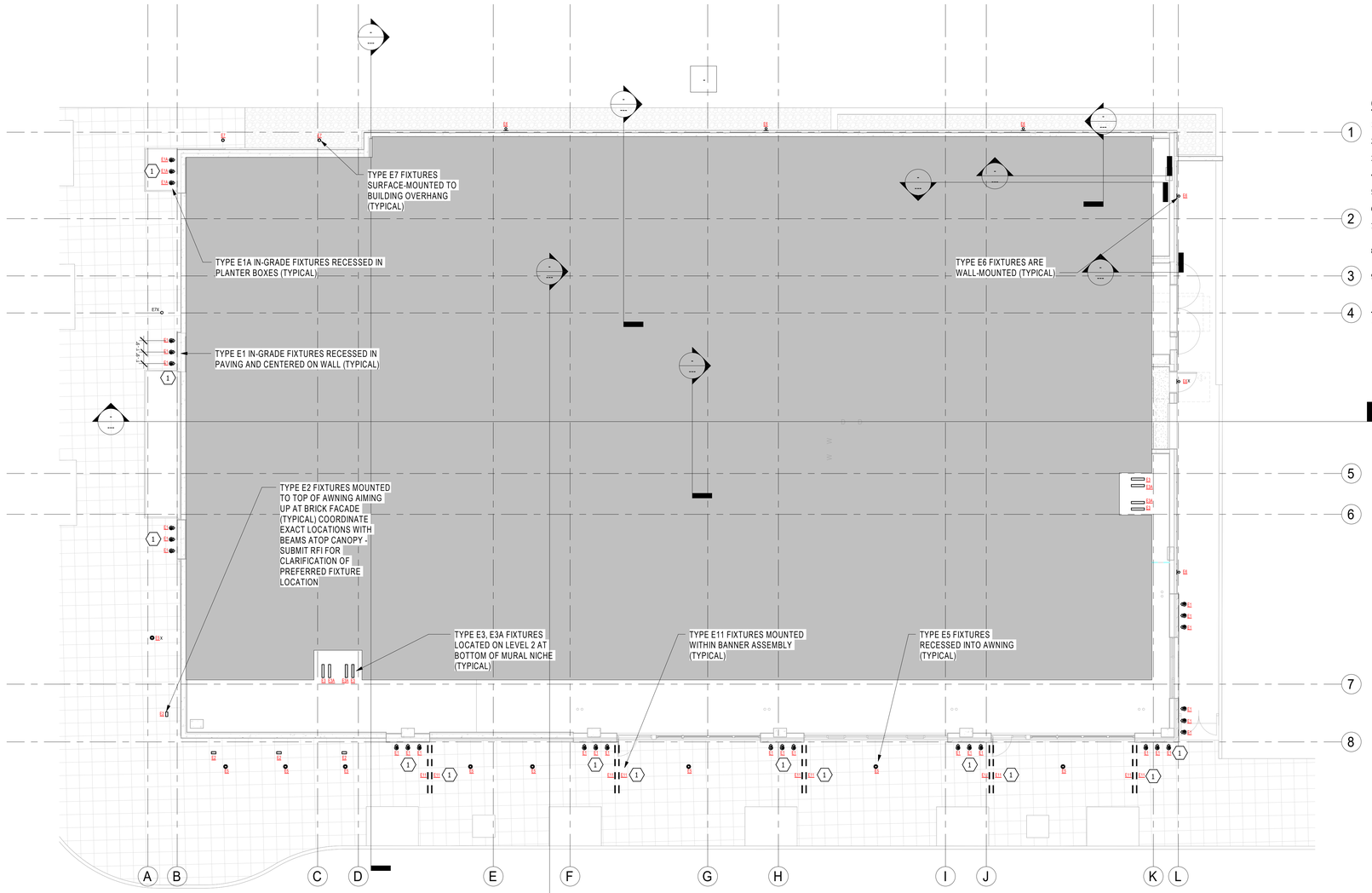

1 EXTERIOR SITE LIGHTING
1/8" = 1'-0"

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1. SEE LUMINAIRE SCHEDULE ON SHEET E0.10 FOR ALL INFORMATION REGARDING LUMINAIRE TYPES SHOWN.
2. LUMINAIRES SHOWN ON PLAN ARE EITHER CEILING OR WALL MOUNTED UNLESS OTHERWISE NOTED.
3. SEE ARCHITECTURAL ELEVATIONS, SECTIONS, DETAILS, AND AREA ENLARGEMENTS FOR DIMENSIONED LUMINAIRE LOCATIONS.
4. CONTRACTOR TO COORDINATE ALL LUMINAIRE MOUNTING HARDWARE WITH CONDITIONS WHERE SHOWN PRIOR TO ORDERING.
5. REMOTE POWER SUPPLIES TO BE ACCESSIBLE PLACED IN WELL-VENTILATED LOCATIONS PER MANUFACTURER'S INSTRUCTIONS.
6. CONTRACTOR TO SUBMIT REQUESTS FOR INFORMATION FROM THE FIELD FOR ANY ISSUES RELATIVE TO AS-BUILT CONDITIONS.
7. LUMINAIRES INTEGRATED INTO CASEWORK OR ARCHITECTURAL DETAILS REQUIRE COORDINATION WITH CONSTRUCTIONS DRAWINGS PRIOR TO ORDERING.
8. INSTALLATION CONTRACTOR TO BE RESPONSIBELF OR VERIFICAITON OF ALL WIRING SCHEMES AND OTHER INSTALLATION DETAILS WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.
9. EMERGENCY LIGHTING, INDICATED WITH AN "X" TAG SUFFIX, TO BE POWERED VIA INVERTER.

KEYED NOTES: (X)

1. REQUIRES REMOTE CONTROL GEAR.

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PROJECT
Little Saigon Landmark

LOCATION
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Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE

PROJECT MANAGER

PROJECT ARCHITECT

PROJECT DESIGNER

PROJECT TEAM MEMBERS

CHECK

TITLE
EXTERIOR LIGHTING PLAN

PROJECT NO.
2324000

DATE
02/07/25

SHEET NUMBER
E3.00

90% CD SET

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ORIGINAL SHEET SIZE 30" x 42"

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LUMINAIRE SCHEDULE

LUMINAIRE SCHEDULE

TYPE	IMAGE	LOCATION	DESCRIPTION	SIZE (NOMINAL)	LAMP (DELIVERED LUMENS, CCT, CRI)	INPUT WATTS	VOLTS	CONTROLS / GEAR	MANUFACTURER AND SERIES	FINISH	NOTES
			YELLOW INDICATES CHANGE FROM PREVIOUS VERSION								
L1		RESIDENTIAL CORRIDORS	WALL MOUNTED DIRECT/INDIRECT SCONCE WITH ALUMINUM HOUSING AND FROSTED GLASS DIFFUSER	5.5" X 5.5" X 2.5" DEPTH	LED (INCLUDED) 554 LUMENS, 3000K, 90+ CRI	9.6	PER EE	INTEGRAL / DIM TO 10% WITH TRIAC OR ELV	WAC DUET SERIES	STANDARD, PER ARCHITECT	
L2		RESIDENTIAL CORRIDORS	SURFACE MOUNT, DECORATIVE DRUM-SHAPED FIXTURE WITH FROSTED ACRYLIC DIFFUSER AND SLATTED WOOD-VENEER SURROUND	19" DIAMETER X 5.9" TALL	LED (INCLUDED) APPROX. 2400 LUMENS, 3000K, 90+ CRI	36	PER EE	INTEGRAL / DIM TO 10% WITH 0-10V	ACCORD RIPADO 5033LED SERIES	STANDARD, PER ARCHITECT	
L3		RESIDENTIAL CORRIDORS	SURFACE MOUNT, DECORATIVE DRUM-SHAPED FIXTURE WITH FROSTED ACRYLIC DIFFUSER AND SLATTED WOOD-VENEER SURROUND	24" DIAMETER X 5.9" DEPTH	LED (INCLUDED) APPROX. 1884 LUMENS, 3000K, 90+ CRI	32	PER EE	INTEGRAL / DIM TO 10% WITH 0-10V	ACCORD RIPADO 5034LED SERIES	STANDARD, PER ARCHITECT	
L4		RESIDENTIAL CORRIDORS	SURFACE MOUNTED CYLINDRICAL DOWNLIGHT WITH DIE-CAST ALUMINUM HOUSING AND ROUND STANDARD TRIM, AND DIFFUSE, GENERAL AMBIENT BEAM DISTRIBUTION	4" DIAMETER X 4" DEPTH	LED (INCLUDED) 750 LUMEN, 3000K, 90+ CRI	9.5	PER EE	INTEGRAL / DIM TO 1% WITH 0-10V	DMF M SERIES 4" CYLINDER	STANDARD, PER ARCHITECT	
L4A		RESIDENTIAL CORRIDORS	SURFACE MOUNTED CYLINDRICAL DOWNLIGHT WITH DIE-CAST ALUMINUM HOUSING AND ROUND STANDARD TRIM, AND 60DEG BEAM DISTRIBUTION	4" DIAMETER X 4" DEPTH	LED (INCLUDED) 750 LUMEN, 3000K, 90+ CRI	9.5	PER EE	INTEGRAL / DIM TO 1% WITH 0-10V	DMF M SERIES 4" CYLINDER	STANDARD, PER ARCHITECT	
L5		LOBBY	CORD SUSPENDED CYLINDRICAL DOWNLIGHT WITH EXTRUDED ALUMINUM HOUSING, AND 45° BEAM SPREAD	2.5" DIAMETER X 8.5" HEIGHT	LED (INCLUDED) 850 LUMENS, 3000K, 90+CRI	10	PER EE	INTEGRAL / DIM TO 1% WITH 0-10V	METEOR DOT 2 SERIES	BLACK	SUSPEND FIXTURE SO THAT BOTTOM AUGINS WITH CEILING
L6		LOBBY	MINIATURE, SUSPENDED LINEAR DOWNLIGHT WITH EXTRUDED ANODIZED ALUMINUM HOUSING AND ENDCAPS, DOUBLE FEED JOINER CONNECTORS, AND BLACK LOUVER OVER DIFFUSED LENS AND WHITE-OPTICS COATING IN INTERIOR OF HOUSING	.88" WIDTH X .6" HEIGHT X LENGTHS TO FIT LOCATIONS SHOWN IN PLANS	LED (INCLUDED) 169 LUMENS/LINEAR FOOT, 3000K, 90+CRI	4/LF	PER EE	REMOTE / DIM TO 1% WITH 0-10V	QTL VERS LOUVER SK(07) SERIES	MATTE BLACK HOUSING, FACEPLATE, AND LOUVER	SEE ARCHITECTURAL SECTIONS AND ELEVATIONS FOR MOUNTING HEIGHT PROVIDE MANUFACTURER'S SHOP DRAWINGS DURING SUBMITTAL REVIEW
L6A		LOBBY	SUSPENDED LINEAR WALL-WASH LIGHT WITH EXTRUDED ALUMINUM HOUSING, ASYMMETRIC PROFILE, ASYMMETRIC WALL-WASH DISTRIBUTION, BLACK BAFFLE WITH EDGESOFT FEATURE, AND REMOTE CONTROL GEAR	1.25" X 2.25" HEAD, LENGTHS TO FIT LOCATIONS SHOWN IN PLANS	LED (INCLUDED) 576 LUMENS / LINEAR FOOT, 3000K, 90+ CRI	12.4 / LF	PER EE	REMOTE / DIM TO 0.1% WITH 0-10V	VODE WING-RAIL SERIES	PER ARCHITECT, BLACK LOUVER	SEE ARCHITECTURAL SECTIONS AND ELEVATIONS FOR MOUNTING HEIGHT PROVIDE MANUFACTURER'S SHOP DRAWINGS DURING SUBMITTAL REVIEW
L7		ELEVATOR LOBBY	WALL MOUNTED DECORATIVE SCONCE WITH WOOD CONSTRUCTION AND DIRECT/INDIRECT LIGHT DISTRIBUTION	7.2" X 12" X 4" DEPTH	LED (INCLUDED) 1130 LUMENS, 3000K, 90+CRI	14	PER EE	INTEGRAL / DIM TO 10% WITH 0-10V	CERNO RIMA SERIES	STANDARD, PER ARCHITECT	
L8		MAIL ROOM	DECORATIVE BELL-SHAPED PENDANT WITH OPEN-WEAVE RATTAN SHADE SUSPENDED OVER OPAL GLASS DIFFUSER	20" DIAMETER X 22" DEPTH	LED E26-BASE A19 LAMP, 800 LUMENS, 2700K, 90+ CRI	8	120V	INTEGRAL / DIM TO 10%	KUZCO BONDI SERIES PHILLIPS CLASSIC 8DIMLUBS LAMP	STANDARD, PER ARCHITECT	
L9		CONFERENCE ROOM / FRONT OFFICE	RECESSED LINEAR DOWNLIGHT WITH ONE-PIECE EXTRUDED ALUMINUM HOUSING, FULLY LOUVERED OPTIC WITH 67° BEAM SPREAD AND REGRESSED LENS FOR 60DEG CUTOFF TO LIGHT SOURCE	2.3" X LENGTHS TO FIT LOCATIONS SHOWN IN PLANS X 3.5" RECESS DEPTH	LED (INCLUDED) 623 LUMENS PER LINEAR FOOT, 3000K, 90+ CRI	6.25 / LF	PER EE	INTEGRAL / DIM TO 1% WITH 0-10V	FOCAL POINT SIEM 1 LOUVER SERIES	STANDARD, PER ARCHITECT	
L10			TYPE NO LONGER USED								
L11			TYPE NO LONGER USED								
L12		COMMUNITY ROOM	SURFACE MOUNTED CYLINDRICAL DOWNLIGHT WITH DIE-CAST ALUMINUM HOUSING AND REGRESSED WALL-WASH DISTRIBUTION	3.5" DIAMETER X 6.5" TALL	LED (INCLUDED) 750 LUMENS,	9.5	PER EE	INTEGRAL	DMF X SERIES 3" CYLINDER	STANDARD, PER ARCHITECT	
L13		LEVEL 1 RESTROOM	WALL MOUNTED VANITY FIXTURE WITH STEEL HOUSING AND OPAL GLASS SHADE	20" X 6" X 3"	LED (INCLUDED) 505 LUMENS, 3000K, 90+ CRI	13	120	INTEGRAL	ALORA APOLLO WV353020 SERIES	STANDARD, PER ARCHITECT	
L14		STAIRS / BOH CORRIDORS	SURFACE MOUNTED CYLINDRICAL DOWNLIGHT WITH ALUMINUM BODY AND GLASS DIFFUSER, REGRESSED LENS AND DIFFUSE LIGHT DISTRIBUTION	5" DIAMETER X 4.5" HEIGHT	LED (INCLUDED) 607 LUMENS, 3000K, 90+CRI	12	120	INTEGRAL / DIM TO 10% WITH TRIAC OR ELV	WAC DOWNTOWN FM-W47205 SERIES	STANDARD, PER ARCHITECT	
L15		STAIRS	WALL MOUNTED LENSED FIXTURE WITH DIE-CASE ALUMINUM HOUSING, SODA-LIME PRESSED GLASS IMPACT-RESISTANT DIFFUSER, STAINLESS STEEL HARDWARE, INTEGRAL OCCUPANCY SENSOR	12" DIAMETER X 3.3" DEPTH	LED (INCLUDED) 2178 LUMENS, 3000K, 80+CRI	30	PER EE	INTEGRAL / DIMMING TO 10% VIA 0-10V	PERFORMANCE IN LIGHTING BLIZ ROUND 30 HF	STANDARD, PER ARCHITECT	
L16		BOH	LENSED STRIP LIGHT - SUSPENDED WHERE NECESSARY. OPTICAL ACCESSORIES AND ORDERING LENGTHS PER CONTRACTOR	3" X 2" X 4' OR 8' LENGTHS, PER PLANS	LED (INCLUDED) 5,000 OR 10,000 LUMENS, 3000K, 80+CRI	8 W/LF	PER EE	INTEGRAL	HE WILLIAMS 75 LED NARROW STRIP SERIES	STANDARD	CONTRACTOR TO CONFIRM FIXTURE LENGTHS WITH EQUIPMENT IN EACH ROOM. OPTIONAL EMERGENCY BATTERY PACK
L17		COMMUNITY ROOM	SURFACE MOUNT, DECORATIVE DRUM-SHAPED FIXTURE WITH FROSTED ACRYLIC DIFFUSER AND SLATTED WOOD-VENEER SURROUND	19" DIAMETER X 5.9" TALL	LED (INCLUDED) APPROX. 2400 LUMENS, 3000K, 90+ CRI	36	PER EE	INTEGRAL	ACCORD RIPADO SERIES	STANDARD, PER ARCHITECT	
L18			TYPE NO LONGER USED								
L19		RESIDENTIAL UNITS	DECORATIVE CEILING FIXTURE WITH CLEAR GLASS CYLINDER AND FROSTED GLASS DIFFUSER	12" DIAMETER X 6.75" DEPTH	LED (INCLUDED) 1360 LUMENS, 3000K, 90+	13	120	INTEGRAL / DIM TO 10% WITH TRIAC OR ELV	KUZCO BIRCH FM53512 SERIES	STANDARD, PER ARCHITECT	
L20		RESIDENTIAL BATHROOMS	DECORATIVE WALL MOUNTED SCONCE WITH CLEAR GLASS CYLINDER AND INTERNAL FROSTED DIFFUSER	3" DIAMETER X 7" HEIGHT ON 5" DIAMETER CANOPY	LED (INCLUDED) 935 LUMENS, 3000K, 90+CRI	11	120	INTEGRAL / DIM TO 10% WITH TRIAC OR ELV	KUZCO BIRCH WS53505 SERIES	STANDARD, PER ARCHITECT	
L21		RESIDENTIAL SHOWERS	RECESSED WET LOCATION FIXED DOWNLIGHT WITH IC-RATED, AIRTIGHT HOUSING, REGRESSED LENSED FLAT PANEL LED MODULE WITH ROUND FLANGED TRIM ASSEMBLY, AND CONTROL GEAR	4.8" DIAMETER OUTER TRIM, 2.2" INNER DIAMETER LENS APERTURE, 4.3" DEPTH HOUSING	LED (INCLUDED) 903 LUMENS, 2700K, 90+CRI	9	120	INTEGRAL / DIM TO 2% WITH TRIAC	VISUAL COMFORT AND CO VERSE 3" SERIES	STANDARD WHITE FIELD-PAINTABLE	FOR INSTALLATION IN JOIST CEILINGS
L22		RESIDENTIAL UNITS AND COMMUNITY ROOM	SURFACE MOUNTED LINEAR UNDERCABINET FIXTURE WITH NARROW EXTRUDED ALUMINUM HOUSING AND ACRYLIC LENS, THROUGH-WIRING FLEX CONNECTIONS, AND HARD WIRING BOXES. 10", 21" OR 40" LENGTHS	1.25" X 1" X JOINED LENGTHS TO FIT LOCATIONS SHOWN IN PLANS	LED (INCLUDED) 500 LUMENS/LF, 2700K, 90+CRI	5 W/LF	120	REMOTE / LOCAL SWITCH	GEORGE KOVACS SLIM LINE LED UNDERCABINET SERIES	STANDARD	LOCATE FIXTURES BELOW CASEWORK AT FRONT EDGE BEHIND VALENCE. PROVIDE MARKED-UP
L23		RESIDENTIAL UNITS	DECORATIVE CEILING FIXTURE WITH CLEAR GLASS CYLINDER AND FROSTED GLASS DIFFUSER	9.5" DIAMETER X 10" HEIGHT	LED (INCLUDED) 1360 LUMENS, 3000K, 90+CRI	13	120	INTEGRAL / DIM TO 10% WITH TRIAC OR ELV	KUZCO BIRCH FM53509 SERIES	STANDARD, PER ARCHITECT	
L24		RESIDENTIAL UNITS	CEILING SUSPENDED FAN WITH INTEGRAL LENSED LIGHT	60" BLADE DIAMETER	LED (INCLUDED) 1290 LUMENS, 3000K, 90+CRI	25	120	INTEGRAL / DIM LIGHT AND FAN SEPARATELY WITH REMOTE	LUMENS / VISUAL COMFORT & CO. STOCKTON LED CEILING FAN	STANDARD, PER ARCHITECT	CONTRACTOR TO FIX HANDHELD REMOTE TO WALL LOCATIONS AS SHOWN

EXTERIOR FIXTURES

TYPE	IMAGE	LOCATION	DESCRIPTION	SIZE (NOMINAL)	LAMP (DELIVERED LUMENS, CCT, CRI)	INPUT WATTS	VOLTS	CONTROLS / GEAR	MANUFACTURER AND SERIES	FINISH	NOTES
E1		BRICK FAÇADE	GRADE RECESSED IP67 RATED ADJUSTABLE UPLIGHT WITH DIE-CAST ALUMINUM FIXTURE BODY, SEMI-FLUSH STAINLESS STEEL TRIM, CLEAR TEMPERED GLASS LENS, VANDAL RESISTANT FASTENERS, 20° X 360° LOCKING AIMING ADJUSTMENT, AND 60° BEAM SPREAD. PROVIDE WITH RECESSED HOUSING AND CONTROL GEAR.	4.3" DIAMETER X 5.2" DEPTH	LED (INCLUDED) 573 LUMENS, 3000K, 90+CRI	9	PER EE	REMOTE	SUELO ADJUSTABLE OPTICS VANDAL RESISTANT SERIES	STANDARD, PER ARCHITECT	
E1A		BRICK FAÇADE AT PLANTER	GRADE RECESSED IP67 RATED ADJUSTABLE UPLIGHT WITH DIE-CAST ALUMINUM FIXTURE BODY, SEMI-FLUSH STAINLESS STEEL TRIM, CLEAR TEMPERED GLASS LENS, VANDAL RESISTANT FASTENERS, 20° X 360° LOCKING AIMING ADJUSTMENT, AND 60° BEAM SPREAD. PROVIDE WITH RECESSED HOUSING AND CONTROL GEAR.	4.3" DIAMETER X 5.2" DEPTH	LED (INCLUDED) 573 LUMENS, 3000K, 90+CRI	9	PER EE	REMOTE	SUELO ADJUSTABLE OPTICS VANDAL RESISTANT SERIES	STANDARD, PER ARCHITECT	SECURE HOUSING WITH COMPONENTS REQUIRED FOR USE WITHIN PLANTER BOXES
E2		AWNING	J-BOX MOUNTED IP66 RATED ADJUSTABLE LOUVERED FLOODLIGHT WITH ALUMINUM HOUSING, POLYESTER POWDER-COAT FINISH, LOCKABLE KNUCKLE ADJUSTMENT, HERMETICALLY SEALED TEMPERED GLASS LENS, CUTOFF VISOR, AND WALL-WASH OPTICAL DISTRIBUTION.	6" x 9" X 10"	LED (INCLUDED) 1924 LUMENS, 3000K, 80+CRI	23	PER EE	REMOTE	BK LIGHTING YOSEMITE SERIES	STANDARD, PER ARCHITECT	COORDINATE MOUNTING ATOP CANOPY WITH BEAM SUPPORT LOCATIONS
E3		FAÇADE MURAL NICHE	SURFACE MOUNTED IP66 RATED LINEAR FLOODLIGHT WITH EXTRUDED ALUMINUM HOUSING, STAINLESS STEEL FASTENERS, UV STABILIZED POLYCARBONATE LENS FOR 15°X15° DISTRIBUTION, AND LOCKABLE HINGED AIMING ADJUSTMENT.	2" x 2" X 12"	LED (INCLUDED) 1217 LUMENS, 3000K, 90+ CRI	12	PER EE	INTEGRAL	ECOSENSE TROV SERIES	STANDARD	
E3A		FAÇADE MURAL NICHE	SURFACE MOUNTED IP66 RATED LINEAR FLOODLIGHT WITH EXTRUDED ALUMINUM HOUSING, STAINLESS STEEL FASTENERS, UV STABILIZED POLYCARBONATE LENS FOR 9°X9° DISTRIBUTION, AND LOCKABLE HINGED AIMING ADJUSTMENT.	2" x 2" X 12"	LED (INCLUDED) 1217 LUMENS, 3000K, 90+ CRI	12	PER EE	INTEGRAL	ECOSENSE TROV SERIES	STANDARD	
E4			TYPE NO LONGER USED								
E5		AWNING	RECESSED WET-LOCATION RATED DOWNLIGHT WITH 60° WIDE-FLOOD DISTRIBUTION, REGRESSED SOURCE AND STANDARD BEVELED TRIM	4.5" DIAMETER APERTURE, 3.25" HOUSING DEPTH	LED (INCLUDED) 750 LUMENS, 3000K, 93+ CRI	9.5	PER EE	INTEGRAL	DMF M SERIES COMMERCIAL	STANDARD, PER ARCHITECT	
E6		BACK WALKWAYS	WALL-MOUNTED IP65 RATED LIGHT WITH TYPE II DISTRIBUTION AND REGRESSED SOURCE, MARINE-GRADE COPPER-FREE ALUMINUM ALLOY HOUSING, CLEAR, SAFETY-GLASS LENS, HIGH TEMPERATURE SILICONE GASKET AND MECHANICALLY CAPTIVE STAINLESS STEEL FASTENERS	8" X 4" X 3.5" PROJECTION	LED (INCLUDED) 459 LUMENS, 3000K, 90+ CRI	8	PER EE	INTEGRAL	BEGA 24372 SERIES	STANDARD, PER ARCHITECT	
E7		BUILDING OVERHANG	SURFACE-MOUNTED IP-65 RATED CYLINDRICAL DOWNLIGHT WITH ALUMINUM BODY AND GLASS DIFFUSER, REGRESSED LENS AND DIFFUSE LIGHT DISTRIBUTION	5" DIAMETER X 4.5" HEIGHT	LED (INCLUDED) 607 LUMENS, 3000K, 90+CRI	12	120	INTEGRAL	WAC DOWNTOWN FM-W47205 SERIES	STANDARD, PER ARCHITECT	
E8		LEVEL 2 PATIO	SURFACE-MOUNTED IP67 RATED SILICONE ENCAPSULATED LINEAR LIGHT IN EXTRUDED ALUMINUM CHANNEL WITH DIFFUSE TRANSLUCENT LENS FOR NO-DIODE VISIBILITY, CONCEALED CLIP MOUNTING, PASS THROUGH-WIRING, CONNECTORS AND CONTROL GEAR	.64" X .88" X LENGTHS TO FIT LOCATIONS SHOWN IN PLANS	LED (INCLUDED) 125 LUMENS / LINEAR FOOT	1.5 W/LF	PER EE	REMOTE	QTL VERS-ENCAPSULATED SERIES	STANDARD, PER ARCHITECT	PROVIDE MANUFACTURER'S SHOP DRAWINGS DURING SUBMITTAL REVIEW
E9		LEVEL 2 PATIO	STAKE-MOUNTED IP66 RATED ADJUSTABLE ACCENT LIGHT WITH CORROSION RESISTANT ALUMINUM HOUSING, AND CONTINUOUSLY ADJUSTABLE 10°-50° BEAM ANGLE AND ONBOARD DIMMER	2.5" DIAMETER X 5.25"	LED (INCLUDED) 45-365 LUMENS, 85+ CRI	7 MAX	PER EE	REMOTE	WAC MINI ACCENT 12V 5111 SERIES	STANDARD, PER ARCHITECT	
E10		LEVEL 2 PATIO / ROOF	WALL-MOUNTED IP65 RATED DOWN LIGHT WITH ALUMINUM HOUSING REGRESSED, DIFFUSE GLAS LENS, AND FACTORY-SEALED LIGHT ENGINE	6" x 5" X 4" PROJECTION	LED (INCLUDED) 553 LUMENS, 90+ CRI	12	PER EE	INTEGRAL	WAC MOD WS-W65607 SERIES	STANDARD, PER ARCHITECT	
E11		BUILDING OVERHANG	RECESSED IP66 AND IK08 RATED LINEAR LED WALL WASH FOR DISTRIBUTION AND EVEN NO-DOT APPEARANCE EXTRUSION MOUNTED IN EXTRUDED ALUMINUM L BRACKET. PROVIDE WITH ALL WIRING HARNESSES, MOUNTING HARDWARE AND CONTROL GEAR FOR A COMPLETE SYSTEM	.2" X .25" X LENGTHS TO FIT LOCATIONS SHOWN IN PLANS	LED (INCLUDED) 261 LUMENS / FT, 3000K, 92 CRI	3W / LF	PER EE	REMOTE	QTL XT24 SERIES QTL BK-MICRO BACKWARDS L BRACKET ALUMINUM EXTRUSION QTL QZ-PH/0-10V POWER SUPPLY	STANDARD	SEE ARCHITECTURAL DETAILS
F1		ELEVATOR PIT	SURFACE MOUNTED VAPOR-TIGHT FIXTURE - LENGTHS PER EE		LED (INCLUDED) 6240 LUMENS, 4000K, 80+CRI	48	PER EE	INTEGRAL	MAXLITE LSV4 SERIES	STANDARD	ALL ASPECTS OF THIS FIXTURE TO BE CONFIRMED BY ELECTRICAL ENGINEER DURING SUBMITTAL REVIEW
X1		THROUGHOUT	UNIVERSAL MOUNT EDGE-LIT EXIT SIGN		LED (INCLUDED)	1.1	PER EE	INTEGRAL	SURE-LITES ELIX SERIES	STANDARD	ALL ASPECTS OF THIS FIXTURE TO BE CONFIRMED BY ELECTRICAL ENGINEER DURING SUBMITTAL REVIEW
X2		THROUGHOUT	UL924 OUTDOOR EXIT SIGN		LED (INCLUDED)	4	PER EE	INTEGRAL	SURE-LITES LPXW SERIES	STANDARD	ALL ASPECTS OF THIS FIXTURE TO BE CONFIRMED BY ELECTRICAL ENGINEER DURING SUBMITTAL REVIEW

NOTES:
1. CONTRACTOR RESPONSIBLE FOR PROVIDING LINEAR FIXTURES IN LONGEST LENGTHS TO FIT LOCATIONS SHOWN IN PLANS, WITH FEWEST QUANTITY OF POWER DROPS FOR REQUIRED CONTROLS.
2. REMOTE CONTROL GEAR TO BE PLACED IN WELL-VENTILATED, ACCESSIBLE LOCATIONS.
3. CONTRACTOR TO CHECK COMPATIBILITY OF FIXTURE MOUNTING HARDWARE AND WIRING AT EACH LOCATION SHOWN IN PLANS.
4. PRIOR TO ORDERING, ENSURE COMPATIBILITY OF LUMINAIRE CONTROL GEAR TO MEET SPECIFIED DIMMING PERFORMANCE WITH SPECIFIED DIMMING EQUIPMENT TO BE PROVIDED.
5. SUBMITTALS FOR ALL FIXTURES TO INCLUDE ORDERING CODES SHOWING ALL PARTS TO BE PROVIDED; SUCH AS ACCESSORY COMPONENTS, REMOTE CONTROL GEAR, MOUNTING HARDWARE, POWER FEEDS, AND LAMP INFORMATION.
6. PROVIDE FACTORY SHOP DRAWINGS FOR ALL MODIFIED OR "SYSTEM" PRODUCTS. IF FACTORY DRAWINGS UNAVAILABLE CONTRACTOR TO SUBMIT MATERIAL EXPLAINING INTENDED INSTALLATION.

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SPARKLAB

sparklabLD.com

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Little Saigon Landmark

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PREPARED FOR
SCIDpda / Friends of Little Saigon

NO.	DATE	REVISION

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CH
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DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL
CHECK

TITLE
LUMINAIRE SCHEDULE

PROJECT NO.
2324000

DATE
09/10/24

SHEET NUMBER
AL0.01

90% CONSTRUCTION DOCUMENTS

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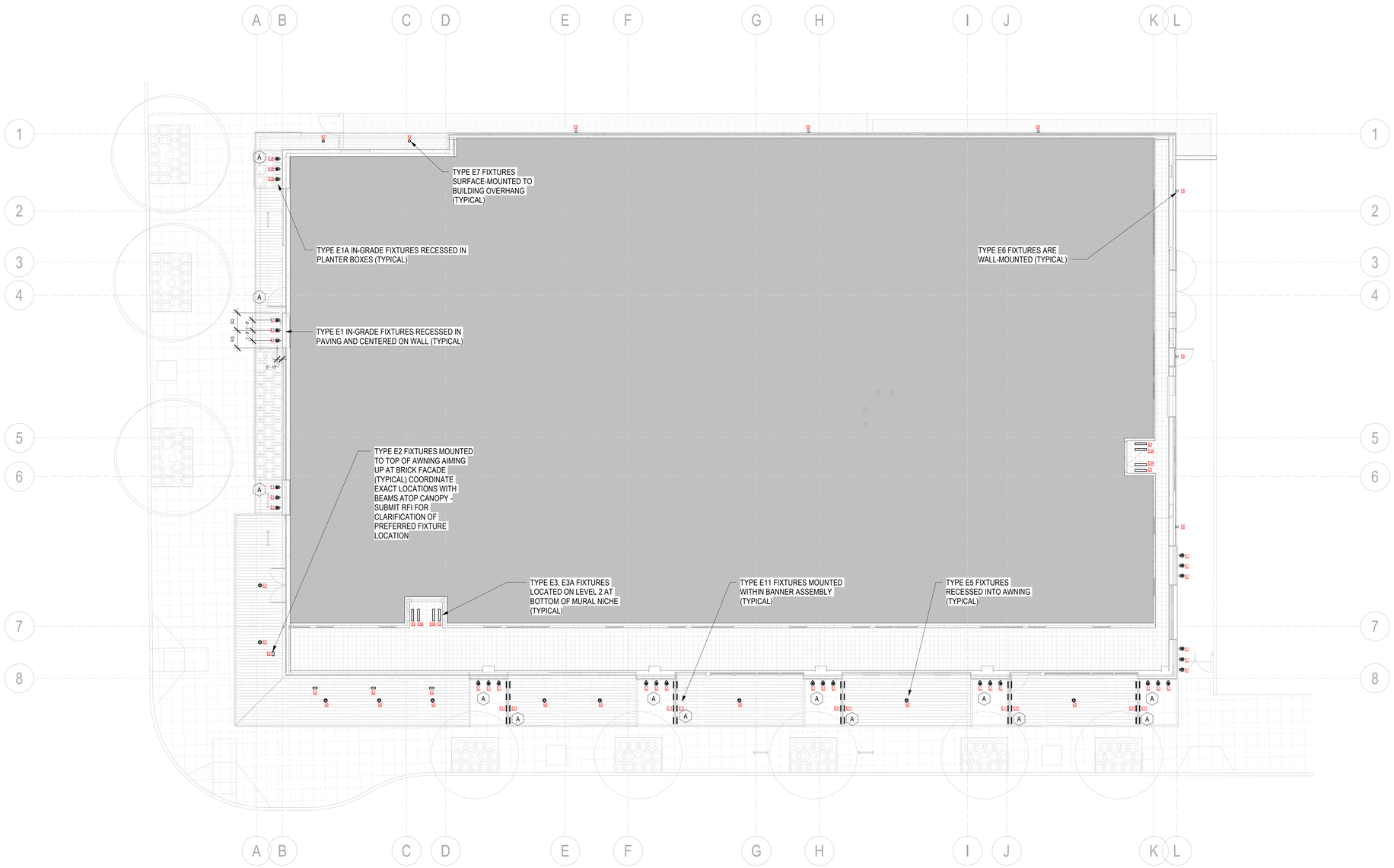

1 LEVEL 01 SITE_All Exterior
1/8" = 1'-0"

LIGHTING LEGEND

- IN-GRADE ADJUSTABLE UPLIGHT
- RECESSED DOWNLIGHT
- WALL SCONCE
- SURFACE-MOUNT DOWNLIGHT CYLINDER
- SURFACE MOUNT LINEAR LIGHT
- CONCEALED LINEAR LIGHT

GENERAL NOTES

1. SEE LIGHT FIXTURE SCHEDULE SHEET AL0.01 FOR ALL INFORMATION REGARDING FIXTURE TYPES SHOWN.

2. LIGHT FIXTURES SHOWN ON PLAN ARE EITHER CEILING OR WALL MOUNTED UNLESS OTHERWISE NOTED.

3. SEE ARCHITECTURAL ELEVATIONS, SECTIONS, DETAILS, AND AREA ENLARGEMENTS FOR DIMENSIONED LIGHTING FIXTURE LOCATIONS.

4. CONTRACTOR TO COORDINATE ALL FIXTURE MOUNTING HARDWARE WITH CONDITIONS WHERE SHOWN PRIOR TO ORDERING.

5. REMOTE POWER SUPPLIES TO BE ACCESSIBLY PLACED IN WELL-VENTILATED LOCATIONS PER MANUFACTURER'S INSTRUCTIONS.

6. CONTRACTOR TO SUBMIT REQUESTS FOR INFORMATION FROM THE FIELD FOR ANY ISSUES RELATIVE TO AS-BUILT CONDITIONS.

7. SEE ELECTRICAL ENGINEERING DRAWINGS FOR INDICATION OF FIXTURES AND WIRING OF PRODUCTS TO BE USED WHEN EMERGENCY POWER IS REQUIRED.

8. FIXTURES INTEGRATED INTO CASEWORK OR ARCHITECTURAL DETAILS REQUIRE COORDINATION WITH CONSTRUCTION DRAWINGS PRIOR TO ORDERING.

9. INSTALLATION CONTRACTOR TO BE RESPONSIBLE FOR VERIFICATION OF ALL WIRING SCHEMES AND OTHER INSTALLATION DETAILS WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS.

SHEET NOTES

(A) REQUIRES REMOTE CONTROL GEAR

CONTROL INTENT

EXTERIOR:

ALL FIXTURES OF SIMILAR TYPE TO BE CONTROLLED TOGETHER UNLESS OTHERWISE NOTED

ALL LIGHT FIXTURES TO BE CONTROLLED TO TURN ON AT DUSK AND OFF AT DAWN, OR OTHERWISE USER SPECIFIED TIME.

0 4" 8" 16" 24"
1/8" = 1' - 0"

ORIGINAL SHEET SIZE 36" x 24"

MITHUN

SEATTLE / Pier 56, 1201 Alaskan Way, #200
Seattle, WA 98101 / 206.623.3344

SAN FRANCISCO / 585 Howard Street, #300
California, CA 94105 / 415.956.0688

LOS ANGELES / 5837 Adams Blvd
Culver City, CA 90232 / 323.937.2150

mithun.com

SPARKLAB

sparklabLD.com

PROJECT
Little Saigon Landmark

LOCATION
1001 S Jackson
Seattle, Washington
98104

PREPARED FOR
SCIDpda / Friends of Little Saigon

DATE	ISSUE

NO.	DATE	REVISION

PARTNER IN CHARGE
CH
PROJECT MANAGER
DL
PROJECT ARCHITECT
MO
PROJECT DESIGNER
CH
PROJECT TEAM MEMBERS
EB, TL
CHECK

TITLE
FACADE LIGHTING

PROJECT NO.
2324000
DATE
02/07/25
SHEET NUMBER
AL1.01

90% CONSTRUCTION DOCUMENTS

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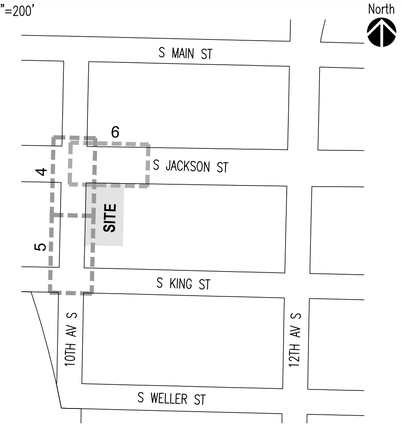
General Notes EFFECTIVE DATE 7/13/23

1. ALL WORK SHALL CONFORM TO THE 2023 EDITION OF CITY OF SEATTLE STANDARD SPECIFICATIONS, THE 2023 EDITION OF THE CITY OF SEATTLE STANDARD PLANS; AND SEATTLE DEPARTMENT OF TRANSPORTATION DIRECTOR'S RULE 01-2017 RIGHT-OF-WAY OPENING AND RESTORATION RULES. A COPY OF THESE DOCUMENTS SHALL BE ON SITE DURING CONSTRUCTION.
2. A COPY OF THE APPROVED PLAN MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. ERRORS AND OMISSIONS ON THE PERMITTED PLANS MUST BE CORRECTED BY THE ENGINEER AND APPROVED BY THE CITY OF SEATTLE.
4. ALL PERMITS REQUIRED FOR WORK WITHIN THE PUBLIC RIGHT OF WAY MUST BE OBTAINED PRIOR TO THE START OF CONSTRUCTION.
5. PRIOR TO THE START OF CONSTRUCTION WITHIN THE RIGHT OF WAY, THE PERMITTEE SHALL SCHEDULE AND ATTEND A PRECONSTRUCTION MEETING WITH THE CITY OF SEATTLE DEPARTMENT OF TRANSPORTATION.
6. PERMITTEE SHALL CONTACT SEATTLE DEPARTMENT OF TRANSPORTATION, STREET USE INSPECTOR A MINIMUM OF 2 BUSINESS DAYS PRIOR TO NEEDING AN INSPECTION.
7. ALL DAMAGE TO CITY INFRASTRUCTURE CAUSED BY THE CONSTRUCTION SHALL BE IMMEDIATELY REPORTED AND REPAIRED AS REQUIRED BY THE SEATTLE DEPARTMENT OF TRANSPORTATION. TO REPORT DAMAGE TO SPU INFRASTRUCTURE, INCLUDING ANY SEWAGE RELEASE OR BLOCKAGE, CALL 206-386-1800.
8. THE APPROVED PLANS SHALL SHOW THE APPROXIMATE AREA OF PAVEMENT RESTORATION BASED ON THE DEPTH OF UTILITY CUTS AND/OR THE AREA OF CURB AND/OR PAVEMENT TO BE REMOVED AND REPLACED. THE ACTUAL LIMITS OF THE PAVEMENT RESTORATION SHALL BE PER THE DIRECTOR'S RULE 01-2017, RIGHT- OF-WAY OPENING AND RESTORATION RULE AND WILL BE DETERMINED IN THE FIELD BY THE SEATTLE DEPARTMENT OF TRANSPORTATION STREET USE INSPECTOR PRIOR TO THE PAVEMENT RESTORATION. FOR SPU WATER SERVICES, APPLICANT MUST SHOW THE PAVEMENT RESTORATION LIMITS FOR THE PROPOSED AND THE EXISTING WATER SERVICES TO BE RETIRED, INCLUDING SERVICES THAT ARE OUTSIDE THE PROJECT AREA, BUT SERVE THE PARCEL.
9. DATUM: NAVD88 AND NAD 83 (2011) 2010.00 EPOCH.
10. SURVEYING AND STAKING OF ALL IMPROVEMENTS IN THE PUBLIC RIGHT OF WAY SHALL BE COMPLETED PRIOR TO CONSTRUCTION. PERMITTEE TO STAKE THE CURB AT THE CENTERLINE OF DRAINAGE GRATES PER STANDARD PLAN 260A. SURVEY GRADE SHEETS MUST BE SUBMITTED AND APPROVED BY THE SEATTLE DEPARTMENT OF TRANSPORTATION AT LEAST 2 BUSINESS DAYS PRIOR TO CONSTRUCTION.
11. IF AN EXISTING CURB IS TO BE REMOVED AND REPLACED IN THE SAME LOCATION THE PERMITTEE SHALL PROVIDE THE STREET USE INSPECTOR A PLAN WITH EXISTING FLOW LINE AND TOP OF CURB ELEVATIONS IDENTIFIED. PERMITTEE TO STAKE THE LOCATION OF THE EXISTING CURB PRIOR TO DEMOLITION.
12. THE PERMITTEE MUST BE RESPONSIBLE FOR REFERENCING AND REPLACING ALL SURVEY MONUMENTS THAT MAY BE DISTURBED, DESTROYED OR REMOVED BY THE PROJECT AND 2 WORKING DAYS, PRIOR TO THE WORK, MUST FILE AN APPLICATION FOR PERMIT TO REMOVE OR DESTROY A SURVEY MONUMENT WITH THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES, PURSUANT TO WAC 332-120. THE PERMITTEE MUST PROVIDE THE ENGINEER AND SPU LAND SURVEY WITH A COPY OF THE APPROVED PERMIT AND COMPLETION REPORT. SEE STANDARD SPECIFICATION 1- 07.28 ITEM 17.
13. THE PERMITTEE SHALL SUBMIT ALL APPLICABLE DOCUMENTS REQUIRED UNDER SECTION 1-05.3 OF THE STANDARD SPECIFICATIONS PRIOR TO CONSTRUCTION. A MATERIAL SOURCE FORM FOR ALL MATERIALS TO BE PLACED IN THE RIGHT OF WAY AND MIX DESIGNS FOR ALL ASPHALT, CONCRETE AND AGGREGATES TO BE PLACED IN THE RIGHT OF WAY MUST BE SUBMITTED TO THE SEATTLE DEPARTMENT OF TRANSPORTATION FOR REVIEW AND APPROVAL PRIOR TO BEGINNING CONSTRUCTION. A REVISED MATERIAL SOURCE FORM AND MIX DESIGNS MUST BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO PLACEMENT OF ANY SUBSTITUTE MATERIALS.
14. THE PERMITTEE SHALL NOTIFY THE SEATTLE FIRE DEPARTMENT DISPATCHER (206-386-1495) AT LEAST TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUTOFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE PERMITTEE SHALL ALSO NOTIFY THE DISPATCHER OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
15. THE PERMITTEE SHALL LOCATE AND PROTECT ALL CASTINGS AND UTILITIES DURING CONSTRUCTION.
16. THE PERMITTEE SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
17. IT IS THE SOLE RESPONSIBILITY OF THE PERMITTEE TO VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
18. THE PERMITTEE SHALL ADJUST ALL EXISTING MAINTENANCE HOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES, AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
19. THE PERMITTEE SHALL FOLLOW SPU CORE TAP PROCEDURES FOR ALL NEW CONNECTIONS TO EXISTING SEWER OR DRAINAGE MAINS OR STRUCTURES. CONTRACTORS ARE NOT ALLOWED TO CORE INTO MAINS OR STRUCTURES WITHOUT PRIOR APPROVAL FROM SPU-DWW. TO SCHEDULE CORE CUT CONTACT SPU-DWW AT 206-615-0511 A MINIMUM OF 2 BUSINESS DAYS IN ADVANCE.
20. ALL UTILITY SERVICE CONNECTIONS SHOWN ON THIS PLAN REQUIRE SEPARATE PERMITS.
21. THE PERMITTEE SHALL PROVIDE FOR ALL TESTING AS REQUIRED BY THE STREET USE INSPECTOR.
22. INSPECTION AND ACCEPTANCE OF ALL WORK IN THE PUBLIC RIGHT-OF-WAY SHALL BE DONE BY REPRESENTATIVES OF THE CITY OF SEATTLE. IT SHALL BE THE PERMITTEE'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS ALLOWING FOR PROPER ADVANCE NOTICE. THE SEATTLE DEPARTMENT OF TRANSPORTATION STREET USE INSPECTOR MAY REQUIRE REMOVAL AND RECONSTRUCTION OF ANY ITEMS PLACED IN THE RIGHT OF WAY THAT DO NOT MEET CITY STANDARDS OR THAT WERE CONSTRUCTED WITHOUT APPROPRIATE INSPECTIONS.
23. THE PERMITTEE SHALL PROVIDE A PLAN FOR STORMWATER AND EROSION CONTROL AND INSTALL, MAINTAIN AND REMOVE TEMPORARY FACILITIES PER SECTION 8-01. AS CONSTRUCTION PROGRESSES AND CONDITIONS DICTATE, ADDITIONAL CONTROL FACILITIES MAY BE REQUIRED. DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITTEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY THE PERMITTEE'S ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
24. ALL DISTURBED SOILS MUST BE AMENDED PER STANDARD PLAN 142 AND SECTION 8-02 OF THE STANDARD SPECIFICATIONS UNLESS WITHIN ONE FOOT OF A CURB OR SIDEWALK, THREE FEET OF A UTILITY STRUCTURE (E.G. WATER METER, UTILITY POLE, HAND HOLE, ETC.), OR THE DRIPLINE OF AN EXISTING TREE.
25. ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE CITY OF SEATTLE TRAFFIC CONTROL MANUAL FOR IN-STREET WORK. AN APPROVED TRAFFIC CONTROL PLAN WILL BE REQUIRED FOR ALL ARTERIAL STREETS, HIGH IMPACT AREAS AND CONSTRUCTION HUBS PRIOR TO BEGINNING CONSTRUCTION.
26. PERMITTEE SHALL NOTIFY KING COUNTY METRO AT 206- 477-1140 FOURTEEN DAYS IN ADVANCE OF ANY IMPACT TO TRANSIT OPERATIONS. CALL 206-477-1150 FOR ANY COORDINATION RELATED TO KING COUNTRY METRO TROLLEY (INCLUDING SLU AND FIRST HILL STREET CAR). CONTACT KING COUNTY METRO TWO MONTHS PRIOR FOR ANY TROLLEY DE-ENERGIZING REQUESTS.
27. COORDINATE PARKING/LOADING SIGN(S) AND PAY STATION REMOVAL / RELOCATION AND INSTALLATION WITH SEATTLE DEPARTMENT OF TRANSPORTATION CURB SPACE MANAGEMENT WILLIAM WAN 206-684-8175, WILLIAM.WAN@SEATTLE.GOV WITH AT LEAST 10 BUSINESS DAYS' NOTICE. SIGNPOSTS ARE TO BE INSTALLED IN ACCORDANCE WITH STANDARD PLANS 616, 620, 621A, 621B, 625, & 626.
28. ALL STREET NAME SIGNS MUST BE INSTALLED BY SEATTLE DEPARTMENT OF TRANSPORTATION AT THE PERMITTEE'S EXPENSE.
29. ALL WORK PERFORMED BY SEATTLE CITY LIGHT, SEATTLE PUBLIC UTILITIES, AND OTHER UTILITIES TO INSTALL, REPAIR, REMOVE OR RELOCATE UTILITIES SHALL BE DONE AT THE PERMITTEE'S EXPENSE.
30. PERMITTEE MUST CONTACT THE SEATTLE DEPARTMENT OF PARKS AND RECREATION TO APPLY FOR A SEPARATE PERMIT IF WORKING WITHIN A DESIGNATED PARK BOULEVARD.
31. CARE SHALL BE EXERCISED WHEN EXCAVATING OR REMOVING PAVEMENT NEAR EXISTING CHARGED WATER MAINS. CAST IRON WATER MAINS ARE KNOWN TO BE SENSITIVE TO EXCESSIVE VIBRATION. COORDINATE PROTECTION METHODS WITH SPU.

Vicinity Map



Datum

HORIZONTAL DATUM:
NAD 83/2011 (EPOCH 2010.00)

SOURCE: CITY OF SEATTLE
DESCRIPTION: MON IN CASE W/ 3/8" BRASS PIN
LOCATION: INTERSECTION OF S JACKSON ST AND 12TH AVE S
NORTHING: 222097.65
EASTING: 1274341.82

SOURCE: CITY OF SEATTLE
DESCRIPTION: 4"X4" CONC MON IN CASE W/ 1-3/4" BRASS DISK
LOCATION: 25' SOUTH OF INTERSECTION OF S JACKSON ST AND 10TH AVE S
NORTHING: 222079.74
EASTING: 1273738.50

VERTICAL DATUM:
NAVD 88

SOURCE: CITY OF SEATTLE
ID#: 3895-0702
DESCRIPTION: 2"BRASS CAP
LOCATION: NE QUADRANT OF S JACKSON ST AND 12TH AVE S, 12'N & 1'W OF BACK CONCRETE WALK INTERSECTION.
ELEVATION: 177.95

SOURCE: BRH
ID#: TBM 'B'
DESCRIPTION: CHISELED "□"
LOCATION: IN BACK CURB AT WEST WING OF WESTERLY H/C RAMP AT NW QUADRANT OF S JACKSON ST & 10TH AVE S.
ELEVATION: 147.33

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Owner

FRIENDS OF LITTLE SAIGON
1227 S WELLER ST SUITE A
SEATTLE, WA 98144
(253) 245-9341 CONTACT: QUYNH PHAM

Architect

MITHUN
1201 ALASKAN WAY #200
SEATTLE, WA 98101
(206) 623 3344 CONTACT: DOUG LEIGH

Engineer

COUGHLIN PORTER LUNDEEN
1191 SECOND AVENUE, SUITE 1100
SEATTLE, WA 98101
206-343-0460 CONTACT: KEN WIERSEMA, PE

Surveyor

BUSH ROED AND HITCHINGS
15400 SE 30TH PL SUITE 100
BELLEVUE, WA 98007
(206) 323-4144 CONTACT: TAYLOR SCHULTE PLS

Civil Abbreviations

BOE	BOTTOM OF MASS EXCAVATION	ROW	RIGHT OF WAY
CB	CATCH BASIN	SDCI	SEATTLE DEPARTMENT OF CONSTRUCTION AND INSPECTIONS
CMP	CORRUGATED METAL PIPE		
CO	CLEAN OUT	SDCO	STORM DRAIN CLEAN OUT
CONC	CONCRETE	SDMH	STORM DRAIN MANHOLE
COS	CITY OF SEATTLE	SPU	SEATTLE PUBLIC UTILITIES
FF	FINISH FLOOR	SS	SANITARY SEWER
MH	MANHOLE	SSCO	SANITARY SEWER CLEAN OUT
PS/PSS	PIPE SEWER/PIPE SANITARY SEWER	SSMH	SANITARY SEWER MANHOLE
PSD	PIPE STORM DRAIN	STDS	STANDARDS
PVC	POLYVINYLCHLORIDE	TOS	TOP OF SLAB
RCP	REINFORCED CONCRETE PIPE	WM	WATER METER

Monument Construction Notes

EXISTING MONUMENT CASES WITHIN THE CONSTRUCTION AREA SHALL BE ADJUSTED OR RESET. SURVEY MONUMENTS AND MONUMENT CASES SHALL NOT BE REMOVED, DISTURBED, COVERED, OR DESTROYED BEFORE A PERMIT IS OBTAINED FROM THE WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES. WWW.DNR.WA.GOV/HTDOCS/PLSO/DOWNLOAD.HTM OR 360-902-1194. A COPY OF THE PERMIT SHALL BE GIVEN TO THE SEATTLE PUBLIC UTILITIES SURVEY SECTION, PHONE 206-684-5073, FAX 206-733-9902, AT LEAST 4 WORKING DAYS BEFORE A MONUMENT IS REMOVED, DISTURBED, COVERED, OR DESTROYED. THE CONTRACTOR MAY REQUEST THAT THE SEATTLE PUBLIC UTILITIES SURVEY SECTION PERFORM THE REQUIRED MONUMENT PERMITTING AND SURVEYING. CONTACT THE LAND SURVEY MANAGER AT 206-684-5073 AT LEAST 4 WORKING DAYS PRIOR TO ACTIVITY WHICH WILL AFFECT A MONUMENT.

Legal Description

PARCEL A:

LOT 1 AND THE NORTH 60 FEET OF LOTS 21 AND 22 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;

EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.

PARCEL B:

LOT 2 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;

EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.

TITLE REPORT REFERENCE:
THIS SURVEY WAS CONDUCTED ACCORDING TO THE DESCRIPTION SHOWN, FURNISHED BY FIRST AMERICAN TITLE INSURANCE COMPANY, COMMITMENT NO. NCS-1184153-WA1, DATED AUGUST 25, 2023. THE EASEMENTS SHOWN OR NOTED HEREON RELATE TO THIS COMMITMENT.

NOTE: EASEMENTS CREATED OR RESCINDED AFTER THIS DATE ARE NOT SHOWN OR NOTED HEREON.

Drainage CB And Inlet Notes

UNLESS OTHERWISE NOTED

1. CATCH BASIN CONNECTIONS AND INLET CONNECTIONS MUST BE 8" DIAMETER. PIPE MUST BE CEMENT MORTAR LINED DUCTILE IRON CLASS 50 (MIN) PER SPECIFICATION 9-05.3. FITTINGS MUST BE CEMENT MORTAR LINED DUCTILE IRON. JOINTS MUST BE RUBBER GASKET, PUSH-ON OR MECHANICAL.
2. BEDDING MUST BE CLASS D WITH SELECT NATIVE MATERIAL.
3. CATCH BASIN CONNECTIONS MUST BE PLACED AT A MINIMUM SLOPE OF 2% AND A MAXIMUM SLOPE OF 100% PER STANDARD PLAN NO. 261 AND SPECIFICATION 7-08.3(4).
4. INLET CONNECTIONS MUST BE PLACED AT A MINIMUM SLOPE OF 5% AND A MAXIMUM SLOPE OF 50% PER SPECIFICATION 7-08.3(5).
5. CATCH BASINS AND INLETS MUST BE LOCATED PER STANDARD PLAN NO. 260A AND 260B.
6. TELEVISION INSPECTION OF CATCH BASIN CONNECTIONS MUST BE PER SPECIFICATION 7-17.3(3)G.
7. CONTRACTORS ARE NOT ALLOWED TO CORE INTO MAINS OR STRUCTURES WITHOUT PRIOR APPROVAL FROM SPU. TO SCHEDULE CORE TAPS, CONTACT SPU AT 206-615-0511 A MINIMUM OF 2 BUSINESS DAYS IN ADVANCE. SPU SHALL BE ON SITE PRIOR TO THE START OF CONTRACTOR PERFORMED CORE TAP. CONTRACTORS PERFORMING CORE TAPS MUST PROVIDE THE COUPON OF REMOVED MATERIAL TO SPU.

Tax Account Numbers

817010-0005-00
817010-0010-03

Requirements Prior To Permit Issuance		
Task	Responsible Party	Notes
Drawing Approval	Design Team	
Surety Bond	Contractor Or Owner	Bond Amount Determined By Sdot
Pre-construction Material Submittal	Contractor	Pre-construction List Provided By SDOT
Insurance Certificate	Contractor	
Permit Issuance Fee ($8,262)	Contractor Or Owner	
Approved Traffic Control Plan	Contractor	
Construction Hub Approval	Contractor	
Pre-construction Meeting	Contractor	Contractor To Schedule Based On Sub-contractor Availability
Street Use Fees (Utility Permits Only)	Contractor	

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

06.06.25 3:01 PM
\\Server6\civil\...2023\123ALP-018\CAD\CAD\SS_SDOT_COVER.dwg

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

KENNETH A. WIERSEMA — STATE OF WASHINGTON — 22431 — REGISTERED PROFESSIONAL ENGINEER

COUGHLIN PORTER LUNDEEN
STRUCTURAL CIVIL SEISMIC ENGINEERING
1191 SECOND AVENUE, SUITE 1100
SEATTLE, WA 98101
(206) 343-0460
www.cplinc.com

Call before you Dig. 8-1-1
or 1-800-424-5555
UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING	
ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER .....
SPU/WATER ENGINEERING	SDOT SUPERVISOR .....
SPU/DRAINAGE	REVISED AS-BUILT .....

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS IN EFFECT ON THE DATE SHOWN ABOVE, AND SUPPLEMENTED BY SPECIAL PROVISIONS.

Seattle Department of Transportation

1001 S JACKSON ST

COVER SHEET

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	1 OF 17

Street Lighting General Notes

1. EXISTING STREET LIGHTING SYSTEM SHALL BE MAINTAINED DURING CONSTRUCTION.
2. WORK MUST BE SCHEDULED SUCH THAT NO TWO (2) ADJACENT OR OPPOSITE STREETLIGHTS ARE DISABLED AT ANY ONE TIME.
3. ANY EXCAVATION IN PROXIMITY TO AN EXISTING STREETLIGHT POLE MUST BE DONE WITHOUT UNDERMINING ITS STABILITY. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY STABILIZING SUPPORT.
4. MAINTAIN MINIMUM HORIZONTAL AND VERTICAL CLEARANCES BETWEEN SCL UNDERGROUND STRUCTURES AND VARIOUS OTHER UTILITY STRUCTURES PER SCL CONSTRUCTION STANDARD 0214.00.

Tree Protection Notes

1. CONTRACTOR SHALL PREPARE A TREE, SOIL AND VEGETATION PROTECTION WORK PLAN. NOTE AND PHOTOGRAPH CONDITIONS AND MATERIALS IN EXISTING TREE PITS TO INCLUDING PAVERS FOR REVIEW BY SDOT URBAN FORESTRY.
2. CONTRACTOR SHALL SCHEDULE A URBAN FORESTRY-SPECIFIC PRE-CON SITE VISIT PRIOR TO BOTH DEMOLITION AND EXCAVATION WITHIN THE TREE DRIP LIN.
3. AIR SPADING REQUIRED
   ALL TRENCH EXCAVATION IN THE TREE DRIPLINE SHALL BE PERFORMED TO FULL DEPTH AND WIDTH OF EXCAVATION WITH AN AIRSPADE UNDER THE SUPERVISION OF SDOT URBAN FORESTRY ARBORIST. WATER SLUICING IS NOT ALLOWED. RETAIN ALL STRUCTURAL ROOTS (1 INCH OR GREATER) ACROSS TRENCHES. SDOT URBAN FORESTRY ARBORIST TO DIRECT ROOT PRUNING IF NECESSARY.
4. AVOID DAMAGE TO ROOTS DURING CONCRETE SAWCUTTING, DEMOLITION, EXCAVATION AND TRENCHING.
5. REMOVE PAVEMENT WITHIN TREE DRIPLINE BY SAWCUTTING FREQUENTLY (12 TO 18 INCHES O.C.) TO ALLOW SMALL PIECES TO BREAK OUT. IF PART OF PAVEMENT IS FIRMLY ATTACHED TO ROOTS GREATER THAN 1-INCH, PRUNE ROOTS UNDER SUPERVISION OF SDOT URBAN FORESTRY ARBORIST.
6. PROTECT TREE ROOTS AFTER EXPOSURE DUE TO CONCRETE REMOVAL, AIRSPADING AND OTHER CONSTRUCTION ACTIVITY. ONLY EXCAVATE AND EXPOSE AREA OF ROOTS THAT CAN BE BACKFILLED AND COVERED WITHIN ONE WORKING DAY. MAINTAIN MOIST SUBGRADE CONDITION UNTIL NEW CONCRETE IS INSTALLED.
7. TRENCH BACKFILL IN CRITICAL ROOT ZONE SHALL BE COS MINERAL AGGREGATE TYPE 24 OR 22. USE OF BACKHOE IN TREE DRIPLINE IS PROHIBITED.
8. 8. KEEP TREE ADEQUATELY WATERED UNTIL SIDEWALK IS REPLACED.

General PSE Notes

1. CONTACT MAPREQUEST@PSE.COM FOR UPDATED GAS MAPS OF AREA.
2. MAINTAIN A MINIMUM 1' VERTICAL SEPARATION WHEN CROSSING GAS MAINS OR SERVICES.
3. MAINTAIN A MINIMUM 3' HORIZONTAL SEPARATION WHEN RUNNING PARALLEL TO GAS MAINS OR SERVICES.
4. IF HP IS ENCOUNTERED, PLEASE CONTACT PSE PI INSPECTOR BEFORE WORKING NEAR HP GAS MAINS: GLENN HUDEN, 206-396-4159, GLENN.HUDEN@PSE.COM
5. COORDINATE WITH PSE CUSTOMER CONSTRUCTION SERVICES AT 1-888-321-7779 AND A PSE PROJECT MANAGER FOR RELOCATION OF GAS MAINS AND SERVICES AS NEEDED.
6. LOCATE AND PROTECT ALL GAS FACILITIES IN THE FIELD.

Construction HUB Note

PROJECT IS LOCATED WITHIN THE BOUNDARY OF UPTOWN, BELLTOWN, AND SLU CONSTRUCTION HUB. CONTRACTORS PLANNING TO WORK IN THESE AREAS MUST SCHEDULE THEIR RIGHT-OF-WAY IMPACTS AN CONSTRUCTION WITH CONSTRUCTION HUB COORDINATORS BEFORE PERMITS CAN BE ISSUED. PERFORMING WORK IN THE CONSTUCTION HUB REQUIRES AT MINIMUM 10 BUSINESS DAYS BEFORE WORK IS SCHEDULED TO BEGIN. TO SUBMIT A SCHEDULING REQUEST, PLEASE COORDINATE WITH THE HUB COORDDINATOR; SDOTCONSTRUCTIONHUB@SEATTLE.GOV

Signal Operations General Notes

1. CONTRACTOR SHALL MAINTAIN EXISTING SIGNAL OPERATION DURING CONSTRUCTION AND PROVIDE TEMPORARY SIGNAL MODIFICATIONS WHEN NEEDED APPROVED BY THE ENGINEER AT THE CONTRACTOR'S EXPENSE.
2. ALL WORK NECESSARY TO ADJUST, RELOCATE, REPAIR OR CONSTRUCT ANY PART OF THE SIGNAL UTILITY SHALL BE AT THE CONTRACTOR'S EXPENSE. THIS WORK IS TO BE PERFORMED BY A QUALIFIED SIGNAL CONTRACTOR OR SDOT CREWS.
3. ANY CONFLICTS WITH THE SIGNAL SYSTEM AND CONSTRUCTION SEQUENCE MUST BE COORDINATED WITH THE SIGNAL OPERATIONS OFFICE AS SOON AS KNOWN. CONTACT DODD PHARIS AT 206-255-7244. A MINIMUM FIVE WORKING-DAY NOTICE IS REQUIRED FOR ANY WORK REQUESTED OF TRAFFIC SIGNAL ELECTRICIAN CREWS. SDOT CREWS WILL NOT BE SCHEDULED UNTIL AN ACCOUNT HAS BEEN SET UP FOR THE SPECIFIC PROJECT WITH A DEPOSIT TO COVER ALL COSTS TO RESOLVE THE CONFLICT AND A RESPONSIBLE PARTY HAS SIGNED THE SDOT-SIGNAL PRIVATE CONTRACTOR BILLING AGREEMENT. ANY WORK PERFORMED BY SDOT CREWS EXCEEDING THE DEPOSIT AMOUNT WILL BE INVOICED AND BILLED TO THE CONTRACTOR. ANY UNUSED MONEY WILL BE REFUNDED AT THE CONCLUSION OF THE PROJECT.
4. ANY SIGNAL ITEMS, INCLUDING BUT NOT LIMITED TO SIGNAL HEADS, POLE FOUNDATIONS, PEDESTALS, DETECTOR LOOPS, CONDUITS, HANDHOLES, AND ASSOCIATED SPAN WIRES AND CABLES THAT ARE DAMAGED OR DESTROYED SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
5. ANY SIGNAL ITEMS WHICH ARE DISTURBED AS A RESULT OF GRADE CHANGE ARE REQUIRED TO BE REGRADED OR REPLACED AT THE CONTRACTOR'S EXPENSE.
6. ACCESS TO CONTROLLER CABINETS AND ASSOCIATED SIGNAL EQUIPMENT MUST BE AVAILABLE AT ALL SPACE MUST BE PROVIDED FOR DOOR SWING. ANY FENCES, EQUIPMENT AND MATERIAL STORAGE SHALL NOT BLOCK ACCESS TO SIGNAL EQUIPMENT. ANY COSTS AND/OR TIME LOSS INCURRED BY SDOT CREWS IN GAINING ACCESS TO BLOCKED SIGNAL EQUIPMENT WILL BE AT THE CONTRACTOR'S EXPENSE.
7. ANY WORK THAT WILL DAMAGE OR DESTROY TRAFFIC LOOP DETECTORS MUST NOTIFY SIGNAL OPERATIONS OFFICE AT EARLIEST TIME NO LESS THAN TWO WEEKS PRIOR TO SCHEDULED WORK. SIGNAL OPERATIONS OFFICE WILL PREPARE AN ESTIMATE TO COVER THE COST ASSOCIATED WITH TEMPORARY DETECTION AND TIMING, DIS-CONNECTION, DETECTOR TESTING, RE-CONNECTION AND RESTORATION OF PERMANENT TIMING. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO RESTORE THE DETECTOR LOOPS WITHIN TWO (2) WEEKS OF DESTRUCTION OR PROVIDE TEMPORARY DETECTION DURING THE INTERIM. FULLY RESTORED PAVEMENT MUST BE IN PLACE BEFORE THE LOOPS CAN BE RESTORED. A DEPOSIT FOR THE FULL ESTIMATE PREPARED BY THE SIGNAL OPERATIONS OFFICE AND A SIGNED SDOT-SIGNAL PRIVATE CONTRACTOR BILLING AGREEMENT BILLING IS REQUIRED PRIOR TO SCHEDULED WORK. DISCONNECT AND TEMPORARY TIMING WILL BE SCHEDULED NO LESS THAN FIVE (5) WORKING DAYS AFTER RECEIPT OF THE DEPOSIT. SIGNAL OPERATIONS PERSONNEL WILL WORK ON A TIME AND MATERIAL BASIS. ANY UNUSED MONEY WILL BE REFUNDED AT THE CONCLUSION OF THE PROJECT.
8. THE CONTRACTOR SHALL INVESTIGATE FOR UNDERGROUND UTILITIES PRIOR TO ANY POLE FOUNDATION EXCAVATION OR CONDUIT TRENCHING TO AVOID DAMAGE TO ANY UNDERGROUND UTILITIES (INCLUDING SIDE SEWERS).
9. THE CONTRACTOR SHALL VERIFY THE CAPACITIES OF ALL EXISTING CONDUITS OR DUCT RUNS DESIGNATED FOR USE ON THIS PROJECT. ANY DISCREPANCIES WITH THE PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO ANY CONSTRUCTION WORK.
10. EXISTING SIGNS WHICH ARE REMOVED (STREET NAME SIGNS, SIGNAL SIGNS, ETC.) FROM AN EXISTING POLE SHALL BE REINSTALLED PER PLAN OR ADJUSTED IN THE FIELD WITH THE ENGINEER'S APPROVAL.
11. IF A CONTROLLER CABINET, HANDHOLE, CONDUIT, POLE, OR PEDESTAL IS TO BE RELOCATED IN SUCH A WAY AS TO LENGTHEN THE TRAFFIC CABLE RUNS, NEW WIRING OF THE AFFECTED LINES MAY BE REQUIRED. SPLICES WILL NOT BE ALLOWED IN ANY ITS EQUIPMENT CABLES, SIGNAL INTERCONNECT, PREEMPT, TRUNK, OR VIDEO DETECTION LINES, NOR IN PEDESTRIAN PUSHBUTTON WIRING.
12. ANY EXCAVATION IN PROXIMITY TO AN EXISTING POLE OR DOWN GUY MUST BE DONE WITHOUT UNDERMINING THEIR STABILITY. INSPECTION IS REQUIRED PRIOR TO ANY EXCAVATION.
13. ALL POLE INSTALLATIONS SHALL BE INSPECTED AT SEVERAL STAGES; INCLUDING BUT NOT LIMITED TO FOUNDATION EXCAVATION, BOLT, REBAR AND CONDUIT INSTALLATIONS, POLE SET FOR PROPER RAKE, LUMINAIRE INSTALLATIONS, WIRING, GROUNDING AND BONDING.
14. SIGNAL CONDUITS THAT ENTER THE CONSTRUCTION SITE, SUCH AS THOSE CROSSING THE STREET OR INTERCONNECT TO OTHER SIGNALIZED INTERSECTIONS, MUST BE RECONNECTED. THE RECONNECTIONS MUST BE INSPECTED AND APPROVED IN WRITING BY THE SDOT INSPECTOR BEFORE THE BACKFILL AND PAVING WORK MAY BE SCHEDULED.
15. PRIOR TO CURB INSTALLATION, SIDEWALK INSTALLATION, STREET PAVING, OR TREE INSTALLATION ALL CONDUITS, EXISTING AND NEWLY INSTALLED, MUST BE INSPECTED FOR CONTINUITY. PULL STRINGS SHALL BE PRESENT IN ALL NEW CONDUITS. EXISTING CONDUIT MUST BE ACCOUNTED FOR, BE CLEAR OF DEBRIS, EXTEND ABOVE THE BOTTOM OR TERMINATE IN THE SIDE OF THE HANDHOLE, AND HAVE MOVEMENT IN THE CABLES OR HAVE A PULL STRING AVAILABLE TO SHOW MOVEMENT. ALL CONDUITS THAT ARE ABANDONED SHALL BE LABELED SUCH IN EACH ACCESS THEY PASS THROUGH.
16. TO ORDER INSPECTIONS CALL THE SIGNAL INSPECTION SUPERVISOR, RAYMOND HILL AT 206-391-3714. THREE WORKING DAYS NOTICE IS REQUIRED.
17. TO MEET THE REQUIREMENTS OF THE PAVEMENT RESTORATION RULES; IF SIDEWALKS ARE REMOVED AS A PART OF THE STREET IMPROVEMENT, A CONSTRUCTION WINDOW OF NO LESS THAN 5 DAYS SHALL BE PROVIDED FOR SDOT SIGNAL CREWS TO INSTALL ANY INFRASTRUCTURE NOT INCLUDED IN THE PLANS BEFORE THE SIDEWALK IS RESTORED. THIS WINDOW SHALL BE COORDINATED BETWEEN SDOT CREW CHIEF AND CONTRACTOR TO PROVIDE A WINDOW SCHEDULED NOT LESS THAN 5 WORKING DAYS PRIOR TO THE WINDOW.
18. LANDINGS ARE TO REMAIN CLEAR AND PEDESTRIAN PUSH BUTTONS MUST REMAIN EASILY ACCESSIBLE TO THE PUBLIC AT ALL TIMES.
19. ALL MATERIALS USED SHALL GO THROUGH THE SUBMITTAL PROCESS OUTLINED IN THE STANDARD SPECIFICATIONS. IF A PHYSICAL SAMPLE IS TO BE SUBMITTED, THE SAMPLE WILL BE DELIVERED TO THE SIGNAL SHOP. CLEARLY LABEL YOUR SAMPLE WITH THE PROJECT NAME AND THE COMPANY AND CONTACT PHONE NUMBER. CALL CREW CHIEF AT (206) 386-1517 THE DAY BEFORE TO ARRANGE DELIVERY.
20. IF PLAN REQUIRES NEW STEEL STRAIN POLES TO BE INSTALLED, PLEASE NOTE; SIGNAL POLES CAN TAKE 4 TO 6 MONTHS OF LEAD TIME TO ACQUIRE. PLEASE ORDER YOUR POLES AT THE EARLIEST POSSIBLE DATE. SHOP DRAWINGS AND DETAILS SHALL BE REVIEWED BY THE SIGNAL DESIGN ENGINEER.
21. ONLY ELECTRICAL CONTRACTORS WITH TRAFFIC SIGNAL CONSTRUCTION EXPERIENCE ARE ALLOWED TO WORK ON TRAFFIC SIGNAL ITEMS. INTERCONNECT TERMINATION AND POWERING UP AND DOWN OF SIGNALS IS EXCLUSIVELY HANDLED BY SDOT SIGNAL ELECTRICIANS. ALL OTHER SIGNAL RELATED WORK PERFORMED SHALL BE DONE BY A QUALIFIED SIGNAL CONTRACTOR AND INSPECTED UPON COMPLETION.
22. EXISTING SIGNAL SHALL REMAIN OPERATIONAL UNTIL TIME TO CUT OVER TO NEW INSTALLATION. CONTRACTOR IS REQUIRED TO PROVIDE TRAFFIC CONTROL AND ONE OR MORE UNIFORMED POLICE OFFICERS DURING THE PERIOD THE SIGNAL IS DARK. SIGNAL CUT OVER SHALL NOT BE SCHEDULED UNTIL THE INSPECTOR HAS SIGNED OFF ON THE CHECKOUT LIST. CUT OVER SHALL BE SCHEDULED WITH SIGNAL OPERATIONS OFFICE AT LEAST 5 WORKING DAYS.

Street Lighting General Notes

1. ALL DISCONNECTIONS: TEMPORARY OR FINAL SERVICE CONNECTIONS WILL BE MADE BY SEATTLE CITY LIGHT (SCL) AT PROJECT'S EXPENSE. COORDINATE ALL ENERGIZING AND DE-ENERGIZING OF STREET LIGHTING SERVICE WITH SCL ELECTRICAL SERVICE REPRESENTATIVE AND STREETLIGHT ENGINEER FIFTEEN (15) WORKING DAYS IN ADVANCE. ADDITIONAL TIME MAY BE NEEDED FOR CREW SCHEDULING AND MOBILIZATION.
2. CONTRACTOR MUST MAKE PRIOR COORDINATION FOR FLOOD OR STREETLIGHT REMOVAL. CONTRACTOR MUST MAKE PRIOR DELIVERY COORDINATION FOR SALVAGED STREETLIGHT-RELATED MATERIALS TO SEATTLE CITY LIGHT SALVAGE YARD AT 4TH AVE S & S SPOKANE ST, 98134. CONTACT SALVAGE COORDINATOR AT 206-386-1765. NO ARTERIAL STREETLIGHT MAY BE DISABLED WITHOUT PRIOR APPROVAL FROM SEATTLE DEPARTMENT OF TRANSPORTATION, (SDOT).
3. EXISTING STREET LIGHTING SYSTEM SHALL BE MAINTAINED DURING CONSTRUCTION.
4. WORK MUST BE SCHEDULED SUCH THAT NO TWO (2) ADJACENT OR OPPOSITE STREETLIGHTS ARE DISABLED AT ANY ONE TIME.
5. ANY EXCAVATION IN PROXIMITY TO AN EXISTING STREETLIGHT POLE MUST BE DONE WITHOUT UNDERMINING ITS STABILITY. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY STABILIZING SUPPORT.
6. INSTALLATION OF UNDERGROUND STREETLIGHT SYSTEMS, AND STREETLIGHT SYSTEM GROUNDING AND BONDING MUST BE PER SEATTLE CITY LIGHT (SCL) CONSTRUCTION STANDARD 1714.50.
7. ALL WIRING, INCLUDING STREET LIGHTING, PEDESTRIAN LIGHTING AND FESTOON LIGHTING CIRCUITS MUST BE CLEARLY LABELED PER SEATTLE CITY LIGHT (SCL) CONSTRUCTION STANDARD 1714.10.
8. EACH LUMINAIRE MUST BE FUSED PER (SCL) CONSTRUCTION STANDARD 1730.00.
9. STREETLIGHT HANDHOLE AND CONDUIT REQUIREMENTS MUST CONFORM TO SCL CONSTRUCTION STANDARD 1716.07.
10. 10. PULL TAPE MUST BE INSTALLED THROUGH VACANT CONDUIT CAPPED PER (SCL) CONSTRUCTION STANDARD U2-11.40/NDK-40.
11. MAINTAIN MINIMUM HORIZONTAL & VERTICAL CLEARANCES BETWEEN SCL UNDERGROUND STRUCTURES AND VARIOUS OTHER UTILITY STRUCTURES PER SCL CONSTRUCTION STANDARD 0214.00.
12. FOR STREET LIGHTING INSPECTIONS CONTACT SCL ELECTRICAL REVIEWER TEN (10) WORKING DAYS IN ADVANCE.
13. CONTRACTOR MUST CALL FOR AN ELECTRICAL REVIEWER INSPECTION OF THE STREET LIGHTING SYSTEM AT VARIOUS STAGES OF INSTALLATION/CONSTRUCTION OR AS INSTRUCTED BY THE SCL INSPECTOR.
14. CONTRACTOR MUST PROVIDE AN OPERATOR AND MAN LIFT TRUCK FOR USE DURING INSPECTION OF INSTALLED STREETLIGHT FACILITIES.
15. CONTRACTOR MUST ASSIST THE INSPECTOR DURING INSPECTIONS, COMMISSIONING, AND FINAL CONNECTION PHASES OF THE PROJECT AS INSTRUCTED BY THE INSPECTOR. SUCH ASSISTANCE WILL INCLUDE, BUT NOT BE LIMITED TO OPENING HANDHOLES, MANHOLES AND VARIOUS ACCESS COVERS, DISCONNECTING AND RECONNECTING FUSE HOLDERS AND MECHANICAL SPLICE CONNECTIONS, VERIFYING CONDUIT RUNS, ETC.
16. 16. PRIOR TO REQUESTING FINAL STREETLIGHT SERVICE CONNECTION, CONTRACTOR MUST CORRECT ALL PUNCH LIST ITEMS AND CALL FOR A RE-INSPECTION WHERE REQUIRED BY THE INSPECTOR. CONTRACTOR MUST PREPARE A SIGNED AS-BUILT AND WIRING DIAGRAM WHICH INCLUDES WHICH DUCT IS USED IN EACH DUCT BANK.

Water Service Notes

1. APPLICATION FOR A NEW METERED WATER SERVICE AND PAYMENT OF ALL FEES IS REQUIRED BEFORE SERVICE WILL BE AVAILABLE.
2. APPLICANT WILL NEED A WATER AVAILABILITY CERTIFICATE (WAC) AND LEGAL DESCRIPTION OF PROPERTY WHEN SUBMITTING THE APPLICATION. TO OBTAIN A WAC, PLEASE CONTACT THE DEVELOPMENT SERVICES OFFICE AT (206) 684-3333 OR SPUWATERAVAILABILITY@SEATTLE.GOV.
3. ALL WATER SERVICES SHALL BE LOCATED IN THE PUBLIC RIGHT OF WAY AND WITHIN THE FRONTAGE OF THE PARCEL BEING SERVED.
4. WATER SERVICES SERVING PARCELS WITHOUT FRONTAGE TO THE PUBLIC RIGHT OF WAY (SUCH AS UNIT LOT SUBDIVISIONS) OR LANDLOCKED PARCELS SHALL BE SERVED BY A PRIVATE WATER SERVICE EXTENDING FROM THE WATER METER TO THE PARCEL BEING SERVED. THE WATER SERVICE SHALL BE INSTALLED IN A DEDICATED EASEMENT. THE EASEMENT SHALL BE OBTAINED BY THE DEVELOPER, RECORDED, AND A COPY SHALL BE PROVIDED TO SEATTLE PUBLIC UTILITIES (SPU) AT THE TIME OF APPLICATION SUBMITTAL.
5. ALL WATER SERVICES PIPING ON PROPERTY MUST BE INSPECTED PRIOR TO BACKFILLING TRENCH. CONTACT (206) 684-5800 TO REQUEST AN INSPECTION.
6. CUSTOMERS ARE REQUIRED TO INSTALL AN APPROVED AIR GAP OR REDUCED-PRESSURE BACKFLOW ASSEMBLY (RPBA/RPDA) ON ALL WATER SERVICE CONNECTIONS POSING A HIGH HEALTH CROSS-CONNECTION HAZARD (PURSUANT TO WAC 246-290-490). BACKFLOW PREVENTION IS ALSO REQUIRED ON WATER SERVICE CONNECTIONS SUCH AS FIRE SERVICES, IRRIGATION SERVICES, BUILDINGS EXCEEDING THREE STORIES OR 30 FT. IN HEIGHT ABOVE THE METER (MEASURED TO THE HIGHEST WATER FIXTURE), AND MAY BE REQUIRED FOR OTHER WATER SERVICES. SPU AND KING COUNTY HEALTH DEPARTMENT (KCHD) ARE THE ADMINISTRATIVE AUTHORITIES ENGAGED IN A JOINT PROGRAM IDENTIFYING ACTUAL AND POTENTIAL CROSS-CONNECTIONS BETWEEN THE PUBLIC WATER SUPPLY AND POSSIBLE SOURCES OF CONTAMINATION. FOR ANSWERS TO SPECIFIC CROSS-CONNECTION CONTROL QUESTIONS OR TO REQUEST AN INSPECTION, PLEASE CALL (206) 684-3536.

General King County Metro Notes

REVISED 12/11/19

ALL CONSTRUCTION AND OTHER WORK ACTIVITY AFFECTING KING COUNTY METRO TRANSIT OPERATIONS OR FACILITIES AND/OR SEATTLE STREETCAR OPERATIONS OR FACILITIES MUST BE COORDINATED THROUGH THE KCM SYSTEM IMPACTS WORKGROUP. PLEASE CONTACT THEM TO PROVIDE SPECIFIC INFORMATION RELATED TO THE ACTIVITY AND ALLOW THE REQUIRED LEAD TIME NECESSARY FOR RESPONDING TO ANY IMPACTS CAUSED BY IT. FOR NOTIFICATION INFORMATION AND GUIDELINES PLEASE VISIT: HTTPS://KINGCOUNTY.GOV/EN/DEPT/METRO/ABOUT/CONTRACTOR-RESOURCES/TRANSIT-SYSTEM-IMPACTS, OR PHONE 206-477-1140 OR 206-477-1150 FOR TROLLY-RELATED ACTIVITIES.

PLEASE SEE THE FOLLOWING URL FOR STANDARD CONSTRUCTION DETAILS: HTTPS://KINGCOUNTY.GOV/DEPTS/TRANSPORTATION/METRO/ABOUT/CONSTRUCTION-CONTRACTORS/CAPITAL-DELIVERY.ASI

FOR ENGINERING DESIGN QUESTIONS, PLEASE CONTACT KALE CHANG YUEN AT 206-263-0885 OR COLIN ASQUITH AT 206-477-5984 FOR ASSISTANCE.

1. ANY CONSTRUCTION OR INSTALLATION ACTIVITIES AFFECTING TRANSIT OPERATIONS OR FACILITIES MUST BE COORDINATED THROUGH METRO TRANSIT CONSTRUCTION INFORMATION CENTER. FOR NOTIFICATION INFORMATION AND GUIDELINES, PLEASE VISIT: HTTP://WWW.KINGCOUNTY.GOV/TRANSPORTATION/KCDOT/METROTRANSIT/CONSTRUCTION.ASPX OR CONTACT CONSTRUCTION COORDINATORS AT 206-477-1140. PLEASE PROVIDE FIVE BUSINESS DAYS NOTIFICATION FOR BUS REROUTES AND THREE BUSINESS DAYS NOTIFICATION FOR BUS STOP IMPACTS
2. TO SCHEDULE SHELTER REMOVAL, PLEASE CONTACT PLANSREVIEW@KINGCOUNTY.GOV. PLEASE NOTE THAT METRO REQUIRES 3 WEEKS PRIOR NOTIFICATION FOR REMOVAL.
3. PLEASE SEE THE FOLLOWING URL FOR STANDARD CONSTRUCTION DETAILS: HTTP://WWW.KINGCOUNTY.GOV/DEPTS/TRANSPORTATION/METRO/DESIGN-CONSTRUCTION-STANDARDS /PASSENGER-FACILITIES/CONSTRUCTION.ASPX
4. ALL METRO FOOTINGS MUST BE INSPECTED BY METRO INSPECTORS BEFORE ANY CONCRETE IS POURED PLEASE CONTACT METRO INSPECTORS DIRECTLY AT 206-263-2381 OR 206-507-6550 OR VIA EMAIL AT TBIR@KINGCOUNTY.GOV. PLEASE NOTE THAT METRO REQUIRES NOTICE OF 3 WORKING DAYS TO SCHEDULE INSPECTION.
5. AFTER FOOTING INSPECTION AND COMPLETED CONSTRUCTION, PLEASE CONTACT PLANSREVIEW@KINGCOUNTY.GOV TO SCHEDULE SHELTER FRAME INSTALLATION AND BUS STOP FLAGPOST INSTALLATION.
6. FOR ANY CIVIL, STRUCTURAL OR ELECTRICAL DESIGN QUESTIONS, PLEASE CONTACT PAUL ENG AT (206) 477-5953 FOR ASSISTANCE.

REV'D	CHK'D	MADE	NATURE REVISIONS	MARK	DATE

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90% STREET IMPROVEMENT PLAN – NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST – SDCI PROJECT NUMBER: 6982286-CN

KENNETH A. REED — STATE OF WASHINGTON — 20431 — REGISTERED PROFESSIONAL ENGINEER — NOT FOR CONSTRUCTION

COUGHLINPORTERLUNDEEN
STRUCTURAL CIVIL SEISMIC ENGINEERING
1191 SECOND AVENUE, SUITE 1100
SEATTLE, WA 98101
(206) 343-0460
www.cplinc.com

Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING	
ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER .....
SPU/WATER ENGINEERING	SDOT SUPERVISOR .....
SPU/DRAINAGE	REVISED AS-BUILT .....

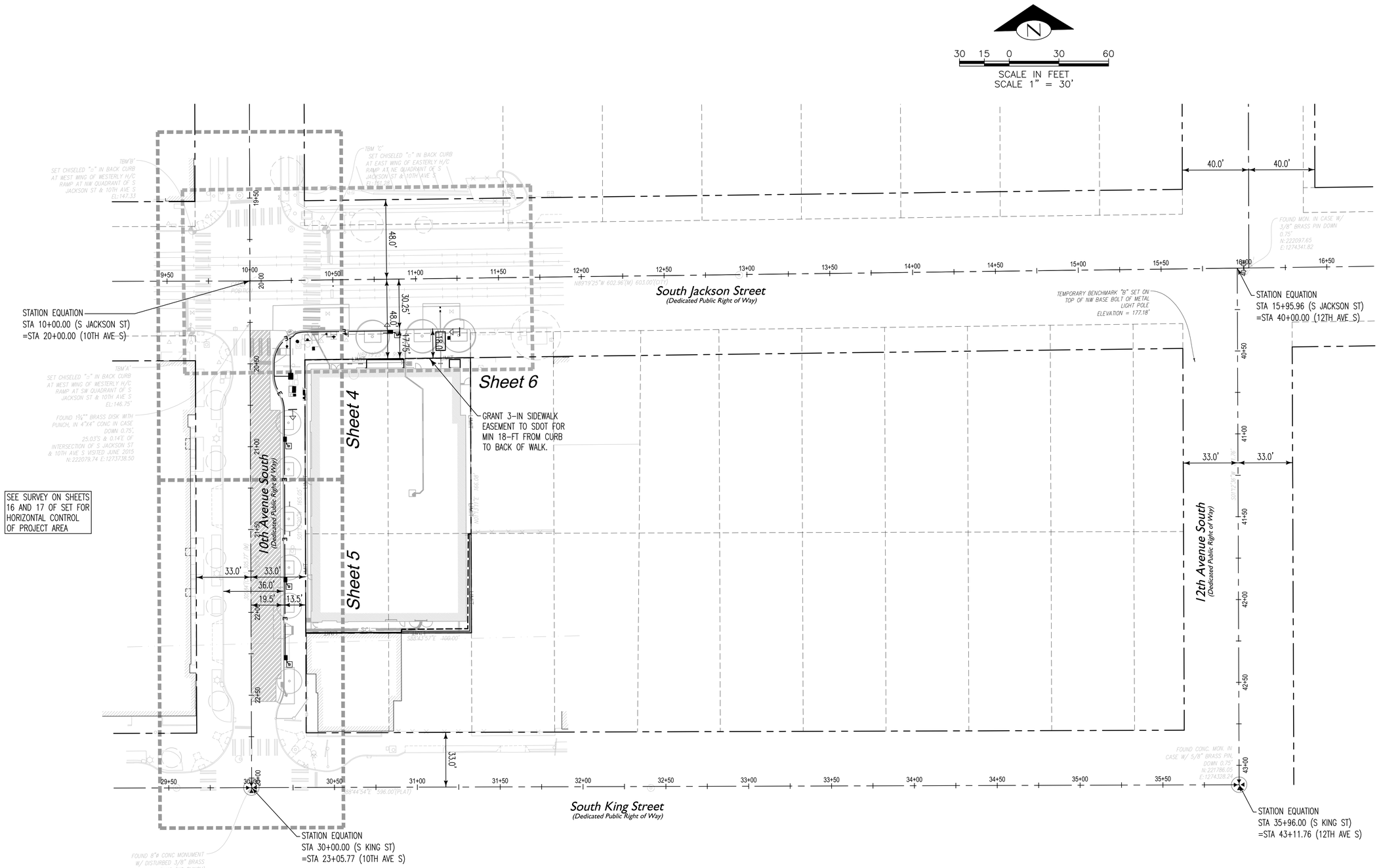
ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS IN EFFECT ON THE DATE SHOWN ABOVE, AND SUPPLEMENTED BY SPECIAL PROVISIONS.

Seattle Department of Transportation

1001 S JACKSON ST

GENERAL NOTES

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	2 OF 17



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		REVISIONS		

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90% STREET IMPROVEMENT PLAN – NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST – SDCI PROJECT NUMBER: 6982286-CN

NOTICE TO CONSTRUCTION
KENNETH A. WESTLUND
STATE OF WASHINGTON
20431
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Seattle Department of Transportation

1001 S JACKSON ST

ALIGNMENT PLAN

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794–119
VAULT SERIAL NO.	40861
SHEET	3 OF 17

LEGEND

- CONCRETE PAVEMENT (STD PLAN 420A)
- ASPHALT PAVEMENT (STD PLAN 402C)
- 2" ASPHALT GRIND & OVERLAY (STD PLAN 402B)
- CONCRETE WALK (STD PLAN 420)
- LANDSCAPING
- EXISTING CENTER LINE
- EXISTING FLOWLINE
- PROPOSED FLOWLINE
- PROPOSED TOP OF CURB
- PROPOSED BACK OF WALK
- EXISTING SPOT ELEVATION x 100.00

COORDINATE STREET/PARKING SIGNAGE REMOVAL AND INSTALLATION IN THE RIGHT-OF-WAY WITH WILLIAM WAN, SDOT STREET SIGNAGE, AT 206-684-8175. SEE GENERAL NOTE #27 FOR PAY STATION/SIGN REMOVAL/RELOCATION.

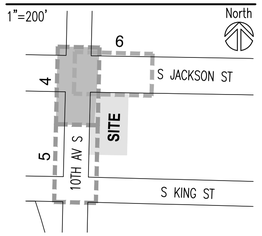
PROTECT TREES & VEGETATION PER STANDARD SPECIFICATIONS 1-07.16(2) & 8-01.3(2)B. CONTACT SDOT URBAN FORESTER BEN.ROBERTS@SEATTLE.GOV FOR FIELD REVIEW OF TREE, VEGETATION AND SOIL PROTECTION PLAN PRIOR TO CONSTRUCTION. SEE TREE PROTECTION NOTES ON SHEET 2.

CONTRACTOR SHALL MAINTAIN SAFE PEDESTRIAN ACCESS ACROSS THE FRONTAGE OF THE PROJECT AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR WORK PERFORMED WITHIN THE CITY OF SEATTLE RIGHT-OF-WAY, UNLESS CONTRACTOR HAS RECEIVED APPROVAL OR OTHERWISE FROM SDOT ON SIDEWALK CLOSURES.

THE CONTRACTOR SHALL COORDINATE SIDEWALK CLOSURES, STREET CLOSURES AND ROW USE PERMITS WITH THE CITY OF SEATTLE DEPARTMENT OF TRANSPORTATION (SDOT).

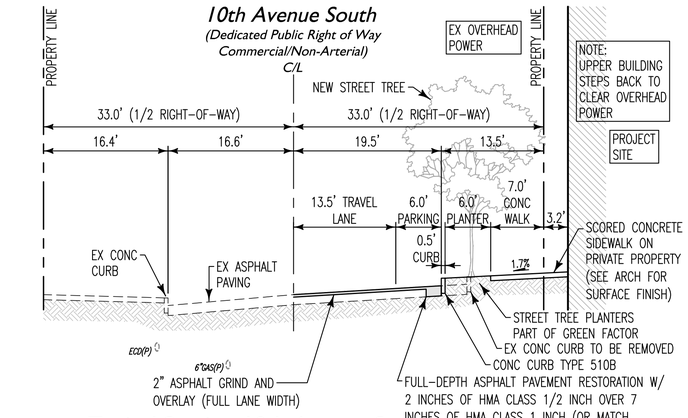
VICINITY MAP

1"=200'



NEW STREET TREES #SDOTTREE0006804

	SPECIES/BOTANICAL NAME	STATION (OFFSET)
1	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 20+85.69, 23.00 LT
2	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 21+13.69, 23.00 LT

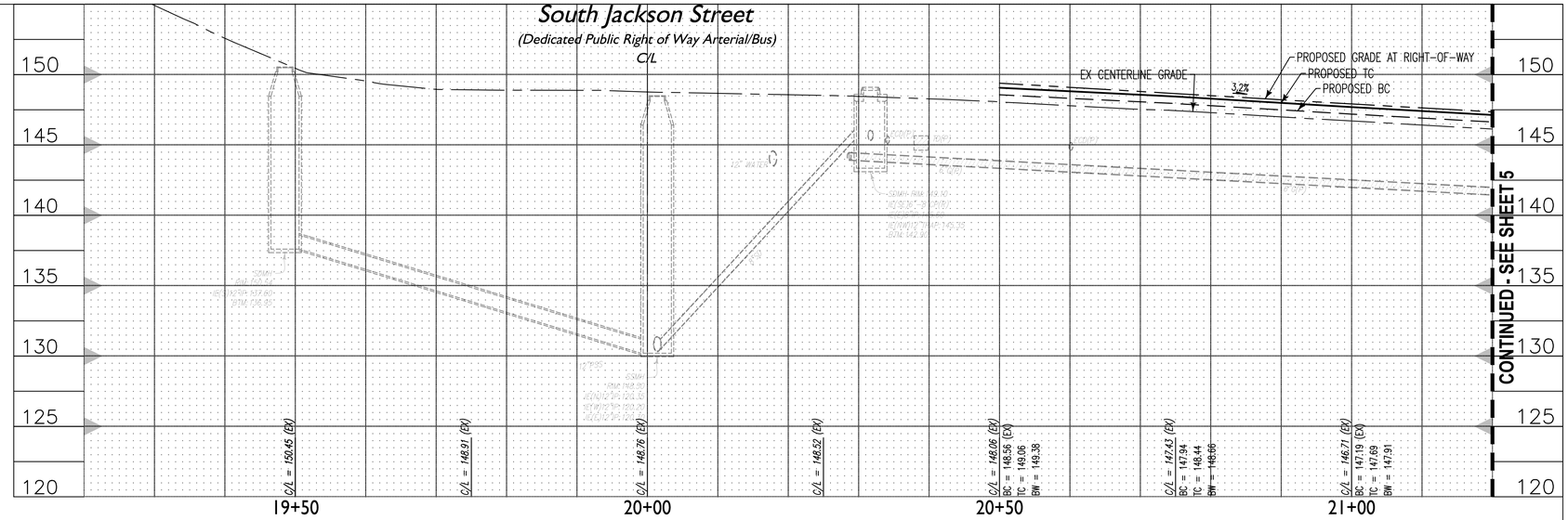


NOTE: UPPER BUILDING STEPS BACK TO CLEAR OVERHEAD POWER

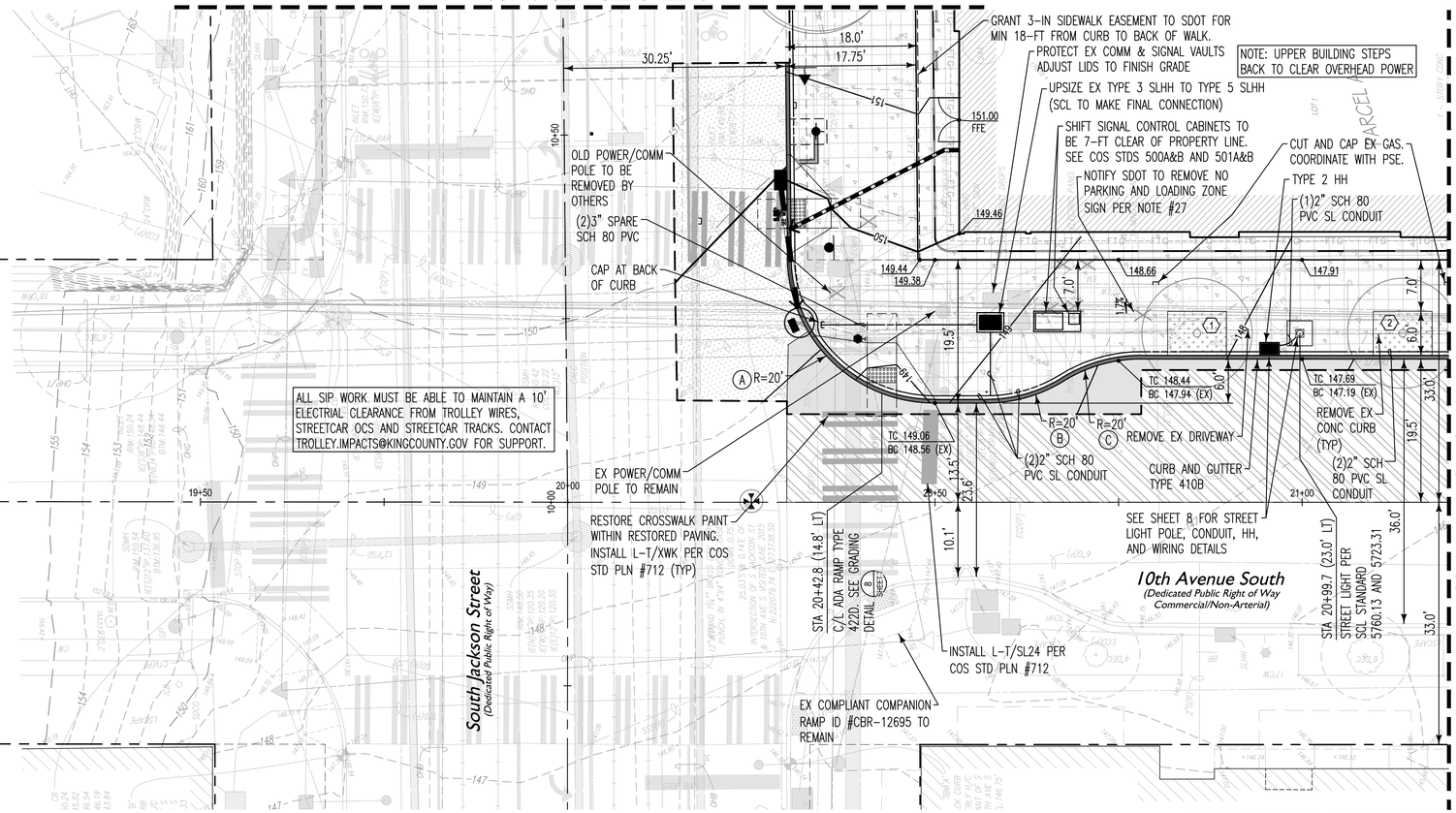
PROJECT SITE

Typical Section 10th Avenue S

SCALE 1"=10' HORZ, 1"=5' VERT



CONTINUED - SEE SHEET 6



CURB RETURN DATA

		BOTTOM OF CURB ELEV	TOP OF CURB ELEV
A	PC STA 20+29.93, 33.31 LT R: 20.00' Δ: 89d38'41.87" L: 31.29' PR STA 20+410.00, 13.50 LT	149.32 (EX) 149.14 (1/4) 148.96 (1/2) 148.73 (3/4) 148.50	149.71 (EX) 149.58 (1/4) 149.46 (1/2) 149.23 (3/4) 149.00
B	PC STA 20+57.03, 13.50 LT R: 20.00' Δ: 31d47'18.09" L: 11.10' PR STA 20+67.56, 16.50 LT	148.32 148.26 (1/4) 148.20 (1/2) 148.14 (3/4) 148.08	148.82 148.76 (1/4) 148.70 (1/2) 148.64 (3/4) 148.58
C	PC STA 20+67.56, 16.50 LT R: 20.00' Δ: 31d47'18.06" L: 11.10' PR STA 20+78.10, 19.50 LT	148.08 148.02 (1/4) 147.96 (1/2) 147.90 (3/4) 147.84	148.58 148.52 (1/4) 148.46 (1/2) 148.40 (3/4) 148.34

10 5 0 10 20
SCALE IN FEET
SCALE 1" = 10'

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
06.06.25	3.02		PRW		

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SPU/WATER ENGINEERING	SDOT SUPERVISOR
SPU/DRAINAGE	REVISED AS-BUILT

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Seattle Department of Transportation

1001 S JACKSON ST

PLAN AND PROFILE
10TH AVE S

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	4 OF 17

LEGEND

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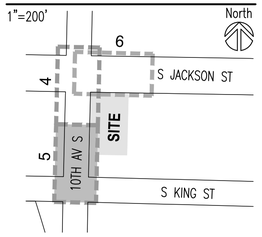
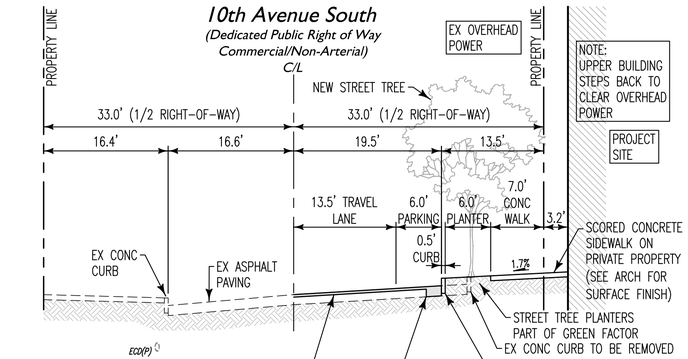
THE CONTRACTOR SHALL COORDINATE SIDEWALK CLOSURES, STREET CLOSURES AND ROW USE PERMITS WITH THE CITY OF SEATTLE DEPARTMENT OF TRANSPORTATION (SDOT).

VICINITY MAP



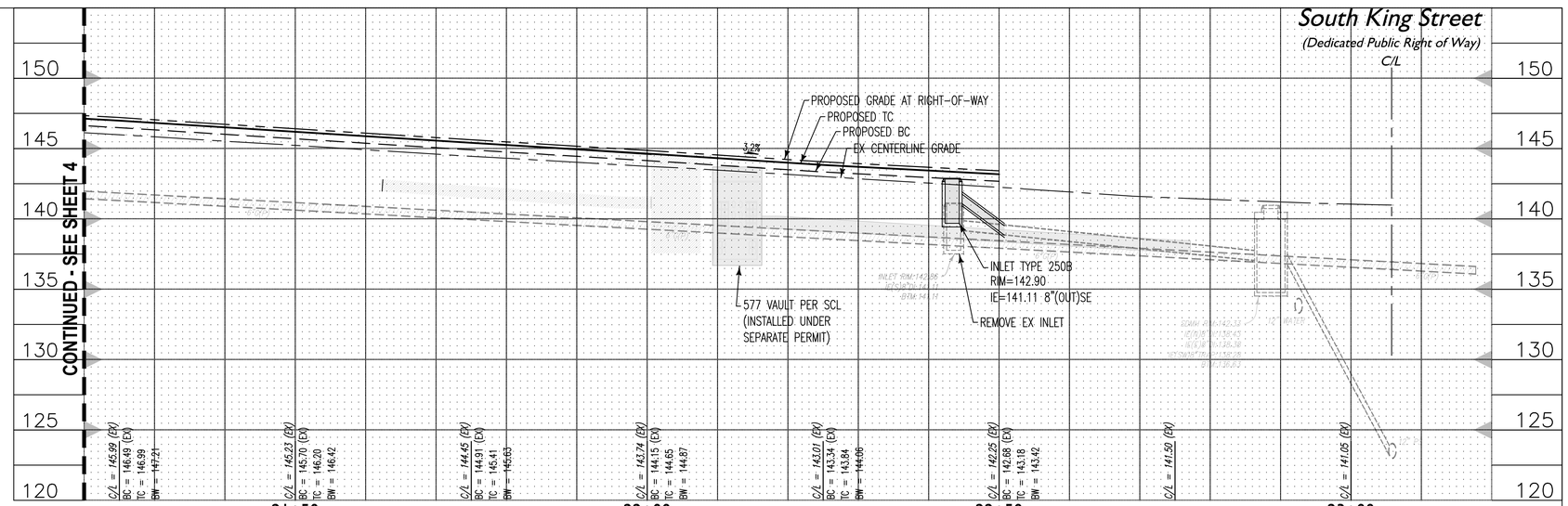
NEW STREET TREES #SDOTTREE0006804

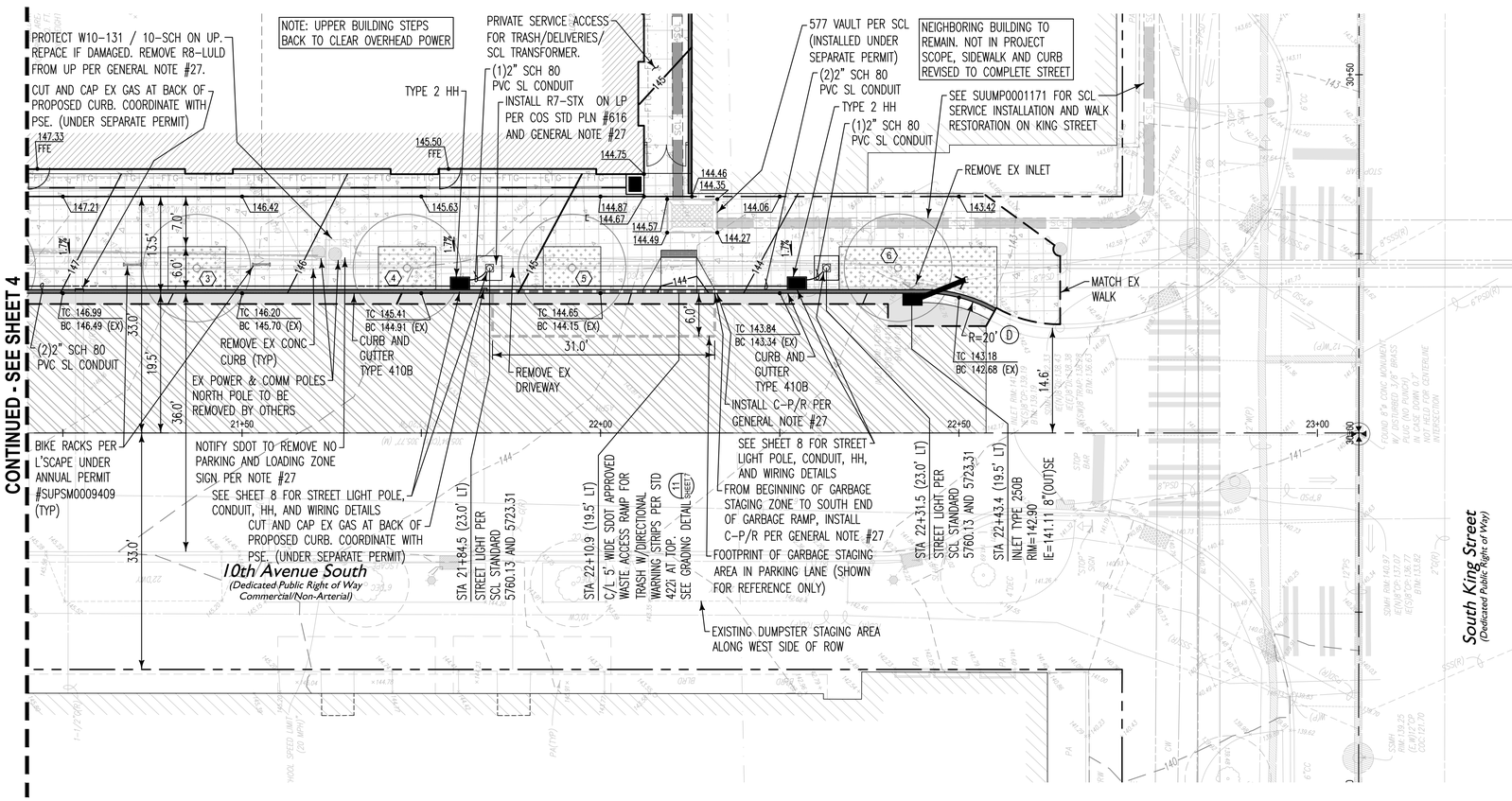
	SPECIES/BOTANICAL NAME	STATION (OFFSET)
③	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 21+43.69, 23.00 LT
④	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 21+73.03, 23.00 LT
⑤	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 21+96.03, 23.00 LT
⑥	STREET TREE PRUNUS SARGENTII (SARGENT'S CHERRY)	STA 22+41.52, 23.00 LT



Typical Section 10th Avenue S

SCALE 1"=10' HORZ, 1"=5' VERT





CURB RETURN DATA

		BOTTOM OF CURB ELEV	TOP OF CURB ELEV
Ⓓ	PC STA 22+45.11, 19.50 LT	142.90	143.40
	R: 20.00'	142.79 (1/4)	142.29 (1/4)
	Δ: 29d22'16.99"	142.68 (1/2)	143.18 (1/2)
	L: 10.25'	142.60 (3/4)	143.10 (3/4)
	PR STA 22+54.92, 16.93 LT	142.52	143.02

10 5 0 10 20
SCALE IN FEET
SCALE 1" = 10'

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

\\Sseven\civil_2023\P2304\F-018\CAD\ES__SD01.dwg 06.05.25 3:02 PRW

90% STREET IMPROVEMENT PLAN – NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST – SDCI PROJECT NUMBER: 6982286-CN

KENNETH A. WEEKS — STATE OF WASHINGTON — 30431 — REGISTERED PROFESSIONAL ENGINEER
NOT FOR CONSTRUCTION

COUGHLINPORTERLUNDEEN
STRUCTURAL CIVIL SEISMIC ENGINEERING
1191 SECOND AVENUE, SUITE 1100
SEATTLE, WA 98101
(206) 343-0460
www.cplinc.com

Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING

ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER
SPU/WATER ENGINEERING	SDOT SUPERVISOR
SPU/DRAINAGE	REVISED AS-BUILT

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS IN EFFECT ON THE DATE SHOWN ABOVE, AND SUPPLEMENTED BY SPECIAL PROVISIONS.

Seattle Department of Transportation

1001 S JACKSON ST

PLAN AND PROFILE
10TH AVE S

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	5 OF 17

LEGEND

- CONCRETE PAVEMENT (STD PLAN 420A)
- ASPHALT PAVEMENT (STD PLAN 402C)
- 2" ASPHALT GRIND & OVERLAY (STD PLAN 402B)
- CONCRETE WALK (STD PLAN 420)
- LANDSCAPING
- EXISTING CENTER LINE
- EXISTING FLOWLINE
- PROPOSED FLOWLINE
- PROPOSED TOP OF CURB
- PROPOSED BACK OF WALK
- EXISTING SPOT ELEVATION x 100.00

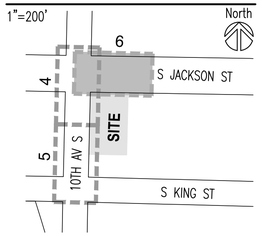
COORDINATE STREET/PARKING SIGNAGE REMOVAL AND INSTALLATION IN THE RIGHT-OF-WAY WITH WILLIAM WAN, SDOT STREET SIGNAGE, AT 206-684-8175. SEE GENERAL NOTE #27 FOR PAY STATION/SIGN REMOVAL/RELOCATION.

PROTECT TREES & VEGETATION PER STANDARD SPECIFICATIONS 1-07.16(2) & 8-01.3(2)B. CONTACT SDOT URBAN FORESTER BEN.ROBERTS@SEATTLE.GOV FOR FIELD REVIEW OF TREE, VEGETATION AND SOIL PROTECTION PLAN PRIOR TO CONSTRUCTION. SEE TREE PROTECTION NOTES ON SHEET 2.

CONTRACTOR SHALL MAINTAIN SAFE PEDESTRIAN ACCESS ACROSS THE FRONTAGE OF THE PROJECT AT ALL TIMES. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR WORK PERFORMED WITHIN THE CITY OF SEATTLE RIGHT-OF-WAY, UNLESS CONTRACTOR HAS RECEIVED APPROVAL OR OTHERWISE FROM SDOT ON SIDEWALK CLOSURES.

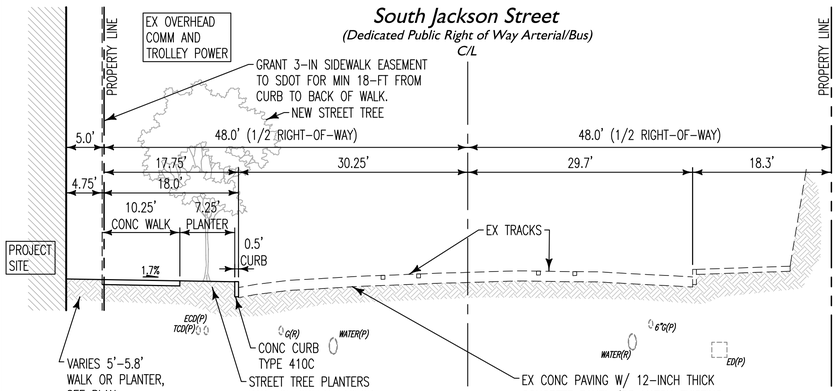
THE CONTRACTOR SHALL COORDINATE SIDEWALK CLOSURES, STREET CLOSURES AND ROW USE PERMITS WITH THE CITY OF SEATTLE DEPARTMENT OF TRANSPORTATION (SDOT).

VICINITY MAP



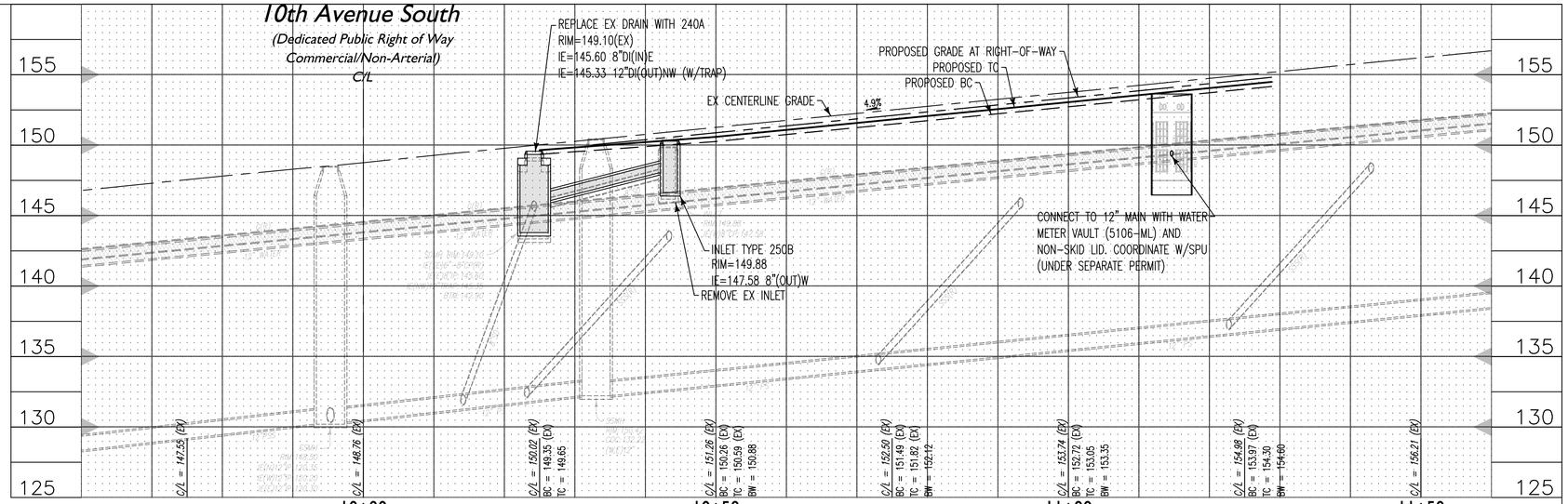
NEW STREET TREES #SDOTTREE0006804

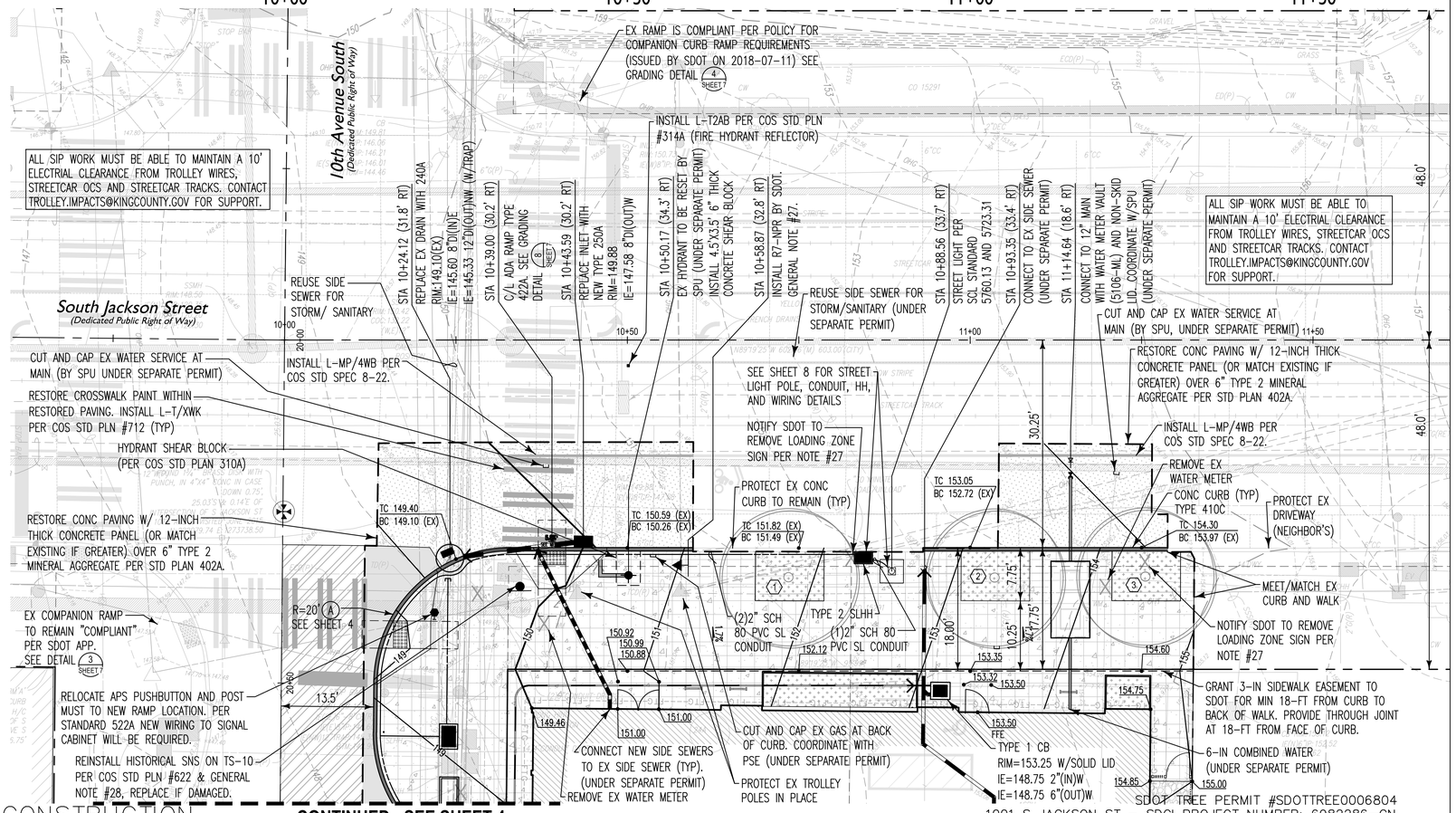
	SPECIES/BOTANICAL NAME	STATION (OFFSET)
1	STREET TREE AESCULUS X CARNEA "BRIOTTII" (RED HORSECHESTNUT)	STA 10+73.50, 34.58 RT
2	STREET TREE AESCULUS X CARNEA "BRIOTTII" (RED HORSECHESTNUT)	STA 11+03.56, 34.62 RT
3	STREET TREE AESCULUS X CARNEA "BRIOTTII" (RED HORSECHESTNUT)	STA 11+25.55, 34.48 RT



Typical Section S Jackson St

SCALE 1"=10' HORZ, 1"=5' VERT





CONTINUED - SEE SHEET 4

N

10 5 0 10 20

SCALE IN FEET
SCALE 1" = 10'

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D
06.05.25	3.02	PRW			

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90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

KENNETH A. WILLIAMS — STATE OF WASHINGTON — 40431 — REGISTERED PROFESSIONAL ENGINEER

NOT FOR CONSTRUCTION

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APPROVED FOR SDOT PERMITTING

ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER
SPU/WATER ENGINEERING	SDOT SUPERVISOR
SPU/DRAINAGE	REVISED AS-BUILT

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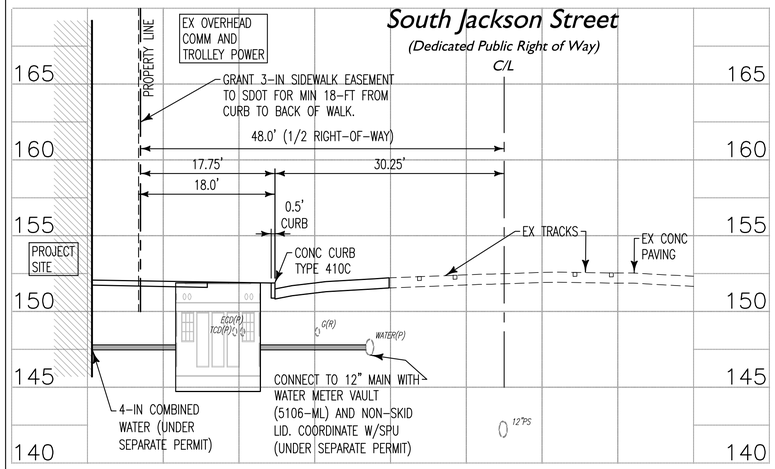
Seattle Department of Transportation

1001 S JACKSON ST

PLAN AND PROFILE
S JACKSON ST

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	6 OF 17

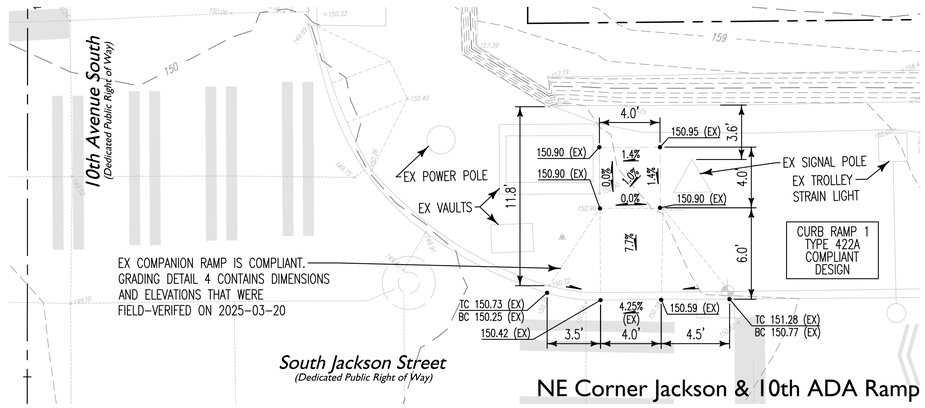


SCALE 1"=10' HORZ, 1"=5' VERT

6" Combined Fire/Domestic Service Profile (Sta 11+14.54, 36.27 Rt) 2

NTS

Not Used 3



Scale 1"=5'

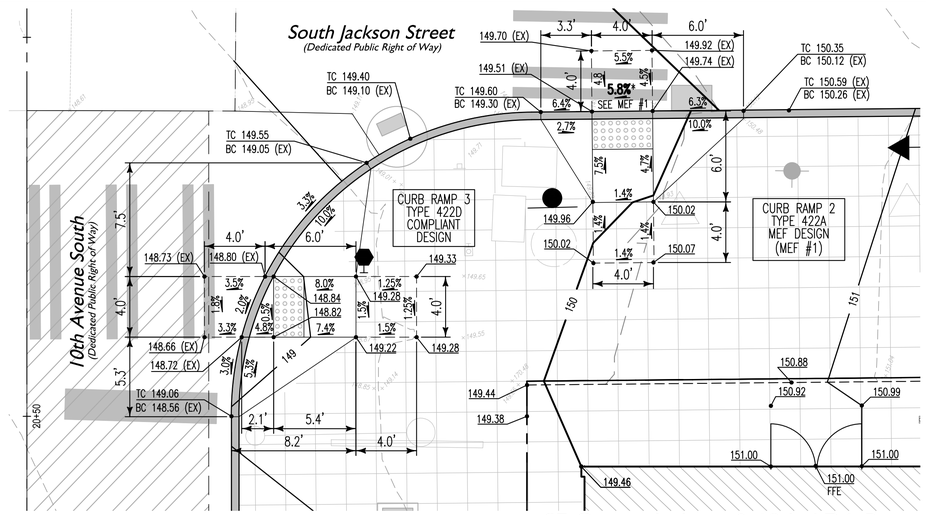
NE Corner Jackson & 10th ADA Ramp Grading Detail 4

NTS

Not Used 5

NTS

Not Used 6



Scale 1"=5'

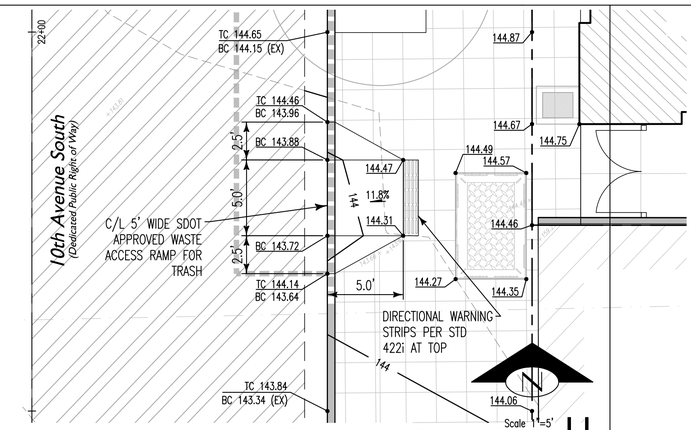
SE Corner Jackson & 10th ADA Ramp Grading Detail 8

NTS

Not Used 9

NTS

Not Used 10



Scale 1"=5'

Trash Ramp Grading Detail 11

NTS

Not Used 12

DATE	MARK	NATURE	MADE/CHK'D	REV'D
		REVISIONS		

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90% STREET IMPROVEMENT PLAN – NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST – SDCI PROJECT NUMBER: 6982286-CN

COUGHLINPORTERLUNDEEN
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ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER
SPU/WATER ENGINEERING	SDOT SUPERVISOR
SPU/DRAINAGE	REVISED AS-BUILT

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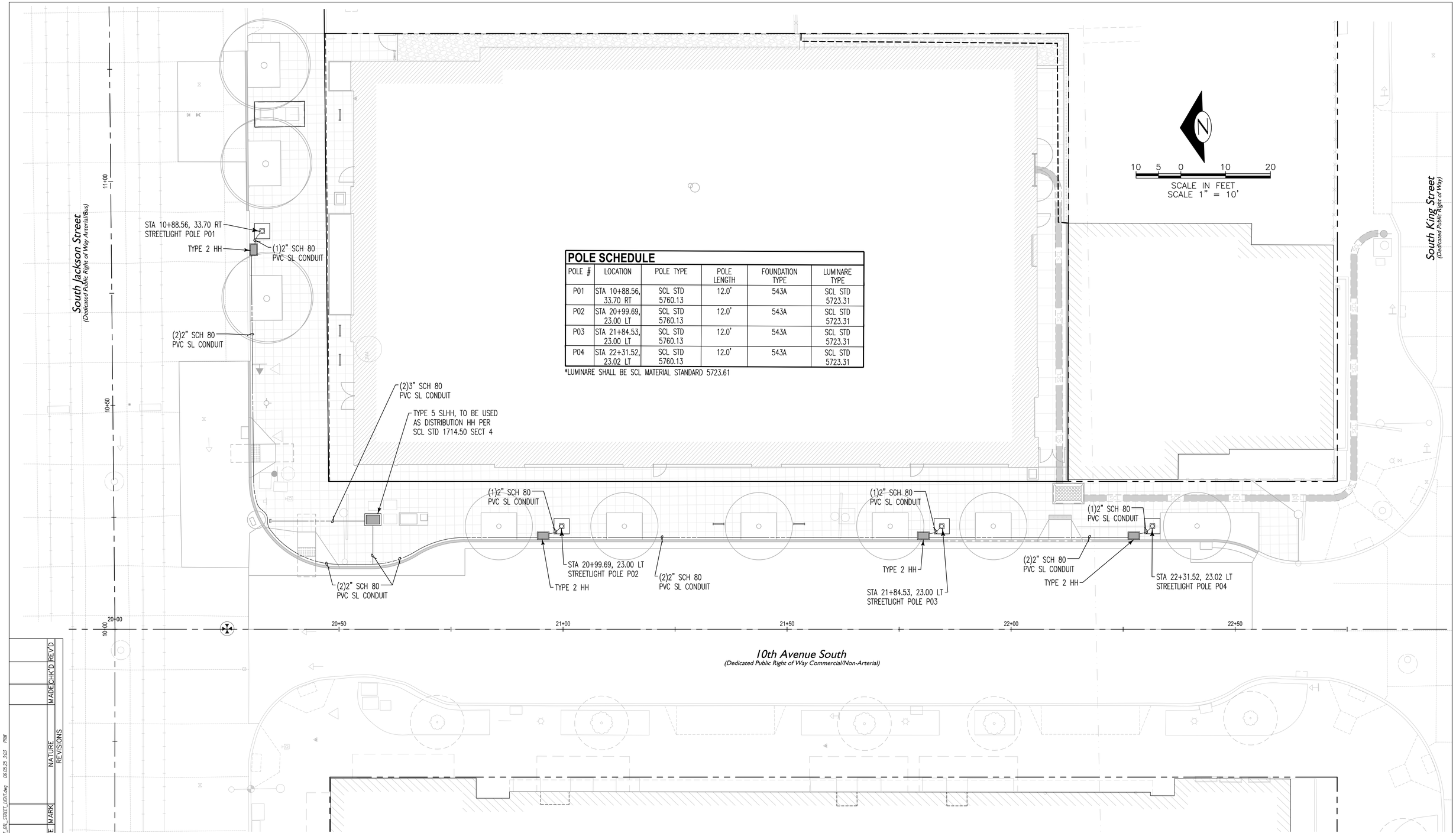
Seattle Department of Transportation

1001 S JACKSON ST

DETAILS SHEET

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	7 OF 17



POLE SCHEDULE

POLE #	LOCATION	POLE TYPE	POLE LENGTH	FOUNDATION TYPE	LUMINARE TYPE
P01	STA 10+88.56, 33.70 RT	SCL STD 5760.13	12.0'	543A	SCL STD 5723.31
P02	STA 20+99.69, 23.00 LT	SCL STD 5760.13	12.0'	543A	SCL STD 5723.31
P03	STA 21+84.53, 23.00 LT	SCL STD 5760.13	12.0'	543A	SCL STD 5723.31
P04	STA 22+31.52, 23.02 LT	SCL STD 5760.13	12.0'	543A	SCL STD 5723.31

*LUMINARE SHALL BE SCL MATERIAL STANDARD 5723.61

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

90% STREET IMPROVEMENT PLAN – NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
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APPROVED FOR SDOT PERMITTING	
ENGINEER/LA/SURVEYOR	SDOT PROJECT MANAGER .....
SPU/WATER ENGINEERING	SDOT SUPERVISOR .....
SPU/DRAINAGE	REVISED AS-BUILT .....

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Seattle Department of Transportation

1001 S JACKSON ST

STREET LIGHTING

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	8 OF 17

KENNETH A. WILLIAMS
STATE OF WASHINGTON
40431
REGISTERED
PROFESSIONAL ENGINEER
NOT FOR CONSTRUCTION

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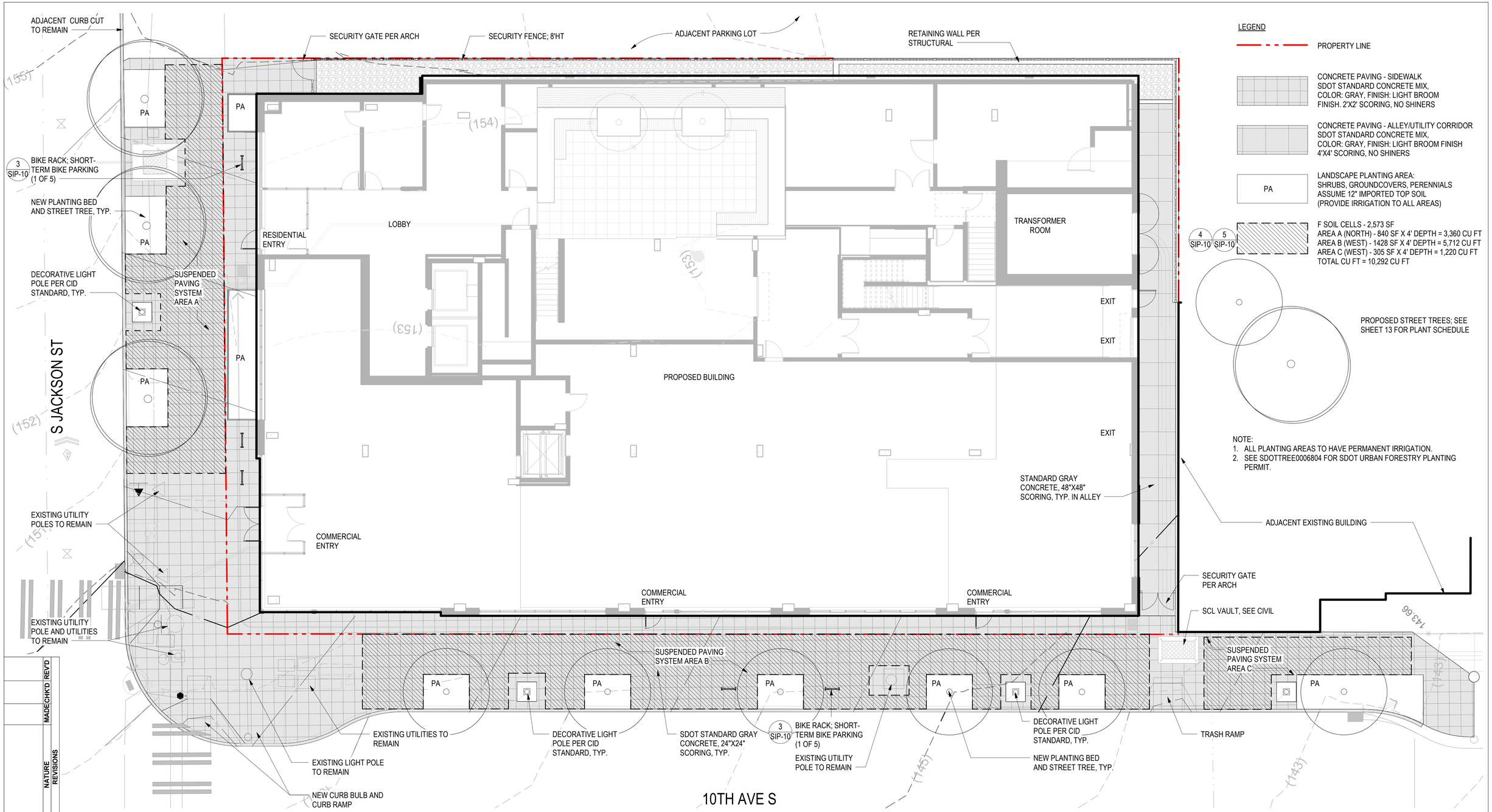

LEGEND

PROPERTY LINE

CONCRETE PAVING - SIDEWALK
SDOT STANDARD CONCRETE MIX,
COLOR: GRAY, FINISH: LIGHT BROOM
FINISH. 2'X2' SCORING, NO SHINERS

CONCRETE PAVING - ALLEY/UTILITY CORRIDOR
SDOT STANDARD CONCRETE MIX,
COLOR: GRAY, FINISH: LIGHT BROOM FINISH
4'X4' SCORING, NO SHINERS

PA
LANDSCAPE PLANTING AREA:
SHRUBS, GROUNDCOVERS, PERENNIALS
ASSUME 12" IMPORTED TOP SOIL
(PROVIDE IRRIGATION TO ALL AREAS)

4 SIP-10 5 SIP-10
F SOIL CELLS - 2,573 SF
AREA A (NORTH) - 840 SF X 4' DEPTH = 3,360 CU FT
AREA B (WEST) - 1428 SF X 4' DEPTH = 5,712 CU FT
AREA C (WEST) - 305 SF X 4' DEPTH = 1,220 CU FT
TOTAL CU FT = 10,292 CU FT

PROPOSED STREET TREES; SEE SHEET 13 FOR PLANT SCHEDULE

NOTE:
1. ALL PLANTING AREAS TO HAVE PERMANENT IRRIGATION.
2. SEE SDOTTREE0006804 FOR SDOT URBAN FORESTRY PLANTING PERMIT.

1 LANDSCAPE PLAN
1/8" = 1'-0"

0 4' 8' 16'
Scale: 1/8" = 1'-0"

DATE	MARK	REVISIONS	MADE	CHK'D	REV'D
		NATURE			

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

MITHŪN

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Seattle, WA 98101 / 206.623.3344

SAN FRANCISCO / 585 Howard Street, #300
California, CA 94105 / 415.956.0688

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Culver City, CA 90232 / 323.937.2150

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UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING			
ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

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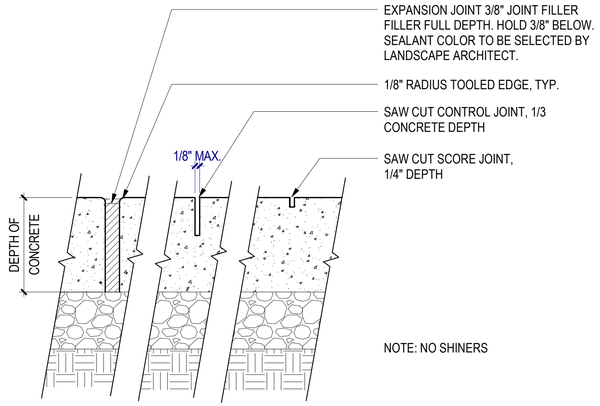
Seattle Department of Transportation

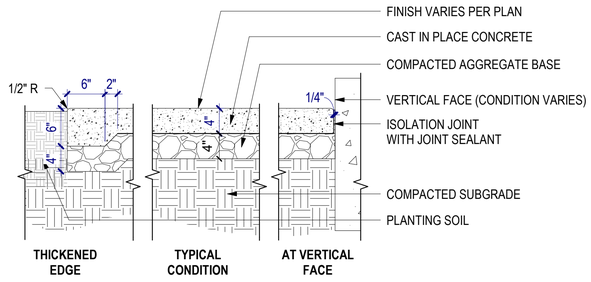
1001 S JACKSON ST

LANDSCAPE PLAN

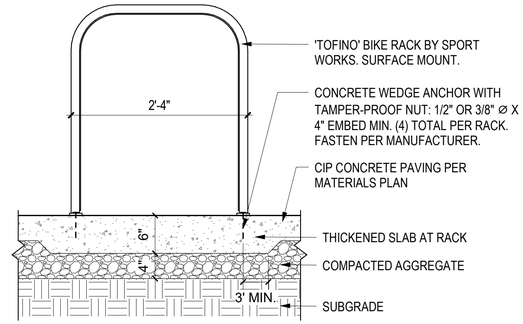
SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	9 OF 17



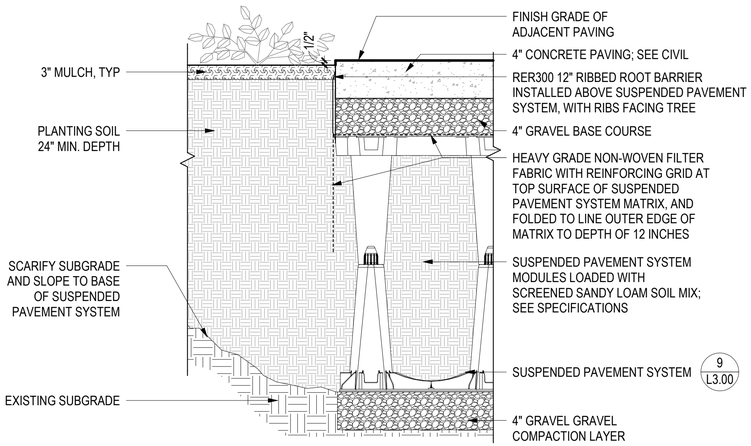
1 CONCRETE JOINTS
6" = 1'-0"



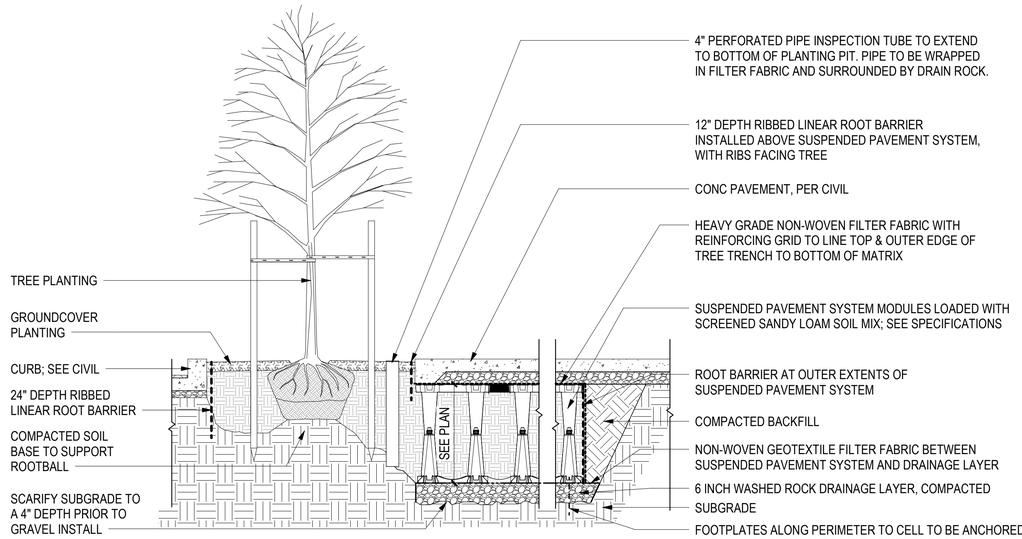
2 PEDESTRIAN CONCRETE PAVING
1" = 1'-0"



3 BIKE RACK 'TOFINO'
1" = 1'-0"



4 SUSPENDED PAVEMENT SYSTEM AT TREE PITS
1 1/2" = 1'-0"



5 SUSPENDED PAVEMENT SYSTEM AT TREE PITS
1/2" = 1'-0"

DATE	MARK	REVISIONS	MADE/CHK'D	REV'D
		NATURE		

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

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APPROVED FOR SDOT PERMITTING			
ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

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Seattle Department of Transportation

1001 S JACKSON ST

LANDSCAPE DETAILS

SDOT PROJECT NO. SUSIP0000772
VAULT PLAN NO. 794-119
VAULT SERIAL NO. 40861
SHEET 10 OF 17

1 STREETSCAPE PLANTING PLAN
1/8" = 1'-0"

Scale: 1/8" = 1'-0"

DATE	MARK	NATURE REVISIONS	MADE	CH'D	REV'D

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

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1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

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APPROVED FOR SDOT PERMITTING

ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

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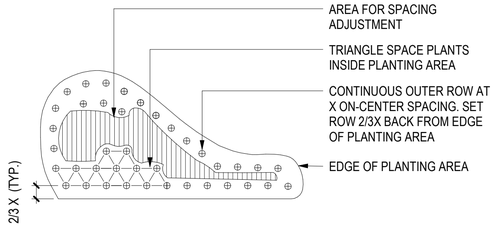
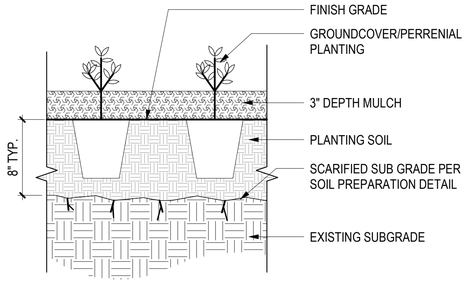
1001 S JACKSON ST

STREETSCAPE PLANTING PLAN

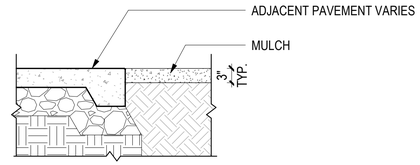
SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	11 OF 17



1 PLANT SPACING
1/2" = 1'-0"

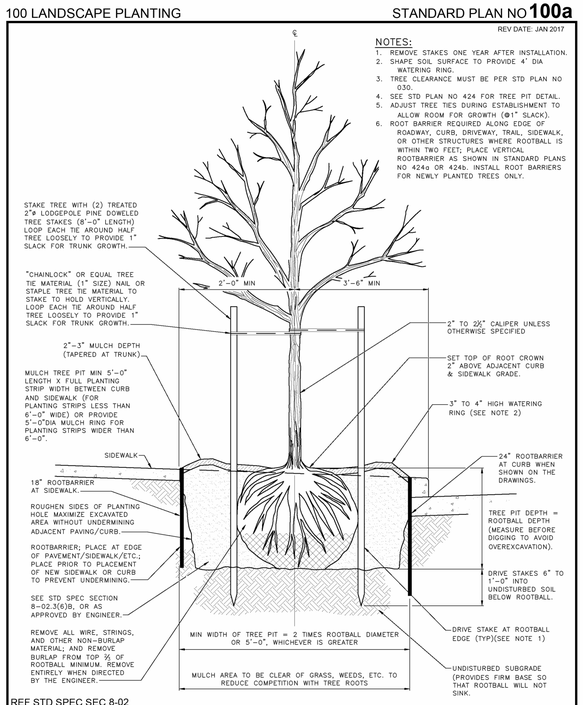


2 GROUNDCOVER PLANTING
1 1/2" = 1'-0"



3 MULCH AT PAVEMENT
3/4" = 1'-0"

100 LANDSCAPE PLANTING — STANDARD PLAN NO **100a**
REV DATE: JAN 2017



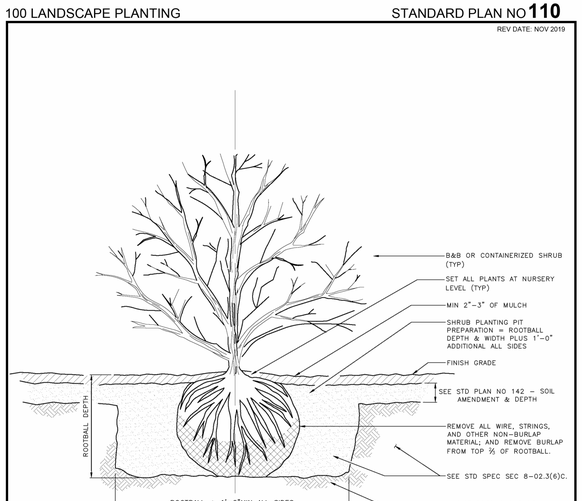
REF STD SPEC SEC 8-02

City of Seattle | NOT TO SCALE | DECIDUOUS TREE PLANTING IN PLANTING STRIP

2023 Edition City of Seattle Standard Plans for Municipal Construction

4 SDOT STANDARD PLAN - TREE PLANTING
1 1/2" = 1'-0"

100 LANDSCAPE PLANTING — STANDARD PLAN NO **110**
REV DATE: NOV 2019



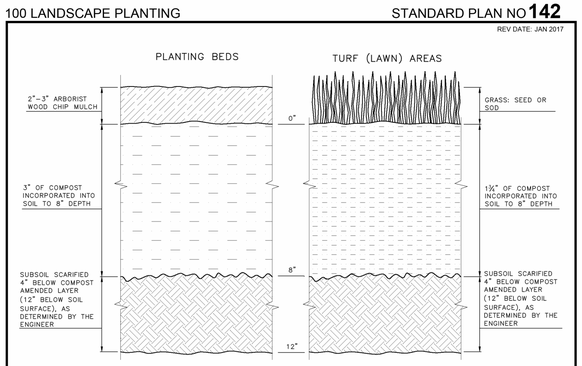
REF STD SPEC SEC 8-02

City of Seattle | NOT TO SCALE | SHRUB PLANTING

2023 Edition City of Seattle Standard Plans for Municipal Construction

5 SDOT STANDARD PLAN - SHRUB PLANTING
1 1/2" = 1'-0"

100 LANDSCAPE PLANTING — STANDARD PLAN NO **142**
REV DATE: JAN 2017



NOTES:
1. ALL SOIL AREAS DISTURBED OR COMPACTED DURING CONSTRUCTION, AND NOT COVERED BY BUILDINGS OR PAVEMENT, MUST BE AMENDED WITH COMPOST AS DESCRIBED BELOW.
2. SUBSOIL SHOULD BE SCARIFIED (LOOSENED) 4 INCHES BELOW AMENDED LAYER, TO PRODUCE 12-INCH DEPTH OF UN-COMPACTED SOIL, EXCEPT WHERE SCARIFICATION WOULD DAMAGE TREE ROOTS OR AS DETERMINED BY THE ENGINEER.
3. COMPOST MUST BE TILLED IN TO 8 INCH DEPTH INTO EXISTING SOIL, OR PLACE 8 INCHES OF COMPOST-AMENDED SOIL, PER SOIL SPECIFICATION.
4. TURF AREAS MUST RECEIVE 1.75 INCHES OF COMPOST TILLED IN TO 8-INCH DEPTH, OR MAY SUBSTITUTE 8" OF IMPORTED SOIL CONTAINING 20-25% COMPOST BY VOLUME. THEN PLANT GRASS SEED OR SOD PER SPECIFICATION.
5. PLANTING BEDS MUST RECEIVE 3 INCHES OF COMPOST TILLED IN TO 8-INCH DEPTH, OR MAY SUBSTITUTE 8" OF IMPORTED SOIL CONTAINING 35-40% COMPOST BY VOLUME. MULCH AFTER PLANTING, WITH 2-3 INCHES OF ARBORIST WOOD CHIP MULCH OR APPROVED EQUAL.
6. SETBACKS: TO PREVENT UNEVEN SETTLING, DO NOT COMPOST-AMEND SOILS WITHIN 3 FEET OF UTILITY INFRASTRUCTURES (POLES, VAULTS, METERS ETC.). WITHIN ONE FOOT OF PAVEMENT EDGE, CURBS AND SIDEWALKS SOIL SHOULD BE COMPACTED TO APPROXIMATELY 90% PROCTOR TO ENSURE A FIRM SURFACE.

REF STD SPEC SEC 8-01, 8-02, 9-14

City of Seattle | NOT TO SCALE | SOIL AMENDMENT AND DEPTH

2023 Edition City of Seattle Standard Plans for Municipal Construction

6 SDOT STANDARD PLAN - SOIL AMENDMENT
1 1/2" = 1'-0"

DATE	MARK	REVISIONS	MADE/CHK'D	REV'D
		NATURE		

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

MITHŪN®
SEATTLE / Pier 56, 1201 Alaskan Way, #200 Seattle, WA 98101 / 206.623.3344
SAN FRANCISCO / 585 Howard Street, #300 California, CA 94105 / 415.956.0688
LOS ANGELES / 5837 Adams Blvd Culver City, CA 90232 / 323.937.2150
mithun.com

Call before you Dig. 8-1-1 or 1-800-424-5555 UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING			
ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS IN EFFECT ON THE DATE SHOWN ABOVE, AND SUPPLEMENTED BY SPECIAL PROVISIONS.

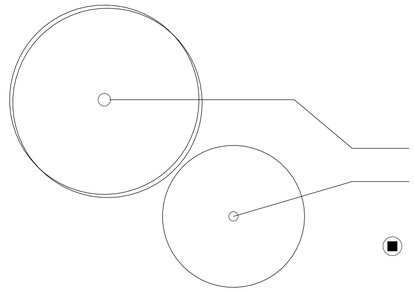
Seattle Department of Transportation

1001 S JACKSON ST

LANDSCAPE PLANTING DETAILS

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	12 OF 17

LEGEND



STREETSCAPE_PLANT SCHEDULE

QTY	KEY	BOTANICAL NAME	COMMON NAME	SIZE	ON-CENTER SPACING	ROOT CONDITION	NATIVE/ADAPTED	COMMENTS
TREE								
3	AES CAR	Aesculus x carnea 'Briottii'	RED HORSECHESTNUT	2" - 2.5" CAL	AS SHOWN	B&B		FULL EVEN UPRIGHT STRUCTURE WITH STRONG CENTRAL LEADER
6	PRU SAR	Prunus sargentii	SARGENT'S CHERRY	2" - 2.5" CAL	AS SHOWN	B&B		FULL EVEN UPRIGHT STRUCTURE WITH STRONG CENTRAL LEADER
BAMBOO								
202	CIS COR	Pleioblastus pygmaeus	PYGMY BAMBOO	5 GAL	24" O.C.	CONTAINER	X	ADAPTED TO SEATTLE

NOTES
1. PLANT SIZE AND SPACING DEMONSTRATE PLANT COVERAGE OF ALL PLANTING AREAS WITHIN THREE GROWING SEASONS WITH A COMBINATION OF SHRUBS, PERENNIALS AND GROUNDCOVERS.
2. ALL PLANTING AREAS TO BE SUPPLIED WITH A PERMANENT IRRIGATION SYSTEM FOR A MINIMUM OF (2) GROWING SEASONS TO ENSURE ADEQUATE PLANT ESTABLISHMENT.
3. SEE SDOTTREE0006804 FOR SDOT URBAN FORESTRY PLANTING PERMIT.

DATE	MARK	REVISIONS	MADE/CHK'D	REV'D
		NATURE		

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

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or 1-800-424-5555
UNDERGROUND SERVICE (USA)

APPROVED FOR SDOT PERMITTING

ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

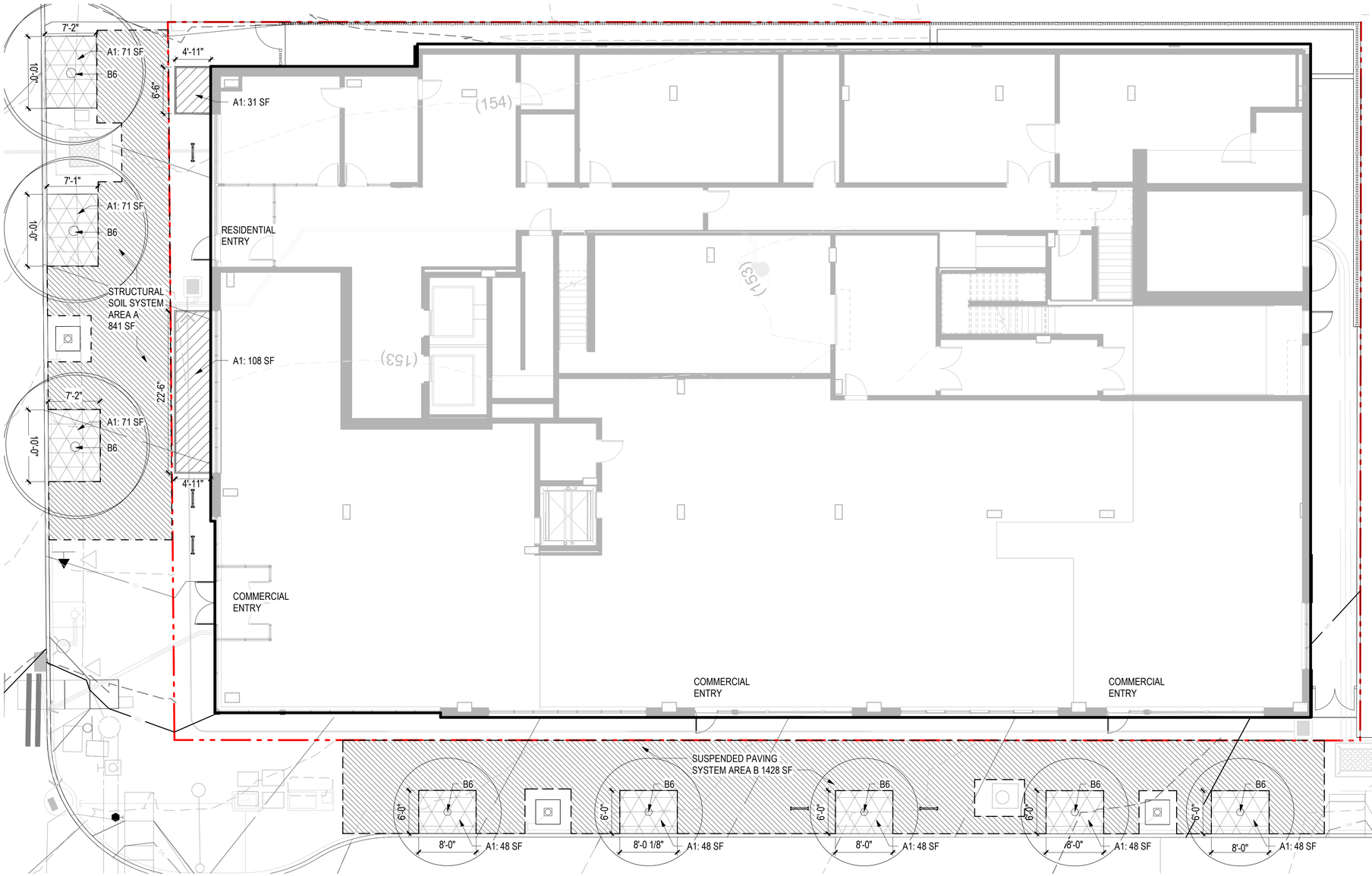
ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CITY OF SEATTLE STANDARD PLANS AND SPECIFICATIONS IN EFFECT ON THE DATE SHOWN ABOVE, AND SUPPLEMENTED BY SPECIAL PROVISIONS.

Seattle Department of Transportation

1001 S JACKSON ST

LANDSCAPE PLANTING SCHEDULE

SDOT PROJECT NO. SUSIP0000772
VAULT PLAN NO. 794-119
VAULT SERIAL NO. 40861



1 GREEN FACTOR SITE PLAN
1/8" = 1'-0"

LEGEND

PROPERTY LINE

A1 LANDSCAPE AREA ON PROPERTY - 393 SF
ONLY 139 SF IS SHOWN ON STREETSCAPE PLAN
PLANTED AREA WITH A SOIL DEPTH OF 24" OR GREATER

A1 LANDSCAPE AREA IN ROW - 594 SF
PLANTED AREA WITH A SOIL DEPTH OF 24" OR GREATER

A2 BIORETENTION FACILITIES - 147 SF (NOT SHOWN ON STREETSCAPE PLAN. BIORETENTION IS ON STRUCTURE)
BIORETENTION PLANTING AREA

C2 GREEN ROOFS 4"-8" OF GROWTH MEDIUM - 1383 SF (NOT SHOWN ON STREETSCAPE PLAN)
GREEN ROOF AREA

F SOIL CELLS - 2,573 SF
AREA A (NORTH) - 840 SF X 4' DEPTH = 3,360 CU FT
AREA B (WEST) - 1428 SF X 4' DEPTH = 5,712 CU FT
AREA C (WEST) - 305 SF X 4' DEPTH = 1,220 CU FT
TOTAL CU FT = 10,292 CU FT

B4 SMALL TREE
QTY: 2 ON COURTYARD

B6 MEDIUM/LARGE TREE
QTY: 9 IN ROW

NOTES:
1. SEE SHEET 15 FOR GREEN FACTOR WORKSHEET AND SCORE SHEET
2. ALL PLANTINGS AND LANDSCAPE ELEMENTS REQUIRED AS PART OF THIS BUILDING PERMIT MUST BE MAINTAINED FOR THE LIFE OF THE PROJECT. IF ALTERATIONS OR FAILURES REDUCE LANDSCAPE FEATURES TO A LEVEL BELOW THE MINIMUM REQUIRED PLANTING AREA OR GREEN FACTOR SCORE, NEW FEATURES MUST BE ADDED TO COMPENSATE. THIS REQUIREMENT ALSO APPLIES TO LANDSCAPE IMPROVEMENTS IN THE RIGHT-OF-WAY IF USED TO MEET GREEN FACTOR REQUIREMENTS (DR 30-2015).
3. SEE SDOTTREE0006804 FOR SDOT URBAN FORESTRY PLANTING PERMIT.

DATE	MARK	NATURE REVISIONS	MADE/CHK'D	REV'D

0 4' 8' 16'
Scale: 1/8" = 1'-0"

SDOT TREE PERMIT #SDOTTREE0006804
1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

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APPROVED FOR SDOT PERMITTING			
ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

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Seattle Department of Transportation

1001 S JACKSON ST

GREEN FACTOR SITE PLAN

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	14 OF 17

Green Factor Worksheet

SEATTLE×green factor

Project title:

Landscape Elements	Measurement	Planting Area 1	2	3	4	5	6	7	Total
		Step 1. Enter all values for Green Factor landscape elements here. Values entered here will automatically populate the Score Sheet. Step 2. Go to the Score Sheet and enter the size of the development site. Step 3. Check the Score to make sure your project meets the minimum score for the zone. *Totals on the Green Factor Scoresheet will calculate automatically							
A1	square feet	594	384						978
A2	square feet	0	147						147
B1	square feet	594	531						1125
B2	# of plants	209	140						349
B3	# of plants								0
B4	# of trees		2						2
B5	# of trees								0
B6	# of trees	9							9
B7	# of trees								0
B8	Inches DBH								0
C1	square feet								0
C2	square feet		1371						1371
C3	square feet								0
D	square feet								0
E1	square feet								0
E2	square feet								0
F	square feet	2573							2573
G1	square feet	594	411						1005
G2	square feet								0
G3	square feet	594	139						733
G4	square feet								0

REVISED 07-07-2020

Green Factor Scoresheet PAGE 1

SEATTLE×green factor

Project title:

Enter sq ft of parcel

Parcel size: 16,500 SCORE 0.349382

	Landscape Elements**	Totals calculate automatically from Green Factor Worksheet		Factor	Total
A	**Planted areas**				
1	Planted areas with a soil depth of 24" or greater	978 square feet		0.6	587
2	Bioretention facilities	147 square feet		1	147
B	**Plantings (credit for plants in landscaped areas from Section A)**				
1	Mulch, ground covers, or other plants less than 2' tall at maturity	1125 square feet		0.1	113
2	Medium shrubs or perennials 2'-4' tall maturity - calculated at 9 sq ft per plant (typically planted no closer than 18" on center)	349 plants	3141	0.3	942
3	Large shrubs or perennials 4'+ at maturity - calculated at 36 sq ft per plant (typically planted no closer than 24" on center)	0 plants	0	0.3	0
4	**Small Trees** Tree canopy for "Small Trees" or equivalent (canopy spread of 8' to 15') - calculated at 75 sq ft per tree	2 trees	150	0.3	45
5	**Small/Medium Trees** Tree canopy for "Small/Medium Trees" or equivalent (canopy spread 16' to 20') - calculated at 150 sq ft per tree	0 trees	0	0.5	0
6	**Medium/Large Trees** Tree canopy for "Medium/Large Trees" or equivalent (canopy spread of 21' to 25') - calculated at 250 sq ft per tree	9 trees	2250	0.7	1,575
7	**Large Trees** Tree canopy for "Large Trees" or equivalent (canopy spread of 26' or more) - calculated at 350 sq ft per tree	0 trees	0	0.9	0
8	**Preserved Trees** Tree canopy for preservation of existing trees with trunks 6"+ DBH (Diameter at Breast Height, 4.5' above the ground) - calculated at 20 sq ft per inch diameter	0 inches	0	1	0

*** Do not count public rights-of-way in parcel size calculation.**

**** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards Director's Rule (DR XX-2020).**

REVISED 07-07-2020

Green Factor Scoresheet PAGE 2

SEATTLE×green factor

C	**Green roofs**			
1	Green roofs over at least 2" and less than 4" of growth medium	0 square feet	0.4	0
2	Green roofs 4" - 8" of growth medium	1371 square feet	0.6	823
3	Green roofs 8"+ of growth medium	0 square feet	0.8	0
D	**Vegetated walls** NC, C, SM, and South Downtown zones only	0 square feet	0.4	0
E	**Permeable paving**			
1	Permeable paving over at least 6" and less than 24" of soil or gravel	0 square feet	0.2	0
2	Permeable paving over at least 24" of soil or gravel	0 square feet	0.5	0
F	**Structural soil systems**	2573 square feet	0.5	1,287
	sub-total of sq ft =	11,735		
G	**Bonuses**			
1	Landscaping that consists of drought-tolerant and/or native plant species	1005 square feet	0.1	101
2	Landscaped areas where at least 50% of annual irrigation needs are met through the use of harvested rainwater or collected greywater	0 square feet	0.2	0
3	Vegetation visible to passersby from adjacent public right of way or public open spaces	733 square feet	0.2	147
4	Landscaping in food cultivation	0 square feet	0.1	0
	Green Factor numerator =	5,765		

*** Do not count public rights-of-way in parcel size calculation.**

**** You may count landscape improvements in rights-of-way contiguous with the parcel. All landscaping on private and public property must comply with the Landscape Standards Director's Rule (DR XX-2020).**

REVISED 07-07-2020

DATE	MARK	NATURE REVISIONS	MADE	CHK'D	REV'D

90% STREET IMPROVEMENT PLAN - NOT FOR CONSTRUCTION

SDOT TREE PERMIT #SDOTTREE0006804

1001 S JACKSON ST - SDCI PROJECT NUMBER: 6982286-CN

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APPROVED FOR SDOT PERMITTING			
ENGINEER/LA/SURVEYOR	.....	SDOT PROJECT MANAGER	.....
SPU/WATER ENGINEERING	.....	SDOT SUPERVISOR	.....
SPU/DRAINAGE	.....	REVISED AS-BUILT	.....

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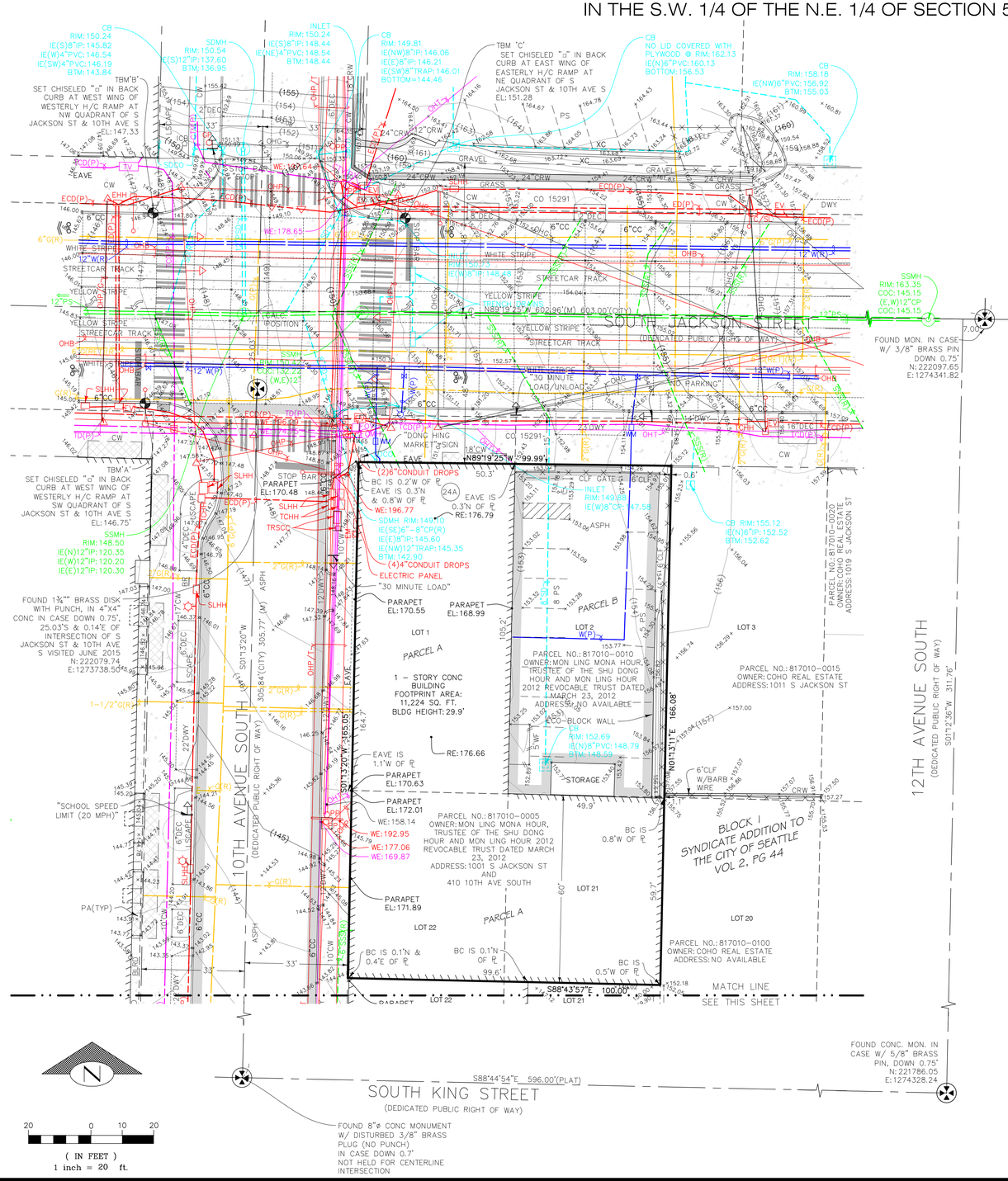
Seattle Department of Transportation

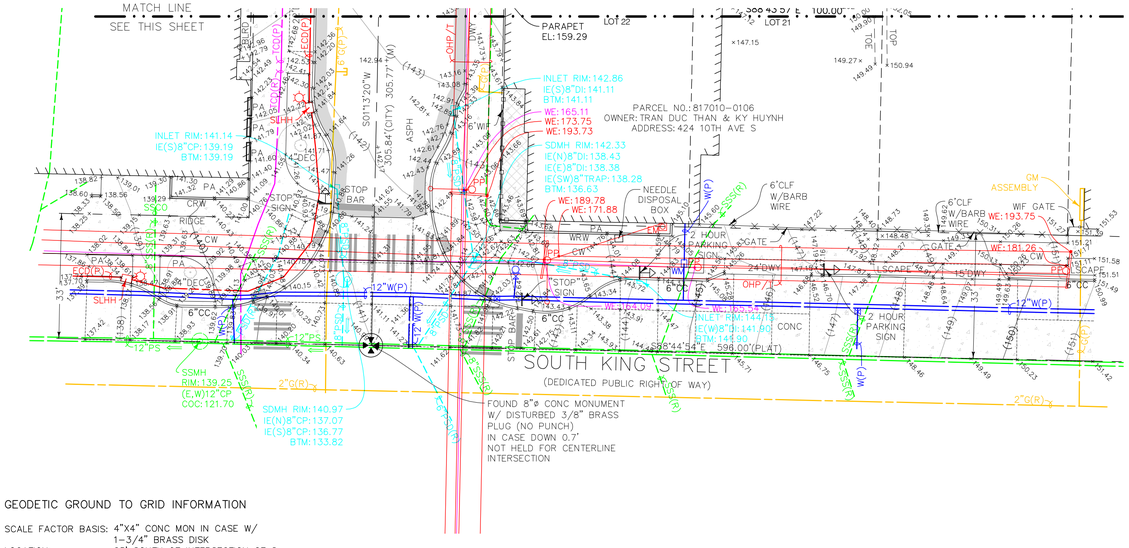
1001 S JACKSON ST

GREEN FACTOR SCORE SHEET

SDOT PROJECT NO.	SUSIP0000772
VAULT PLAN NO.	794-119
VAULT SERIAL NO.	40861
SHEET	15 OF 17

IN THE S.W. 1/4 OF THE N.E. 1/4 OF SECTION 5, TOWNSHIP 24 N., RANGE 04 E., W.M.





GEODETIC GROUND TO GRID INFORMATION

SCALE FACTOR BASIS: 4"X4" CONC MON IN CASE W/ 1–3/4" BRASS DISK
LOCATION: 25' SOUTH OF INTERSECTION OF S JACKSON ST AND 10TH AVE S
NORTHING: 222079.74
EASTING: 1273738.50
(GRID) SCALE FACTOR: 0.99998299
ELEVATION (SCALE) FACTOR: 0.99999634
COMBINED GRID (SCALE) FACTOR: 0.99997933

LEGEND

⊕	AREA DRAIN
ABAN/RET	ABANDONED/RETIRED
	ASPHALT (ASPH)
BLRD	BOLLARD
	BRICK SURFACE
BC	BUILDING LINE
BR	BUILDING CORNER
	BIKE RACK
	CANOPY
	CATCH BASIN (CB)
	CONCRETE SURFACE
CW/BW	CONCRETE/BRICK WALK
CRW/WRW	CONCRETE/WOOD RETAINING WALL
CC/XC	CONCRETE/EXTRUDED CURB
CP/IP	CONCRETE/IRON PIPE
	CHAIN LINK FENCE (CLF)
CTV	CABLE TV
COL	COLUMN
℄/M	CENTERLINE/MONUMENT LINE
CS/WS	CONCRETE/WOOD STAIRS
♿	H/C PARKING SPACE
CON	CONIFEROUS TREE
DEC	DECIDUOUS TREE
CMP	CORRUGATED METAL PIPE
C.O.C.	CENTER OF CHANNEL
DWY	DRIVEWAY
ECD	ELECTRICAL CONDUIT
ED	ELECTRICAL DUCT
EHH	ELECTRICAL HANDHOLE
EMH	ELECTRICAL MANHOLE
EM	ELECTRICAL METER
EV/ET	ELECTRICAL VAULT/TRANSFORMER
	FOUND SURVEY MONUMENT (AS NOTED)
	FIRE HYDRANT
	FIRE DEPT. CONNECTION (FDC)
FO	FIBER OPTICS
FOMH	FIBER OPTIC MANHOLE
FFE	FINISH FLOOR ELEVATION
G	GAS MAIN
GM	GAS METER
	GAS VALVE
GV	GAS VAULT
	GUY ANCHOR
	GUY POLE
GP	STRAIN POLE
SP	IRRIGATION CONTROL BOX
ICB	IRRIGATION VALVE
IV	IRON FENCE (WIF)
	INVERT ELEVATION
IE	LIGHT POLE (METAL)
	LIGHT POLE (WOOD)
	STRAIN POLE W/ LIGHT
	LIGHT POLE (DECORATIVE)
LSCAPE/PA	LANDSCAPE/PLANTER
	MANHOLE
OHP/OHT	OVERHEAD POWER/TELEPHONE
OHG/OHB	OVERHEAD GUYWIRE/BUS (TROLLEY)
P.S.	PARKING SPACE(S)
℄	PROPERTY LINE (PL)
(P)	PAINTED UTILITY LOCATION
⟹	PIPE FLOW DIRECTION
PE	POLYETHYLENE
PS/PSS	COMBINED/SANITARY SEWER
PSD	STORM DRAIN
	PRIVATE CATCH BASIN
	PEDESTRIAN PUSH BUTTON (PPB)
	PEDESTRIAN SIGNAL/PEDESTAL
(R)	RECORD DATA
	GRAVEL SURFACE
	ROCKERY
RE	ROOF ELEVATION
SCL/CLHH	SEATTLE CITY LIGHT HANDHOLE
SD	SERVICE DRAIN (STORM)
CO	CLEANOUT
SSS	SANITARY SIDE SEWER (RECORD)
	SIGN/STREET NAME SIGN
TC/SL	TRAFFIC CONTROL/STREET LIGHT HANDHOLE
	TRAFFIC CONTROL CABINET (TRSCC)
TCHD	TRENCH DRAIN
	TEMPORARY BENCHMARK (TBM)
TCD	TELEPHONE CONDUIT (BURIED)
TD	TELEPHONE DUCT
TV	TELEPHONE VAULT
TMH	TELEPHONE MANHOLE
TS	TELEPHONE SENTRY
	TRAFFIC FLOW DIRECTION
	TRAFFIC SIGNAL
TRCD	TRAFFIC SIGNAL CONDUIT (BURIED)
UP	UTILITY POLE (WOOD)
WV	WATER VAULT
W	WATER MAIN
WM	WATER METER
	WATER VALVE
	WATER GATE VALVE/CHAMBER
VO/CO	VACATION/CONDEMNATION ORDINANCE
WE	WIRE ELEVATION
	WOOD FENCE (WF)

HORIZONTAL DATUM:
NAD 83/2011 (EPOCH 2010.00)

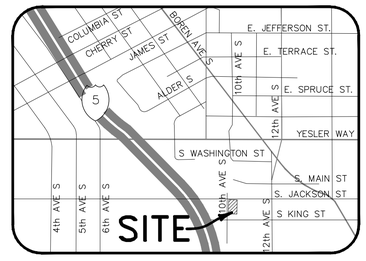
SOURCE: CITY OF SEATTLE
DESCRIPTION: MON IN CASE W/ 3/8" BRASS PIN
LOCATION: INTERSECTION OF S JACKSON ST AND 12TH AVE S
NORTHING: 222097.65
EASTING: 1274341.82

SOURCE: CITY OF SEATTLE
DESCRIPTION: 4"X4" CONC MON IN CASE W/ 1–3/4" BRASS DISK
LOCATION: 25' SOUTH OF INTERSECTION OF S JACKSON ST AND 10TH AVE S
NORTHING: 222079.74
EASTING: 1273738.50

VERTICAL DATUM:
NAVD 88

SOURCE: CITY OF SEATTLE
ID#: 3895–0702
DESCRIPTION: 2"BRASS CAP
LOCATION: NE QUADRANT OF S JACKSON ST AND 12TH AVE S, 12'N & 1'W OF BACK CONCRETE WALK INTERSECTION.
ELEVATION: 177.95

SOURCE: BRH
ID#: TBM 'B'
DESCRIPTION: CHISELED "⌂"
LOCATION: IN BACK CURB AT WEST WING OF WESTERLY H/C RAMP AT NW QUADRANT OF S JACKSON ST & 10TH AVE S.
ELEVATION: 147.33



VICINITY MAP
NO SCALE

BUSH, ROED & HITCHINGS, CORPORATE SEAL, 1969, WASHINGTON
TAYLOR R. SCHULTE, STATE OF WASHINGTON, 44640, REGISTERED PROFESSIONAL LAND SURVEYOR
0/4/25/25

NO	REVISION	DATE

BUSH, ROED & HITCHINGS, INC.
LAND SURVEYORS & CIVIL ENGINEERS
15400 SE 30TH PL, STE 100
BELLEVUE, Washington
98007-6546
(206) 323-4144
1-800-935-0508
WWW.BRHINC.COM

TOPOGRAPHIC & BOUNDARY SURVEY
FRIENDS OF LITTLE SAIGON
1005 S. JACKSON ST.
SEATTLE KING COUNTY WASHINGTON

drawn by	checked by
HAK/JRP	TRS
scale	date
1" = 20'	4/25/25
job no.	
2023032.02	
sheet 1 of 2	

22"x34" 4/25/2025 U:\C3D\2023\2023032\SURVEYING\DWG\XS-SUR-02.DWG

SITE NOTES

SITE ADDRESS:
1001 S JACKSON STREET
410 10TH AVENUE SOUTH
SEATTLE, WA 98104

TAX ACCOUNT NOS.:
817010-0005-00
817010-0010-03

ZONING:
DMR/C 75/75-95: DOWNTOWN MIXED RESIDENTIAL/COMMERCIAL 75/75-95

ZONING AGENCY:
CITY OF SEATTLE
SEATTLE DEPARTMENT OF CONSTRUCTION AND INSPECTIONS
700 5TH AVENUE, SUITE 2000
SEATTLE, WA 98104
(206) 684-8600

SETBACKS:
CURRENT SETBACK REQUIREMENTS SUBJECT TO SITE PLAN REVIEW. CURRENT SETBACKS MAY DIFFER FROM THOSE IN EFFECT DURING DESIGN/CONSTRUCTION OF EXISTING IMPROVEMENTS.

THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY BY THE GOVERNING JURISDICTION INDICATES THAT STRUCTURES ON THIS PROPERTY COMPLIED WITH MINIMUM SETBACK AND HEIGHT REQUIREMENTS FOLLOWING CONSTRUCTION.

FLOOD ZONE:
THIS SITE APPEARS ON NATIONAL FLOOD INSURANCE RATE MAP, DATED AUGUST 19, 2020, COMMUNITY PANEL NO. 53033C0630G, AND IS SITUATED IN ZONE "X", AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

HORIZONTAL DATUM:
NAD 83/2011 (EPOCH 2010.00)

VERTICAL DATUM:
NAVD 88

AREA:
SITE AS SHOWN CONTAINS 16,555 SQUARE FEET OR 0.3801 ACRES, MORE OR LESS.

PARKING SPACE COUNT:
PARKING SPACES TOTAL 14 INCLUDING 1 DISABLED PARKING SPACE.

SUBSTRUCTURES:
BURIED UTILITIES ARE SHOWN AS INDICATED ON RECORDS MAPS FURNISHED BY OTHERS AND VERIFIED WHERE POSSIBLE BY FEATURES LOCATED IN THE FIELD. WE ASSUME NO LIABILITY FOR THE ACCURACY OF THOSE RECORDS. FOR THE FINAL LOCATION OF EXISTING UTILITIES IN AREAS CRITICAL TO DESIGN CONTACT THE UTILITY OWNER/AGENCY.

TELECOMMUNICATIONS/FIBER OPTIC DISCLAIMER:
RECORDS OF UNDERGROUND TELECOMMUNICATIONS AND/OR FIBER OPTIC LINES ARE NOT ALWAYS AVAILABLE TO THE PUBLIC. BRH HAS NOT CONTACTED EACH OF THE MANY COMPANIES, IN THE COURSE OF THIS SURVEY, WHICH COULD HAVE UNDERGROUND LINES WITHIN ADJACENT RIGHTS-OF-WAY. THEREFORE, BRH DOES NOT ACCEPT RESPONSIBILITY FOR THE EXISTENCE OF UNDERGROUND TELECOMMUNICATIONS/FIBER OPTIC LINES WHICH ARE NOT MADE PUBLIC RECORD WITH THE LOCAL JURISDICTION. AS ALWAYS, CALL 1-800-424-5555 BEFORE CONSTRUCTION.

UTILITY PROVIDERS:

SANITARY SEWER AND STORM DRAINAGE:
SEATTLE PUBLIC UTILITIES
PROJECT MANAGEMENT AND ENGINEERING
700 5TH AVENUE
PO BOX 34018
SEATTLE, WA 98124-4018
(206) 233-7900

WATER:
SEATTLE PUBLIC UTILITIES
700 5TH AVENUE, SUITE 4900
PO BOX 34018
SEATTLE, WA 98124-4018
(206) 684-3000

POWER:
SEATTLE CITY LIGHT
700 5TH AVENUE, SUITE 3200
SEATTLE, WA 98124-4023
(206) 684-3000

NATURAL GAS:
PUGET SOUND ENERGY
10885 NE 4TH STREET, SUITE 1200
PO BOX 97034
BELLEVUE, WA 98009-9734
(425) 454-6363
(888) 225-5773

TELEPHONE:
LUMEN TECHNOLOGIES
1600 7TH AVENUE
SEATTLE, WA 98191
(800) 244-1111

DESCRIPTION:

PARCEL A:

LOT 1 AND THE NORTH 60 FEET OF LOTS 21 AND 22 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;

EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.

PARCEL B:

LOT 2 IN BLOCK 1 OF SYNDICATE ADDITION TO THE CITY OF SEATTLE, AS PER PLAT RECORDED IN VOLUME 2 OF PLATS, PAGE 44, RECORDS OF KING COUNTY AUDITOR;

EXCEPT THE NORTH 15 FEET THEREOF CONDEMNED BY THE CITY OF SEATTLE FOR WIDENING JACKSON STREET IN KING COUNTY SUPERIOR COURT CAUSE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.

TITLE REPORT REFERENCE:
THIS SURVEY WAS CONDUCTED ACCORDING TO THE DESCRIPTION SHOWN, FURNISHED BY FIRST AMERICAN TITLE INSURANCE COMPANY, COMMITMENT NO. NCS-1184153-WA1, DATED AUGUST 25, 2023. THE EASEMENTS SHOWN OR NOTED HEREON RELATE TO THIS COMMITMENT.

NOTE: EASEMENTS CREATED OR RESCINDED AFTER THIS DATE ARE NOT SHOWN OR NOTED HEREON.

TITLE REPORT SCHEDULE B EXCEPTIONS:
ITEMS CIRCLED ARE SHOWN ON MAP.

13. RIGHT TO DAMAGE THE LAND BY CHANGING AND ESTABLISHING STREET GRADES, AS CONDEMNED IN KING COUNTY COURT CASE NO. 56407, UNDER THE PROVISIONS OF ORDINANCE NO. 15291 OF THE CITY OF SEATTLE.
14. THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED "ORDINANCE NO. 112134" RECORDED MARCH 14, 1985 AS RECORDING NO. 8503140774 OF OFFICIAL RECORDS.
16. THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED "MEMORANDUM OF DRAINAGE CONTROL PLAN" RECORDED DECEMBER 23, 1997 AS RECORDING NO. 9712231503 OF OFFICIAL RECORDS.
17. THE TERMS AND PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED "COVENANT/OFF-SITE ACCESSORY PARKING" RECORDED OCTOBER 15, 1999 AS RECORDING NO. 19991015001342 OF OFFICIAL RECORDS.
24. SURVEY BY TAYLOR R. SHULTE (PLS NO. 44646) AND BUSH, ROED & HITCHINGS, INC., DATED MARCH 29, 2023, LAST REVISED JULY 13, 2023, JOB NO. 2023032.00 , DISCLOSES THE FOLLOWING:

   (A) ENCROACHMENT OF EAVES OVER THE NORTHERN AND WESTERN BOUNDARIES.

STATEMENT OF TOPOGRAPHIC MAP ELEMENTS (WAC 332-130-145)

2(B) PURPOSE: FEASIBILITY AND DESIGN

2(C) CONTOUR SOURCE: CONTOURS DERIVED FROM DIRECT FIELD OBSERVATIONS

2(F) CONTOUR ACCURACY: COMPLIES WITH UNITED STATES NATIONAL MAP ACCURACY STANDARDS (90% OR GREATER OF ALL SURVEY POINTS CHECKED ARE CORRECT WITHIN HALF OF ONE CONTOUR INTERVAL).

2(G) LIMITATIONS: THE PURPOSE OF THIS LIMITED TOPOGRAPHIC SURVEY IS TO SUPPORT SPECIFIC EFFORTS WITHIN THE AREA OF MAPPING SHOWN, AND IS NOT INTENDED TO ILLUSTRATE ANY BOUNDARY OR TITLE INVESTIGATIONS.

2(H) BOUNDARY SOURCE: FIELD SURVEY OF CONTROLLING MONUMENTS, AND CONSIDERATION OF EXISTING RECORDS OF SURVEYS FOR DETERMINING ON THE GROUND POSITIONS OF DEEDED PROPERTY AND EASEMENT LINES.

3(A) & 3(B) UTILITIES: UNDERGROUND UTILITIES ARE SHOWN BY ONE OR MORE OF THE FOLLOWING METHODS:

1. SURVEY FIELD OBSERVATION OF MARKINGS PRODUCED BY DIRECT UTILITY DETECTION WORK.
2. DIRECT OBSERVATIONS OF UNDERGROUND, GRAVITY FLOW PIPES PERFORMED AT VISIBLE CONTROLLING STRUCTURES.
3. SCALING OF AS-BUILTS, DESIGN DRAWINGS OR OTHER RECORDS.

3(C) SCOPE STATEMENT: UTILITY INVESTIGATIONS ARE SUBJECT TO THE LIMITATIONS OF ACCURACY OF CONVENTIONAL UNDERGROUND UTILITY DETECTION EQUIPMENT, THE EXISTENCE / ACCURACY OF RECORD UTILITY MAPS PRODUCED BY OTHERS, OR THE AWARENESS OR LOCAL KNOWLEDGE OF ANYTHING CONCEALED UNDERGROUND. THE COMPREHENSIVENESS OF SAID INVESTIGATIONS ARE THEREFORE LIMITED TO THE CAPACITY OF SAID TECHNOLOGIES AND /OR THE AVAILABILITY OF SUCH RECORDS OR KNOWLEDGE.

BUSH, ROED & HITCHINGS, INC. CORPORATE SEAL 1969 WASHINGTON

TAYLOR R. SCHULTE STATE OF WASHINGTON 44646 REGISTERED PROFESSIONAL LAND SURVEYOR

04/25/25

NO	REVISION	DATE

BUSH, ROED & HITCHINGS, INC.
LAND SURVEYORS & CIVIL ENGINEERS
15400 SE 30TH PL, STE 100
BELLEVUE, Washington
98007-6546
(206) 323-4144
1-800-935-0508
WWW.BRHINC.COM

TOPOGRAPHIC & BOUNDARY SURVEY

FRIENDS OF LITTLE SAIGON

1005 S. JACKSON ST.

SEATTLE | KING COUNTY | WASHINGTON

drawn by	checked by
HAK/JRP	TRS
scale	date
1" = 20'	4/25/25
job no.	
2023032.02	
sheet 2 of 2	

22"x34" 4/25/2025 U:\C3D\2023\2023032\SURVEYING\DWG\XS-SUR-02.DWG

PROJECT NO. 2324000

LITTLE SAIGON LANDMARK

SPECIFICATIONS – 90% CD SET

February 7, 2025

Architects:
Mithun
Pier 56, 1201 Alaskan Way, #200
Seattle, WA 98101
(206) 623-3344

MITHUN®

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project information.
2. Owner-Furnished/Contractor-Installed (OFCI) Products.
3. Contractor's Use of Site and Premises.
4. Work Restrictions.
5. Specification and Drawing Conventions.

1.2 PROJECT INFORMATION

A. Description: The scope of the project consists of the demolition of an existing structure and the construction of a 8-story, 70-unit affordable housing and mixed-use building. Ground floor commercial space, residential amenity spaces and building support spaces accompany 6 stories of residential floors. The building provides approximately 10,550 GSF of commercial space.
1. Level 1 and 2: Future tenant improvement of the Community Commercial space will be by others. Besides the Work of the Construction Documents, the project will include the gray shell improvements required to provide all rough-in mechanical, electrical, plumbing, fire protection, data and communication services to the commercial spaces. Provide all code required temporary lighting, fire protection and heating

B. Building Name: Little Saigon Landmark.

C. Project is located at: 1001 S. Jackon; Seattle, WA 98104.

D. Work consists of providing labor, materials, equipment, services, and administration required in conjunction with or properly incidental to Project construction.

1.3 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.
a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor’s construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:
1. Residential washer and dryers in central laundry rooms and in-unit equipment.

1.4 CONTRACTOR’S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.5 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
2. Should it be necessary to use portions of existing streets, sidewalks or right of ways for operations, obtain approval and pay for use of such areas in accordance with requirements of authorities having jurisdiction.
3. Conduct operations to ensure least inconvenience to public.
4. Obtain and pay for use of additional storage or staging areas needed for operations.
5. Do not load structure with weight that would jeopardize its safety.

B. On-Site Work Hours: Limit work to hours granted by Authority Having Jurisdiction.

C. Behavior: The Owner reserves the right to direct the Contractor to immediately remove any individual that the Owner determines has violated the following rules or constitutes a danger or nuisance to Owner.
1. The Owner will not tolerate inappropriate behavior by any worker on a job site.
2. The Contractor shall not allow obscene, offensive, or otherwise inappropriate material to be displayed on the project or language.

D. Contractor’s Employees:
1. Employee Identification: Provide identification tags for Contractor’s personnel working on Project site. Require personnel to use identification tags at all times.
2. Employee Screening: Comply with Owner’s requirements for drug and background screening of Contractor personnel working on Project site.

E. Fire and Life Safety:

1. Where non-compliance with fire and life safety standards are observed, the Owner may stop the work at no additional cost to the Owner or time extension until remedial action is taken. The Contractor shall reimburse the Owner for any fines or penalties levied by the Fire Department or Building Department for violations related to the construction project.
2. Report all construction spills and/or fires immediately to 911 and Owner/Architect.

F. Odor Controls:
1. General: The use of solvents and materials that produce noxious fumes, or any product or equipment that adversely impacts air quality shall be subject to approval by the Owner. Contractor shall submit a written procedure for the control of any emissions prior to use that includes the following:
   a. Products to be used (MSDS sheets)
   b. Location of work
   c. Application
   d. Ventilation Plan
   e. Hours of operation
   f. Material handling/storage

G. Smoking and Controlled Substance Restrictions: Use of tobacco products, vaping, alcoholic beverages, and other controlled substances on Project site is not permitted.

H. Security: Contractor shall protect work, stored products, construction equipment, and construction areas from theft and vandalism and unauthorized entry. Contractor shall be responsible for any theft or vandalism in occupied areas due to inadequate protection in construction zones.

1.6 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Ceiling Fans Quantity.

1. Base bid: Furnish and install ceiling fan boxes in the living room with control wiring in all units and provide and install 20 ceiling fans and their control panel in units to be identified later.
2. Alternate bid: Furnish and install ceiling fans and control panels in the remaining 51 unit so that each unit has a ceiling fan and control panel.

B. Alternate No. 2: Stair 1 & 2 floor, treads and riser finish.
   1. Base bid: Furnish and install CPT-1 broadloom carpet on stairs and landings.
   2. Alternate bid: In lieu of CPT-1 on stairs and landings at levels 1 & 2 furnish and install R-1 Rubber Treads and risers on stairs and RF-1 vinyl plank on intermediate and floor landings adjacent to R-1 rubber treads (4 total each stair).

C. Alternate No. 3: Apartment Unit – Residential Casework finish.
   1. Base bid: Thermofoil Casework.
   2. Alternate bid:
      a. Furnish and install Beech stile and rail cabinet doors and drawers in lieu of Thermofoil Finish Casework.
      b. Furnish and install Solid Maple stile & rail cabinet doors and drawers in lieu of Thermofoil Finish Casework.

D. Alternate No. 4: Unit kitchen countertops.
   1. Base bid: Furnish and install plastic laminate post formed countertops.
   2. Alternate bid: Furnish and install solid surface countertops per Section 123540 - Solid Surface Countertops.

E. Alternate No. 5: Resilient flooring.
   1. Base bid: Furnish and install RF-1 Shaw 20mil Abide in corridors and RF-1A 12mil Reside in units.
   2. Alternate bid: Furnish and install RF-1 Shaw 20mil Abide in corridors and units.

F. Alternate No. 6: Ceramic Wall Tiling at Restrooms 181 and 381.
   1. Base bid: Abuse-resistant Wall Covering (FRP) per Section 066400 – Plastic Paneling.
   2. Alternate bid: In lieu of FRP wainscoting in Restrooms 181 and 381, furnish and install:
      a. Tile: Daltile Linear Color Wheel glazed ceramic tile, and accessories as specified in Section 093000 – Tiling.
         1) Finish: Semi-Gloss Finish
         2) Size: 4 inch x 16 inch
         3) Color: To be selected by the Architect.
         4) Installation: Horizontal Orientation.
      b. Backer Board as specified in Section 092900 – Gypsum Board.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor to Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Copy of required form is bound after last page of this Section. Remove form for making additional copies or request an original copy from Architect
   2. Documentation: Show compliance with requirements for substitution and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.
      g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.

h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect’s Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed, unless otherwise indicated.
1. Architect will record time required for evaluating these substitutions proposed by Contractor, and for making changes in the Contract Documents. Whether or not Architect accepts Contractor proposed substitution, Contractor shall reimburse Owner for charges of Architect and Architect’s consultants for evaluating each proposed substitution.

C. No additional substitutions will be considered unless a substitution is required due to specified product being removed or unavailable.

1.7 SUBSTITUTION PROCEDURES

A. Limit each request to one proposed substitution.

B. Document each request with supporting data substantiating compliance of proposed substitution with Contract Documents, including:
1. Manufacturer’s name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance and other pertinent characteristics.
3. Reference to article and paragraph numbers in Specification section.
4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
5. Changes required in other Work.
6. Availability of maintenance service and source of replacement parts, as applicable.
7. Certified test data to show compliance with performance characteristics specified.
8. Samples, when applicable or requested.
9. Other information as necessary to assist Architect’s evaluation.

C. A request for substitution for an equivalent product constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it is equal or superior in all respects to specified product.

2. Will provide warranty as required for specified product.
3. Will coordinate installation and make changes to other Work which may be required.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Certifies that proposed product will not affect or delay Construction Progress Schedule.
6. Will pay for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.

D. Substitutions will not be considered when:
1. Indicated or implied on shop drawings or product data submittals without formal request submitted in accord with this Section.
2. Submittal for substitution request has not been reviewed and approved by Contractor.
3. Acceptance will require substantial revision of Contract Documents or other items of the Work, unless substitution is required to bring Project into GMP compliance.
4. Submittal for substitution request does not include point-by-point comparison of proposed substitution with specified product.

1.8 OWNER AND ARCHITECT'S REVIEW

A. Architect will review requests for proposed substitutions and make recommendations to Owner on Substitution Request Form.

B. Considerations for acceptance will be based on conformance with Contract Documents, including following as applicable:
1. Physical dimension and clearance requirements to satisfy space limitations.
2. Static and dynamic weight limitations; structural properties.
3. Audible noise levels.
4. Vibration generation.
5. Interchangeability of parts or components.
6. Accessibility for maintenance to allow possible removal or replacement.
7. Design.
8. Colors, textures, and finishes.
9. Compatibility with other materials, products, assemblies, and components.
10. Performance Requirements.
11. Warranty.

C. Owner's decision to approve or reject requested substitution will be indicated on Substitution Request Form. Approval of substitution not valid without Owner's signature.

D. Rejection of proposed substitution by Owner requires use of specified product.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 012500

Attachment: Substitution Request Form, 2 pages.

Contractor:

Project:

SUBSTITUTION REQUEST FORM

Note: Limit this Request to one proposed substitution

TO: Architect Date: _____ Request Number _____

FROM: ❑ Contractor ❑ Subcontractor ❑ Supplier ❑ Manufacturer _____

Specified Item: _____

Section: _____ Page: _____ Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone Number: _____
Trade Name: _____ Model Number: _____
Installer: _____ Address: _____ Phone Number: _____
History: ❑ New product ❑ 2 to 5 years old ❑ 5 to 10 years old ❑ More than 10 years old

Differences between proposed substitution and specified product: _____

❑ Point by point comparison data attached - **REQUIRED BY ARCHITECT**

Reason for Not Providing Specified Item: _____

Similar Installations:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____
Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: ❑No ❑Yes; explain

_____

Savings to Owner for accepting substitution: ($_____)

Proposed substitution changes Contract Time: ❑ No ❑ Yes; Add/Deduct _____ days.

Supporting Data Attached:
❑ Product Data ❑ Drawings ❑ Tests ❑ Reports ❑ Samples ❑

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will not affect or delay Construction Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by:

Signature:

Firm:

Address:

Telephone:

Attachments:

ARCHITECT'S REVIEW AND ACTION

- ❑ Approve Substitution - Make submittals in accordance with Specification Section 013300.
- ❑ Approve Substitution as noted – Make submittals in accordance with Specification Section 013300.
- ❑ Reject Substitution - Use specified products. Architect shall not have responsibility for performance of substitution approved by Owner and rejected by Architect.
- ❑ Substitution Request received too late - Use specified products.

Signed by:

Comments

OWNER'S REVIEW AND ACTION (Approval of Substitution not valid without Owner's signature)

- ❑ Substitution approved - Make submittals in accordance with Specification Section 013300.
- ❑ Substitution approved as noted - Make submittals in accordance with Specification Section 013300.
- ❑ Substitution rejected - Use specified products.

Signed by:

Comments

END OF FORM

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for handling and processing Contract modifications.
   1. Architect's Supplemental Instructions.
   2. Proposal Request.
   3. Change Orders.
   4. Construction Change Directive.

1.2 SUBMITTALS

A. Refer to Section 013300 – Submittal Procedures for additional information.

B. General:
   1. Submit names of individuals authorized to receive Contract modification documents.
   2. Submit names of individuals responsible for informing Contractor's employees and affected subcontractors of Contract clarifications and modifications.

1.3 CHANGE PROCEDURES

A. General: Change procedures are written instructions issued after execution of Contract Agreement.

B. Minor Changes in the Work:
   1. Form: AIA Document G710, *Architect's Supplemental Instructions*.
   2. Description: Written instructions, clarifications, or interpretations of Contract Documents not involving adjustment to Contract Sum or Contract Time. Instructions or interpretations are binding on Owner and Contractor.
   3. Procedure: Document is prepared and signed by Architect and distributed to Owner and Contractor. Architect's Supplemental Instructions are effective upon receipt.

C. Proposal Request:
   1. Form: AIA Document G709, *Proposal Request*.
   2. Description: Written proposed change of Work within Contract scope consisting of additions, deletions, and other revisions. Proposal Request is for information only and does not authorize changes in Contract Sum or Contract Time. Contractor evaluates proposal for pricing and scheduling impact.
   3. Procedure:
      a. Document is prepared and signed by Architect. Copies are sent to Owner and Contractor.
      b. Contractor shall review Proposal Request and submit Change Order Request and Proposal Worksheet Detail and Summary Forms with proposed changes in Contract Sum and Contract Time.

c. Prepare and submit Change Order Request and Proposal Worksheet Detail and Summary Forms Architect within 20 days of Proposal Request receipt. Proposed Contract Sum and Contract Time changes quoted by Contractor shall remain valid for 30 days from receipt by Architect.

D. Request for Information (RFI):
1. Forms: AIA Document G716, Construction RFI.
a. Change Order Request: Describes and summarizes Contractor's proposed changes. Indicates changes in Contract Sum and Contract Time.
b. Proposal Worksheet Summary: Summarizes labor, materials, overhead and profit, bonds, insurance, and tax of proposed Contract additions and deductions.
c. Proposal Worksheet Detail: Summarizes labor and material costs of each subcontractor involved in proposed change.
2. Description: Written proposed change of Work consisting of additions, deletions, and other revisions. Submit RFI to Architect for conditions which require Contract Document modifications. Include proposed changes in Contract Sum and Contract Time.
3. Procedure:
a. Proposed changes are documented by Contractor on RFI, Proposal Worksheet Summary, and Proposal Worksheet Detail forms. Documents include description of proposed changes and summary of changes in Contract Sum and Contract Time are prepared and signed by Contractor. Send copies to Owner and Architect.
b. Comply with requirements of Section 012500 - Product Substitution Procedures for proposed changes in Work which include products or systems not contained in Contract Documents.
c. Architect and Owner will review RFI and evaluate proposed changes. Architect and Owner may accept or reject RFI. Upon acceptance Architect will prepare Change Order to document Contract change.

E. Change Order:
1. Form: AIA Document G701, *Change Order*.
2. Description: Written change of Work within Contract scope consisting of additions, deletions, product substitutions, and other revisions, including proposed basis for adjustment to Contract Sum and Contract Time. Change Orders are signed by Owner, Contractor, and Architect. Owner's signature authorizes change.
3. Procedure: Document is prepared and signed by Architect; sent to Contractor for acceptance and signature; approved and signed by Owner; distributed to Architect and Contractor. Contractor shall perform changes upon receipt.

F. Construction Change Directive:
1. Form: AIA Document G714, *Construction Change Directive*.
2. Description: Written change of Work within Contract scope consisting of additions, deletions, and other revisions, including a proposed basis for adjustment to Contract Sum and Contract Time. Document is used in absence of agreement on terms of Change Orders.
3. Procedure:
a. Document is prepared and signed by Architect and Owner. Contractor shall perform changes upon receipt.

b. Adjustments to Contract Sum should be one of following:
   1) Lump sum.
   2) Unit price.
   3) Mutually accepted method.
   4) As provided in AIA Document A201 Subparagraph 7.3.6; maintain detailed records on time and material basis of Construction Change Directive Work.
c. Architect will determine proposed method, time, and amount of Contract adjustment based on reasonable expenditures, and allowance for overhead, profit, and time.
d. Contractor's signing of Construction Change Directive acknowledges agreement with proposed method for adjusting Contract Sum and Contract Time and is recorded as Change Order.
e. Contractor disagreement or no response to proposed method for adjusting Contract Sum or Contract Time does not relieve Contractor from responsibility to perform Work.
f. Payment for Construction Change Directives will be made in accordance with AIA Document A201 Subparagraph 9.3.1.1.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Coordinate Schedule of Values and Applications for Payment with Construction Progress Schedule, Submittal Schedule, and List of Subcontracts.

1.2 SCHEDULE OF VALUES

A. General: Refer to Section 013200 – Construction Project Documentation.

1.3 APPLICATIONS FOR PAYMENT

A. General:
   1. Maintain consistency with previous applications for payments as certified by Architect and paid by Owner.
   2. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
   3. Payment application times:
      a. Each progress payment date is as indicated in Agreement.
      b. Work covered by each Application for Payment is period indicated in Agreement.
   4. Payment application forms: Use AIA Document G702 *Application and Certificate for Payment* and G703 *Continuation Sheet* for Application for Payment.

B. Application Preparation:
   1. Complete every entry on form, including notarization and execution by person authorized to sign legal documents on behalf of Contractor.
   2. Incomplete applications will be returned without action.
   3. Match data entries on Schedule of Values and Construction Progress Schedule. Use updated schedules if revisions have been made.
   4. Include amounts of Change Orders and Construction Change Directives issued prior to last day of construction period covered by application.

C. Transmittal:
   1. Submit Application for Payment to Architect by date required for receipt; include waivers of lien and similar attachments with one copy.
   2. Transmit each copy with transmittal form listing attachments, and recording appropriate information related to application in manner acceptable to Architect.

D. Waivers of Mechanics Lien:
   1. With each Application for Payment submit waivers of mechanics liens from subcontractors and suppliers for construction period covered by previous application.
   2. Submit partial waivers on each item for amount requested, prior to deduction for retainage, on each item.
   3. When application shows completion of item, submit final or full waivers.

4. Owner reserves right to designate which entities involved in Work must submit waivers.
5. Waiver forms: Submit waivers of lien on properly executed AIA Document G706A, *Contractor's Affidavit of Release of Liens.*

E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include following:
1. Schedule of Values.
2. Construction Progress Schedule (preliminary if not final).
3. Submittal schedule.
4. List of Contractor's staff assignments.
5. Copies of building permits.

F. Application for Payment at Substantial Completion:
1. Following issuance of Certificate of Substantial Completion, submit Application for Payment reflecting Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work.
2. Required administrative actions and submittals that precede or coincide with this application include:
   a. Occupancy permits and similar approvals.
   b. Warranties and maintenance agreements (dated to commence on date of Substantial Completion).
   c. Test/adjust/balance records.
   d. Maintenance instructions.
   e. Start-up performance reports.
   f. Application for reduction of retainage, and consent of surety, AIA Document G707A, *Consent of Surety to Reduction in or Partial Release of Retainage*.
   g. Final progress photographs.
   h. Comprehensive list of incomplete or non-complying Work (initial punch list).

G. Final Payment Application: Required administrative actions and submittals which precede or coincide with submittal of final payment Application for Payment include following:
1. Completion of Project Closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Assurance that unsettled claims will be settled.
4. Submittal of AIA Document G707, Consent of Surety to Final Payment.
5. Assurance that Work not complete and accepted will be completed without undue delay.
6. Final cleaning.
7. Transmittal of required Project construction records to Owner.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish and similar elements.
10. Change of door locks to Owner's access.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 GENERAL COORDINATION PROVISIONS

A. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect of any error, inconsistency, omission, or apparent discrepancy discovered.

B. Allot time in construction scheduling for liaison with Architect; establish procedures for handling queries and clarifications. Use an approved "Request for Interpretation" form for requesting information. Limit each RFI to a single issue or a group of related issues.
   1. If Architect is able to respond to a request for interpretation by making specific reference to Drawing sheet or Specification Section, Contractor shall reimburse Owner for charges of Architect and Architect's Consultants for performing review services for the Contractor.
   2. If Contractor disagrees with Architect's response to Contractor's RFI, Contractor shall notify Architect within seven days of receipt of response. Lack of such notification shall be understood to mean that Contractor agrees with response.
   3. Allow minimum 7-day response time from receipt of each RFI. RFI's shall include a workable no-cost proposed solution from Contractor. If more than 10 RFIs are received within 4 working day period, Architect's response time will be extended as necessary for professional response; order of responses will be based on priority established by Architect after consultation with Owner and Contractor.

C. In addition to other specified meetings, hold coordination meetings and conferences with personnel and subcontractors to ensure coordination of Work.

D. Coordinate scheduling, submittals, and Work of various Specification sections to avoid conflicts and ensure efficient and orderly sequence of installation of interdependent construction elements.

E. Coordinate Work of various Specification sections having interdependent responsibilities for installation, connection, and operation.

F. Verify that characteristics of operating equipment are compatible with building utilities and services.

G. Except as otherwise indicated, conceal pipes, ducts, conduit and wiring in construction. Coordinate locations of fixtures and outlets with finish elements.

H. Make provision to accommodate items scheduled for later installation.

1.2 ARCHITECT'S DIGITAL DATA FILES

A. Architect's Digital Data Files: Select electronic digital data files of the Contract Drawings can be provided by Architect for Contractor's use in preparing submittals.
   1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
   2. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.3 COORDINATION DRAWINGS AND LAYOUTS

A. General:
   1. Coordination drawings are not shop drawings and are not to be submitted to Architect for approval.
   2. Coordination drawings show relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in space provided or to function as intended.
   3. Except as otherwise specified, prepare composite coordination drawings to scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of site utilities, architectural, structural, mechanical, and electrical equipment and materials in relationship with each other, installations, and building components. Include dimensions.
   4. Provide coordination drawings utilizing different colors to illustrate work of separate trades.
   5. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to efficient flow of Work affecting one or more trades.
   6. Indicate scheduling, sequencing, movement, and positioning of large equipment into building during construction.
   7. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
   8. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.
   9. Show interrelationship of components to be shown on separate Shop Drawings.
   10. Indicate required installation sequences.

B. Site Utilities: Include, but not necessarily limited to following:
   1. Water Distribution: Pipe sizes, valve and meter locations, underground structures, connections, anchors, and reaction backing. Indicate spatial relationship between piping and other piping in same trench, and proximate structures.
   2. Sanitary Sewerage: Pipe sizes, manholes, locations and elevations, underground structures, and connections. Indicate spatial relationship between piping and other piping in same trench, and proximate structures.
   3. Natural Gas Distribution: Pipe sizes, valves, gas meters, and specialties. Include details of underground structures and piping. Show other piping in same trench and clearances from natural gas piping. Indicate interface and spatial relationship between piping and proximate structures.

4. Drainage and Containment:
    a. Manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Indicate spatial relationship between piping other piping in same trench, and proximate structures.
    b. Profile Drawings: Show systems piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities that cross system piping.
5. Storm Drainage:
    a. Pipe sizes, manholes and catch basins locations and elevations. Include details of underground structures and connections. Show other piping in the same trench and clearances from storm sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
    b. Profile Drawings: Show storm sewerage system piping in elevation. Draw profiles at a horizontal scale of not less than 1 inch equals 50 feet and a vertical scale of not less than 1 inch equals 5 feet. Indicate pipe and underground structures. Show types, sizes, materials, and elevations of other utilities crossing sewerage system piping.

C. Structural Systems: Include, but do not necessarily limit to following:
1. Structural frame showing interface with exterior cladding.
2. Location of openings in relation to structure.
3. Show attachments to decking, structural elements, and other systems.

D. Mechanical Systems: Include, but do not necessarily limit to following:
1. Proposed locations of piping, ductwork, equipment, and materials.
2. Proposed locations for access panels and doors.
3. Clearances for installing and maintaining insulation.
4. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance. Show access locations.
5. Equipment connections and support details.
6. Exterior wall and foundation penetrations.
7. Fire-rated wall and floor penetrations.
8. Sizes and location of required concrete pads and bases.
9. Valve stem movement.

E. Plumbing Systems: Include, but do not necessarily limit to following:
1. Proposed locations of clean-outs.

F. Electrical Systems: Include, but do not necessarily limit to following:
1. Proposed locations of major raceway systems, equipment, and materials.
2. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance. Show access locations.
3. Exterior wall and foundation penetrations.
4. Fire-rated wall and floor penetrations.
5. Equipment connections and support details.
6. Sizes and location of required concrete pads and bases.

G. Coordinate in field with affected trades for proper relationship to Work based on Project conditions.

H. Notify Architect of conflicts and other coordination issues requiring resolution prior to commencing construction in each affected area.

I. Submit Contractor's certification to Architect that coordination documents have been completed and coordination issues have been identified and resolved prior to commencing construction in each affected area.

J. Make coordination documents available in field office for review by Architect and Owner during entire period of construction.

1.4 COORDINATION OF SPACE

A. Coordinate use of Project space and sequence of installation of plumbing, fire protection, mechanical and electrical Work. Follow routings shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with building lines. Utilize space efficiency to maximize accessibility for other installations, for maintenance, and for repairs.

B. Layout of plumbing, fire protection, mechanical, and electrical systems, equipment, fixtures, piping, ductwork, conduit, specialty items, and accessories indicated on Drawings is diagrammatic. Variations in alignment, elevation, and details required to avoid interference and satisfy architectural and structural limitations are not necessarily shown.

C. Prior to installation of material and equipment, review and coordinate Work with Architectural and Structural Drawings to establish exact space conditions. Where available space is inadequate or where reasonable modifications are not possible, request information from Architect before proceeding.

D. Coordinate installation to prevent conflicts and cooperate in making, without extra charge, reasonable modifications in layout as needed.

E. Provide clear access to control points, valves, strainers, control devices, and specialty items of every nature related to such systems and equipment to obtain maximum head room. Provide adequate clearances as necessary for operation and maintenance.

1.5 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and clean-up of Work in preparation for Substantial Completion.

B. To minimize disruption of Owner's activities after occupancy of premises, coordinate access to site by various trades for correction of defective Work and for correction of Work not in accordance with Contract Documents.

1.6 GENERAL MEETING REQUIREMENTS

A. Schedule meetings and conferences throughout progress of Work; each session scheduled, administered, and presided by entity indicated. Requirements for meetings and conferences include:
   1. Prepare agenda for each conference and meeting.
   2. Distribute written notice to participants 7 days in advance of scheduled date.
   3. Make physical arrangements.
   4. Record minutes and attendees; include significant proceedings and decisions.
   5. Reproduce and distribute copies of minutes within 5 days after each meeting.
   6. Distribute one copy of minutes to each participant and to entities affected by decisions made at meeting.
   7. Distribute one copy of minutes to Architect and Owner.
   8. Maintain in field office one copy of agenda and minutes for each conference and meeting.

B. Representatives attending meetings shall be qualified and authorized to act on behalf of entity each represents.

C. Architect and professional consultants may attend meetings to ascertain that Work is consistent with Contract Documents.

D. Owner may be present at meetings and may propose agenda items.

1.7 PRECONSTRUCTION CONFERENCES

A. Schedule preconstruction conferences no later than 7 days prior to commencement of Work. Convene at Project site.

B. Attendees:
   1. Architect and professional consultants; Architect presides over meeting and is responsible for minutes.
   2. Owner.
   3. Contractor.
   4. Major subcontractors.
   5. Others as appropriate.

C. Minimum Agenda:
   1. Administrative and procedural issues:
      a. Designation of key personnel.
      b. Review and clarify responsibilities of parties to contract.
      c. Communications procedures.
      d. Review of proposed subcontractors, materials, equipment, and products.
      e. Application for payment procedures; schedule of values, proposal requests, change orders.
      f. Critical work sequencing; long lead time items.
      g. Submittal and construction progress schedules.

h. Submittal requirements; complete, correct, and timely submittals; scheduled dates.
i. Procedures for submitting product data, shop drawings, samples, and other submittals.
j. Product options and substitutions procedures.
k. Procedures for requests for interpretations (RFI), minor changes, field decisions, construction change directives, proposal requests, change orders, and filing claims.
l. Procedures for testing and inspection, including timely notification.
m. Responsibilities and limitations of authority of testing laboratories; distribution of reports.
n. Procedures for maintaining Project Record Documents.
o. Schedule for progress meetings.

2. Site mobilization and utilization:
   a. Use of premises; office and storage areas.
   b. Temporary utilities and services.

1.8 PROGRESS MEETINGS

A. Schedule periodic meetings as necessary by progress of Work; day, location, and time to be determined. Convene at Project site.

B. Attendees:
1. Contractor: presides over meeting and is responsible for minutes.
2. Subcontractors as appropriate.
3. Owner.
4. Others as appropriate to agenda.

C. Minimum Agenda:
1. Approval of minutes of previous meeting.
2. Work progress since previous meeting:
   a. Current activities.
   b. Critical activities.
   c. Deviations from schedule.
3. Field observations, problems, conflicts, and decisions.
4. Deficiencies:
   a. Identification of items.
   b. Status of correction.
5. Requests for Interpretations (RFIs):
   a. Status of clarification.
   b. Status of proposal requests.
6. Changes and modifications:
   a. Status of change orders.
   b. Pending changes.
   c. Pending claims and disputes.
   d. Clarification decisions of Architect or Owner.
7. Problems and conflicts which impede planned progress.
8. Construction Progress and Submittal Schedules:

a. Off-site fabrication and delivery schedules.
b. Effect of proposed changes on construction progress schedule and coordination.
c. Submittal schedules, status of submittals, and effect on construction progress schedule.
d. Corrective measures to regain projected schedule.

9. Planned progress during succeeding Work period.
10. Adequacy of work forces.
11. Coordination between elements of Work.
12. Maintenance of Project Record Documents.
13. Other business relating to progress of Work.

D. Meeting Minutes:
1. Include column to indicate who is required to take action and date action is to be completed. Each of these items requiring action will be carried in subsequent minutes of meeting as "old business" until noted as "resolved."
2. As minimum, separate into following categories:
a. Old business.
b. New business.
c. Work progress.
d. Deficiencies.
e. RFIs.
f. Proposed changes.
g. Schedules.
h. Submittals.
i. Other business, including events to be accomplished by next meeting.

1.9 PREINSTALLATION CONFERENCES

A. Schedule preinstallation conferences required in individual Specification sections. Convene at Project site prior to commencing Work of the section.

B. Attendees:
1. Project Superintendent: presides over meeting and is responsible for minutes.
2. Subcontractor (installer, applicator, or erector).
3. Material or equipment supplier.
4. Manufacturers' representative.
5. Others directly affecting, or affected by the work.
6. Testing agency (if necessary).
7. Subcontractors as appropriate.
8. Owner.
9. Others as appropriate to agenda.

C. Minimum Agenda:
1. Access to work and conditions of proper installation.
2. Conditions of installation, such as substrates, existing and surrounding conditions, and environmental conditions.
3. Conditions detrimental to installation.
4. Preparation procedures, including protection of adjacent work.

5. Verify installers' receipt and understanding of installation instructions.
6. Review submittals, installation procedures, and sequence.
7. Review coordination with other work.
8. Evaluate delivery schedule and Construction Progress Schedule.
9. Observe sample installation.
10. Required protection procedures.
11. Observe actual installation areas.

1.10 CLOSEOUT CONFERENCE

A. Schedule Project Closeout conference prior to requesting Substantial Completion.

B. Attendees:
1. Contractor: presides over meeting and is responsible for minutes.
2. Major subcontractors.
3. Owner.
4. Others as appropriate to agenda.

C. Minimum Agenda:
1. Start-up of facilities and systems.
2. Testing, adjusting, and balancing.
3. System demonstration and observation.
4. Operation and maintenance instructions for the owner's personnel.
5. Contractor's inspection of work.
6. Contractor's preparation of an initial "punch list."
7. Procedure to request Architect inspection to determine date of substantial completion.
8. Completion time for correcting deficiencies.
9. Inspections by authorities having jurisdiction.
10. Certificate of occupancy and transfer of insurance responsibilities.
11. Partial release of retainage.
12. Preparation for final inspection.
13. Closeout submittals:
    a. Project Record Documents.
    b. Operating and maintenance documents.
    c. Operating and maintenance materials.
    d. Warranties and bonds.
    e. Affidavits.
14. Final application for payment.
15. Final cleaning.
16. Contractor's demobilization of site.
17. Maintenance.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SCHEDULE OF VALUES

A. General:
1. Submit at least 15 days prior to submitting first Application for Payment.
2. Upon request of Architect, submit additional data to substantiate accuracy of given values.
3. Approved schedule will be used as basis for reviewing applications for payment.

B. Format:
1. Use AIA Document G703 - *Continuation Sheet* for application and certificate for payment, or use letter size white bond paper following format of AIA Document G703.
2. Contractor’s standard form or electronic media printout will be considered on request.
3. Use Schedule of Values as established in Construction Contract.
4. Identify Schedule of Values with following information:
    a. Project name and location.
    b. Name of the Architect.
    c. Project number.
    d. Contractor's name and address.
    e. Date of submittal.

C. Content:
1. List installed value of each item of Work and each subcontracted item of Work as separate line item to serve as basis for computing values for Progress Payments. Round off values to nearest dollar.
2. For each major subcontract, list products and operations of that subcontract as separate line items.
3. Include in each line item, as applicable, amount specified for allowances.
4. Itemize separate line costs for performance and payment bonds, field supervision, field layout, temporary facilities and controls, and overhead and profit.
5. For items on which payments will be requested for stored products, list sub-values for cost of materials, delivered and unloaded, with taxes paid.
6. Sum of listed values shall equal total Contract Sum.

D. Review and Resubmittals:
1. After Architect’s initial review, revise and resubmit as necessary.
2. Revise and resubmit whenever Change Order is issued. Show each Change Order as new line item. Submit revised schedule with next application for payment.

1.2 CONSTRUCTION PROGRESS SCHEDULE

A. Submit initial preliminary schedule 15 days prior to first Application for Payment. Within 7 days after return of reviewed submittal, resubmit revised data.

B. Prepare schedule as horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week.

C. Content:
1. Show complete sequence of construction by activity, with dates for beginning and completion of each major element of construction.
2. Identify Work of separate stages or phases, separate floors, or other logically grouped activities.
3. Show accumulated percentage of completion of each item, and total percentage of Work completed as of first day of each month.
4. Review specifications and determine availability of products and long-lead items. Identify long lead items on schedule to allow sufficient time for submittals and order placement to obtain item without delaying Work.
5. Provide sub-schedules to define critical portions of entire schedule.

D. Submittal Schedule:
1. Provide separate sub-schedule to construction progress schedule indicating submittal dates and review time allowed for shop drawings, product data, samples and other similar data.
2. Submit schedule submittal 15 days prior to first Application for Payment.
3. Indicate dates reviewed submittals will be required from Architect taking into consideration the quantity of days specified for Architect's review.
4. Allow sufficient time in schedule for resubmittal of disapproved submittals without causing construction delay.
5. Indicate decision dates for selection of finishes and colors.

E. Progress Revisions:
1. Identify activities modified since previous submittal, major changes in scope, changes in dates, and other identifiable changes.
2. Provide narrative report as necessary to define problem areas, anticipated delays, and impact on schedule.
3. Report corrective action taken, or proposed, and its effect.

F. Progress Submittals:
1. Submit revised schedule with each application for payment.
2. Submit in quantity required for distribution, plus 2 copies to be retained by Architect.

G. Distribute copies of reviewed schedule to project site file, subcontractors, suppliers, and other concerned parties.

H. Architect will review construction progress schedules and submittal schedules and return within 30 working days of receipt.

1.3 PROPOSED PRODUCTS LIST

A. General:
1. Submit at least 15 days prior to submitting first Application for Payment.

2. Submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

C. Listing may be combined with submittal of subcontractor listing required by subparagraph 5.2.1 of General Conditions.

D. Architect will reply in writing within 15 days stating whether there is reasonable objection to listed items. Failure to object to a listed item shall not constitute waiver of requirements of Contract Documents.

1.4 PROPOSED SUBCONTRACTORS AND MANUFACTURERS

A. Submit in writing within 30 days of award of contract complete listing of all subcontractors and manufacturers proposed for Project. Follow specification table of contents for subcontractor and manufacturer listing.

B. Architect will respond in writing within 21 days stating whether or not Owner or Architect have reasonable objection to any proposed subcontractor or manufacturer. Failure to reply constitutes notice of no reasonable objection, however, failure to reply does not alter Contract Document requirements.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information, and physical samples that require Consultant's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Consultant's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Construction Project Management Website: Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

E. Metadata: Data that provides information about other data, but not the content of the data, such as the text of message or the image itself. Metadata may include but are not limited to: standardized information (author name, resolution, color space, copyright, keywords), HTML (web page), and PDF files.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Consultant and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
   3. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

B. Format: Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Name of subcontractor.
   4. Description of the Work covered.
   5. Scheduled date for Consultant's final release or approval.
   6. Scheduled date of fabrication.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: See Section 013100 – Project Management and Coordination for requirements related to use of Architect's digital data files.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Consultant reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received. Consultant to coordinate this withhold action with Contractor and Owner's Project Manager so not to delay the project.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Consultant's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Consultant to coordinate additional time with Contractor and Owner's Project Manager so not to delay the project.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Consultant's consultants, Owner, or other parties is indicated, allow 12 working days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Consultant and to Consultant's consultants, allow 10 working days for review of each submittal. Submittal will be returned to Consultant before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use Owner's Project Number and Specification Section number followed by a decimal point and then a sequential number (e.g., 128004-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 128004-061000.01.A).
   3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Consultant.
   4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner's Project Manager, containing the following information:
      a. Project name.
      b. Owner's Project Number.
      c. Date.
      d. Name and address of Consultant.
      e. Name of Contractor.
      f. Name of firm or entity that prepared submittal.
      g. Names of subcontractor, manufacturer, and supplier.
      h. Category and type of submittal.
      i. Submittal purpose and description.
      j. Specification Section number and title.
      k. Specification paragraph number or drawing designation and generic name for each of multiple items.
      l. Drawing number and detail references, as appropriate.
      m. Location(s) where product is to be installed, as appropriate.
      n. Related physical samples submitted directly.
      o. Indication of full or partial submittal.
      p. Transmittal number, numbered consecutively.
      q. Submittal and transmittal distribution record.
      r. Other necessary identification.
      s. Remarks.
   5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
      a. Project name.
      b. Owner's Project Number.
      c. Number and title of appropriate Specification Section.
      d. Manufacturer name.
      e. Product name.

E. Options: Identify options requiring selection by Consultant.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Consultant on previous submittals, and deviations from requirements in

the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Consultant's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Consultant's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Submit electronic submittals via email as PDF electronic files.
a. Consultant will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.

f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.
i. Verification that product manufacturing is going to be available for the full duration of the construction schedule or 1 year, whatever is more.
j. Asbestos free certification.
k. Sample warranty.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Consultant's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Where sample has not been preselected and specified or scheduled, submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer’s product line. Consultant will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three sets of Samples. Consultant will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
    1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
    2. Manufacturer and product name, and model number if applicable.
    3. Number and name of room or space.
    4. Location within room or space.
    5. Submit product schedule in the following format:
        a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 - Project Management and Coordination.

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 - Construction Progress Documentation.

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 - Quality Requirements.

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 - Closeout Procedures.

J. Maintenance Data: Comply with requirements specified in Division 01.

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Consultants and owners, and other information specified. Submit in PDF electronic file format.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified. Submit in PDF electronic file format.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project. Submit in PDF electronic file format.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required. Submit in PDF electronic file format.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents. Submit in PDF electronic file format.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents. Submit in PDF electronic file format.

Q. Asbestos Free Certifications: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents. Provide independent test results documenting asbestos free status. Submit in PDF electronic file format.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents. Submit in PDF electronic file format.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or

on comprehensive tests performed by a qualified testing agency. Submit in PDF electronic file format.

T. Research Reports: Submit written evidence, in PDF electronic file format, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents. Submit in PDF electronic file format.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion. Submit in PDF electronic file format.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents. Submit in PDF electronic file format.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers. Submit in PDF electronic file format.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Consultant.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Consultant.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 - Closeout Procedures.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name, product # and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 CONSULTANT'S ACTION

A. Action Submittals: Consultant will review each submittal, make marks to indicate corrections or revisions required, and return it. Consultant will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Consultant will review each submittal and will not return it if it complies with requirement. Consultant will return it in 10 days if it does not comply with requirements. Consultant and Construction Manager will forward each submittal to appropriate party. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Consultant.

C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

D. Submittals not required by the Contract Documents may be returned by the Consultant without action.

END OF SECTION 013300

SUBMITTAL TRANSMITTAL (Submit separate form for each product)

Contractor: Project:

TRANSMITTAL A To: Contractor _____ Date: _____ Submittal No: _____

From: Subcontractor _____ By: _____ Resubmission ❑ _____

Quantity	Reference Number	Title/Description/ Manufacturer	Specification Section Title, Paragraph / Drawing Detail Reference

❑ Submitted for Review and Approval
❑ Resubmitted for Review and Approval
❑ Complies with Contract Requirements
❑ Will be available to meet construction schedule
❑ A/E Review Time included in construction schedule
❑ Substitution Involved - Substitution Request Attached
❑ If Substitution involved, Submission includes full point by point comparative data or Preliminary details
❑ Items included in Submission will be ordered immediately upon receipt of approval

Other remarks on above submission:

TRANSMITTAL B To: Architect - Att: _____ Date Received by Contractor: _____

From: Contractor _____ Date Transmitted by Contractor: _____

Reviewed, Coordinated, and Approved by Contractor

Remarks on above submission:

❑ One copy retained by sender

TRANSMITTAL C To: Contractor _____ Date Received: _____

From: Architect ❑ Other Signed _____ Dated Returned: _____

❑ Approved
❑ Approved as noted
❑ Disapproved / Resubmit
❑ Not subject to review
❑ Submission Incomplete; Resubmit
❑ Received; No Action Required
❑ Full point by point comparative data required to complete approval process
❑ Provide File Copy with corrections identified
❑ Reproducible copies only returned
❑ Remarks on above submission:
❑ One copy retained by sender

TRANSMITTAL D To: Subcontractor _____ Date Received: _____

From: Contractor Signed _____ Dated Returned: _____

Copies ❑ Owner ❑ _____ ❑ _____ ❑ One copy retained by sender

Remarks on above:

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 REGULATORY REQUIREMENTS

A. General: Reference to codes, standards or regulatory requirements made on Drawings or in Specifications are considered an integral part of Contract Documents as minimum requirements. Nothing in Contract Documents should be understood to conflict with laws, by-laws, or regulations of municipal, State, Federal, and other authorities having jurisdiction.

B. Code Requirements: As indicated on Drawing Sheet A002.

1.2 REFERENCE STANDARDS

A. Comply with association, trade, federal, commercial, standards generating organization (such as ANSI and ASTM), and other similar standards referenced within Specification sections, except where more explicit or stringent requirements are indicated or required by Specification or applicable codes.

B. Reference standards include their associated amendments and supplements.

C. Except where a specific date is indicated, date of standard is latest edition in effect at date of Contract Documents, or date of standard required by code.

D. Reference standards have same force and effect as if bound into or copied directly into Contract Documents; standards are made a part of Contract Documents by reference.

E. Contractual relationship of parties to the Contract shall not be altered from Contract Documents by mention or inference otherwise in reference standards.

F. Names and titles of standards are frequently abbreviated. Where acronyms or abbreviations are used in Specifications, they are defined to mean the recognized name of trade association, standards generating organization, governing authority, or other entity applicable to context of text provision.

G. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

H. When indicated by individual Specification section, obtain copy of standard. Maintain copy at Project site during submittals, planning, and progress of specific work, until Substantial Completion.

I. Units of measurements required by specifications govern regardless of units of measurement used in reference standards.

1.3 PROJECT MANUAL CONTENT

A. Sections of Division 01 - General Requirements apply to execution of all sections of the Specifications.

B. Language:
1. Imperative mood of sentence structure is generally used which places verb as first word in sentence. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor.
2. In certain circumstances, the language of specifications and other contract documents are of abbreviated type. It implies words and meanings that will be appropriately interpreted. Words such as "the," "shall," "shall be," "Contractor shall," "a," "all," "an," "any," and other similar words are eliminated.
3. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of Contract Documents so indicates.
4. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

C. Specialist Assignments:
1. In certain circumstances, Specification text requires or implies that specific elements of Work are to be assigned to specialists who must be engaged to perform that element of Work. Such assignments are special requirements of Contract.
2. Such assignments are intended to establish which party or entity involved in a specific element of Work is considered as being sufficiently experienced in indicated construction processes or operations to be recognized as "expert" in those processes or operations. Nevertheless, ultimate responsibility for fulfilling Contract requirements remains with Contractor.
3. These requirements should not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

D. Minimum Quality/Quantity:
1. Quality level or quantity shown or specified is intended to be minimum for Work to be performed or provided.
2. Except as otherwise specifically indicated, actual Work may either comply exactly with that minimum within specified tolerances, or may exceed that minimum within reasonable limits.
3. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of requirements.
4. Refer instances of uncertainty to Architect for decision before proceeding.

1.4 SYMBOLS

A. List of Symbols:
Number.
% Percent.
F Degrees Fahrenheit.
C Degrees Celsius.

’ Feet.
" Inches.
± Plus to Minus; Plus or Minus.
+/- Plus to Minus; Plus or Minus.

1.5 DEFINITIONS

A. Basic Contract definitions are included in Conditions of the Contract.

B. And: Conjunction indicating that items in series are to be taken jointly. It may also mean plus or in addition to preceding items in the series.

C. Approved: Where used in conjunction with Architect’s response or action, meaning will be held to limitations of Architect’s responsibilities and duties as specified in General and Supplementary Conditions. In no case will Architect’s approval be interpreted as release of Contractor from responsibilities to fulfill requirements of Contract Documents.

D. Directed, Requested: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect," "requested by Architect," and similar phrases. However, no such implied meaning shall be interpreted to extend Architect’s responsibility into area of construction supervision.

E. Finish: The manner or method of completion. The final appearance of a surface, including texture, smoothness, sheen, and color, after finishing operations have been performed. Finishing operations include preparation of substrate and application, curing, and protection of specified finish materials.

F. Furnish: Means to supply, purchase, procure and deliver complete with related accessories, ready for assembly, application, installation, and similar operations, as applicable in each instance.

G. Indicated: Refers to graphic representations, notes, or schedules on Drawings, or other paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help reader locate the reference. Location is not limited.

H. Install: Means to construct, assemble, erect, mount, anchor, place, connect, apply and similar operations, complete with related accessories, as applicable in each instance.

I. Installer: Entity (person or firm) engaged to perform a particular unit of Work at Project site, including installation, erection, application, repair, patching, and similar required operations. Such entities must be experienced in operations they are engaged to perform.

J. Mold Growth Products: Any organic cellular based product capable of fostering growth of mold. Examples include:
1. Wood based products.
2. Paper based products including paper faced products such as gypsum board and gypsum sheathing.
3. Insulation products.

4. Resins, binders, and adhesives.
5. Wall coverings and carpet backings.

K. Or: Used to introduce any of the possibilities in a series. Items in the series are not required to be taken jointly. It does not mean that individual items in the series are optional requirements.

L. Product: Includes natural and manufactured materials, components, machinery, fixtures, equipment, devices, furnishings, systems, and their associated accessories to be incorporated into the Work.

M. Provide: Means to furnish and install, complete and ready for operations and use for purpose intended.

N. Regulations: Includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within construction industry that control performance of the Work.

O. Similar: Interpreted in its general sense and not as meaning identical. Elements defined as "similar" shall be coordinated in relationship to their location and connection with other parts of the Work.

P. True To Line, Plumb, Level, and Flat: Install Work within following tolerances, except where indicated otherwise:
1. True to line: Allowed deviation from straight line within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 3/8 inch in lengths over 20 feet.
2. Level: Allowed deviation from horizontal plane within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 1/2 inch in lengths over 20 feet.
3. Plumb: Allowed deviation from vertical plane within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 1/2 inch in lengths over 20 feet.
4. Flat: Allowed deviation from flat plane in any planar direction within plus or minus 1/16 inch in one foot; plus or minus 1/8 inch in 10 feet; plus or minus 1/4 inch in 20 feet; and plus or minus 3/8 inch in lengths over 20 feet.
5. Tolerances are not accumulative.

1.6 QUALITY ASSURANCE

A. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

B. Monitor quality control over products, suppliers, manufacturers, services, site conditions, and workmanship to ensure Work complies with Contract Documents.

C. Comply with specified reference standards for minimum quality of Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

1.7 MANUFACTURER'S FIELD SERVICES AND REPORTS

A. Submit reports in accordance in accordance with Section 013300.

B. Submit qualifications of field observer 30 days in advance of required observations; observer is subject to approval of Architect.

C. When specified in individual Specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces, quality of workmanship, and conditions of installation as applicable, and to initiate instructions when necessary.

D. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

E. Submit reports within 7 days of observation. Distribute copies to Architect, Project site file, subcontractor, and other entities requiring information.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 014000

SECTION 014219 - REFERENCES

PART 1 - - GENERAL

1.1 SCHEDULE OF REFERENCES:

A. The following information is intended only for the general assistance of the Contractor, and the District does not represent that all of the information is current. It is the Contractor's responsibility to verify the correct information for each of the entities listed.

AA	The Aluminum Association 1400 Crystal Drive, Suite 430 Arlington, VA 22202 www.aluminum.org	703/358-2960
AABC	Associated Air Balance Council 2401 Pennsylvania Avenue NW, Suite 330 Washington, DC 20037 www.aabc.com	202/737-0202
AASHTO	American Association of State Highway and Transportation Officials 555 12th St. NW - Suite 1000 Washington, DC 20004 www.transportation.org	202/624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215Research Triangle Park, NC 27709-2215 www.aatcc.org	919/549-8141
ACA	American Coatings Association 901 New York Ave., NW, Suite 300 West Washington, DC 20001 www.paint.org	202/462-6272
ACI	American Concrete Institute 38800 Country Club Dr. Farmington Hills, MI 48331-3439 www.concrete.org	248/848-3800
ACPA	American Concrete Pipe Association 5605 N. MacArthur Blvd., Suite 340 Irving, TX 75038 www.concrete-pipe.org	972/506-7216

ADC	Air Duct Council 1901 N. Roselle Road, Suite 800 Schaumburg, IL 60195 www.flexibleduct.org	847/706-6750
AF&PA	American Forest and Paper Association 1101 K Street, NW, Suite 700 Washington, DC 20005 www.afandpa.org	202/463-2700
AGA	American Gas Association 400 North Capitol Street, NW, Suite 450 Washington, DC 20001 www.aga.org	202/824-7000
AGC	Associate General Contractors of America 2300 Wilson Blvd., Suite 300 Arlington, VA 22201 www.agc.org	703/548-3118
AHA	American Hardboard Association 1210 West Northwest Highway Palatine, IL 60067 http://domensino.com/AHA/default.htm	847/934-8800
AI	Asphalt Institute 2696 Research Park Drive Lexington, KY 40511-8480 www.asphaltinstitute.org	859/288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006-5292 www.aia.org	202/626-7300
AISC	American Institute of Steel Construction 130 East Randolph Street, Suite 2000 Chicago, IL 60601 www.aisc.org	312.670.2400
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW, Suite 800 Washington, DC 20001 www.steel.org	202/452-7100

AITC	American Institute of Timber Construction 1010 South 336th Street, #210 Federal Way, WA 98003-7394 https://www.plib.org/aitc/	253/835-3344
ALI	Associated Laboratories, Inc. P.O. Box 152837 Dallas, TX 75315 www.assoc-labs.com	214/565-0593
ALSC	American Lumber Standards Committee, Inc. 7470 New Technology Way, Suite F Frederick, MD 21703 www.alsc.org	301/972-1700
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, IL 60004 www.amca.org	847/394-0150
AMPP (formerly SSPC)	Association for Materials Protection and Performance (merger of Society for Protective Coatings and National Association of Corrosion Engineers International) (formerly Steel Structures Painting Council) 800 Trumbull Drive Pittsburgh, PA 15205 www.sspc.org	412/281-2331 877/281-7772
ANLA	AmericanHort (merger of American Nursery & Landscape Association and OFA – The Association of Horticultural Professionals) 2130 Stella Court Columbus, OH 43215 www.americanhort.org	614/487-1117
ANSI	American National Standards Institute 1899 L Street, NW, 11th Floor Washington, DC 20036 www.ansi.org	202/293-8020
APA	APA-The Engineered Wood Association 7011 S. 19th Street Tacoma, WA 98466-5333 www.apawood.org	253/565-6600

APA	Architectural Precast Association 325 John Knox Rd, Suite L-103 Tallahassee, FL 32303 www.archprecast.org	850/205-5637
APCIA	American Property Casualty Insurance Association (merger of American Insurance Association (formerly the National Board of Fire Underwriters) with the Property Casualty Insurers Association of America) 555 12th St, NW, Suite 550 Washington DC 20004 www.apci.org	202/828-7100
AHRI	Air Conditioning and Refrigeration Institute (now Air-Conditioning, Heating, & Refrigeration Institute) 2311 Wilson Blvd, Suite 400 Arlington, VA 22201 www.ahrinet.org	703/524-8800
ARMA	Asphalt Roofing Manufacturers Association 2331 Rock Spring Road Forest Hill, MD 21050 www.asphaltroofing.org	443/640-1075
ASA	The Acoustical Society of America Suite 300 1305 Walt Whitman Road Melville, NY 11747-4300 https://acousticalsociety.org/	516/576-2360
ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 www.asce.org	800/548-2723 703/295-6300
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 180 Technology Parkway Peachtree Corners, GA 30092 www.ashrae.org	800/527-4723 404/636-8400
ASLA	American Society of Landscape Architects 636 Eye Street, NW Washington, DC 20001-3736 www.asla.org	202/898-2444

ASME	American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990 www.asme.org	800/834-2763
ASPE	American Society of Plumbing Engineers 6400 Shafer Court, Suite 350 Rosemont, IL 60018 http://aspe.org	847/296-0002
ASQ	American Society for Quality P.O. Box 3005 Milwaukee, WI 53201-3005 or 600 North Plankinton Avenue Milwaukee, WI 53203 http://asq.org	800/248-1946 414/272-8575
ASSE	American Society of Sanitary Engineering 18927 Hickory Creek Dr., Suite 220 Mokena, IL 60448 www.asse-plumbing.org	708/995-3019
ASTM	ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken, PA, 19428-2959 www.astm.org	610/832-9500
AWCI	Association of the Wall and Ceiling Industry 513 West Broad Street, Suite 210 Falls Church, VA 22046 www.awci.org	703/538-1600
AWPA	American Wood Protection Association (formerly American Wood Preservers Institute) P.O. Box 361784 Birmingham, AL 35236-1784 www.awpa.com	205/733-4077
AWS	American Welding Society 8669 NW 36 Street, Suite 130 Miami, FL 33166 www.aws.org	800/443-9353 305/443-9353

AWI	Architectural Woodwork Institute 46179 Westlake Drive, Suite 120 Potomac Falls, VA 20165-5874 www.awinet.org	571/323-3636
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235 www.awwa.org	800/926-7337 303/794-7711
BHMA	Builders Hardware Manufacturers Association 355 Lexington Avenue, 15th Floor New York, NY 10017 www.buildershardware.com	212/297-2122
BIA	The Brick Industry Association 12007 Sunrise Valley Drive, Suite 430 Reston, VA 20191 www.gobrick.com	703/620-0010
CGA	Compressed Gas Association 8484 Westpark Drive, Suite 220 McLean, VA 22102 www.cganet.com	703/788-2700
CISCA	Ceilings & Interior Systems Construction Association 1010 Jorie Blvd, Suite 30 Oak Brook, IL 60523 www.cisca.org	630/584-1919
CISPI	Cast Iron Soil Pipe Institute 2401 Fieldcrest Dr. Mundelein, IL 60060 www.cispi.org	224/864-2910
CLFMI	Chain Link Fence Manufacturers Institute 10015 Old Columbia Road, Suite B-215 Columbia, MD 21046 chainlinkinfo.org	301/596-2583
CPA	Composite Panel Association 19465 Deerfield Avenue, Suite 306 Leesburg, VA 20176 www.compositepanel.org	703/724-1128

CPSC	Consumer Product Safety Commission 4330 East-West Highway Bethesda, MD 20814 www.cpsc.gov	800/638-2772
CRA	California Redwood Association 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 www.calredwood.org	925/935-1499
CRI	Carpet and Rug Institute 100 S. Hamilton Street Dalton, GA 30722-2048 www.carpet-rug.org	706/278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758 www.crsi.org	847/517-1200
CSI	The Construction Specifications Institute 123 North Pitt St, Suite 450 Alexandria, VA 22314 www.csinet.org	800/689-2900
CTIOA	Ceramic Tile Institute of America 12061 Jefferson Blvd. Culver City, CA 90230-6219 www.ctioa.org	310/574-7800
DHA	Decorative Hardwoods Association (formerly Hardwood Plywood & Veneer Association) 42777 Trade West Dr. Sterling, VA 20166 https://www.decorativehardwoods.org/	703/435-2900
DHI	Door and Hardware Institute (formerly National Builders Hardware Association) 2001 K Street NW, 3rd Floor North Washington, DC 20006 www.dhi.org	202/367-1134
DIPRA	Ductile Iron Pipe Research Association P.O. Box 190306 Birmingham, AL 35219 www.dipra.org	205/402-8700

DOC	U.S. Department of Commerce 1401 Constitution Ave., NW Washington, DC 20230 www.commerce.gov	202/482-2000
DOT	U.S. Department of Transportation 1200 New Jersey Avenue, SE Washington, DC 20590 www.dot.gov	855/368-4200
EJMA	Expansion Joint Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591 www.ejma.org	914/332-0040
EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 www.epa.gov	202/272-0167
FCICA	Floor Covering Installation Contractors Association 800 Roosevelt Rd., Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.fcica.com	630/672-3702
FGIA	Fenestration and Glazing Industry Alliance 1900 E Golf Rd, Suite 1250 Schaumburg, IL 60173 https://fgiaonline.org/	847/303-5664
FM Global	Factory Mutual Insurance Company Amy Daley Global Practice Leader – Education, Public Entities, Health Care FM Global 270 Central Avenue Johnston, RI 02919-4949 www.fmglobal.com	401/275-3000 401/275-3029
FS	General Services Administration (GSA) Index of Federal Specifications, Standards and Commercial Item Descriptions 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407 www.gsa.gov	202/619-8925

GA	The Gypsum Association 962 Wayne Ave., Suite 620 Silver Spring, MD 20910 www.gypsum.org	301/277-8686
HMA	Hardwood Manufacturers Association One Williamsburg Place, Suite 108 Warrendale, PA 15086 http://hmamembers.org	412/244-0440
IAPMO	International Association of Plumbing and Mechanical Officials (formerly the Western Plumbing Officials Association) 4755 E. Philadelphia St. Ontario, CA 91761 www.iapmo.org	909/472-4100
ICC	International Code Council 500 New Jersey Avenue, NW, 6th Floor Washington, DC 20001 www.iccsafe.org	888/422-7233
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212/419-7900
IES	Illuminating Engineering Society 120 Wall Street, Floor 17 New York, NY 10005-4001 www.ies.org	212/248-5000
ITRK	Intertek Testing Services 3933 US Route 11 Cortland, NY 13045 www.intertek.com	607/753-6711
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850 www.mcaa.org	301/869-5800
MMPA (formerly WMMPA)	Moulding & Millwork Producers Association (formerly Wood Moulding & Millwork Producers Association) 507 First Street Woodland, CA 95695 www.wmmpa.com	530/661-9591 800/550-7889

MSS	Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602 http://mss-hq.org	703/281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	630/942-6591
NAIMA	North American Insulation Manufacturers Association P.O. Box 1906 Alexandria, VA 22313 https://insulationinstitute.org/	703/684-0084
NALP	National Association of Landscape Professionals (formerly Professional Landcare Network) 12500 Fair Lakes Circle, Suite 200 Fairfax, VA 22033 https://www.landscapeprofessionals.org/	703/736-9666
NAPA	National Asphalt Pavement Association 6406 Ivy Lane, Suite 350 Greenbelt, MD 20770-1441 www.asphaltpavement.org	888/468-6499 301/731-4748
NCSPA	National Corrugated Steel Pipe Association 14070 Proton Road, Suite 100 Dallas, TX 75244 www.ncspa.org	972/850-1907
NCMA	National Concrete Masonry Association 13750 Sunrise Valley Drive Herndon, VA 20171-4662 www.ncma.org	703/713-1900
NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org	301/977-3698
NECA	National Electrical Contractors Association 1201 Pennsylvania Ave. NW Washington, D.C., 20004 www.necanet.org	202/991-6300

NEMA	National Electrical Manufacturers Association 1300 North 17th Street N, Suite 900 Rosslyn, VA 22209 www.nema.org	703/841-3200
NEII	National Elevator Industry, Inc. 5537 SW Urish Road Topeka, KS 66610 https://nationalelevatorindustry.org/	703/589-9985
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, MA02169-7471 www.nfpa.org	800/344-3555 855/274-8525
NGA (formerly GANA)	National Glass Association (merged with Glass Association of North America) 1945 Old Gallows Road Suite 750 Vienna, VA 22182 www.glass.org	866/342-5642 Ext 127
NHLA	National Hardwood Lumber Association PO Box 34518 Memphis, TN 38184 www.nhla.com	901/377-1818
NIA	National Insulation Association 516 Herndon Pkwy., Ste. D Herndon, VA 20170 www.insulation.org	703/464-6422
NRCA	National Roofing Contractors Association 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607 www.nrca.net	847/299-9070
NSF	NSF International 789 N. Dixboro Road Ann Arbor, MI 48113-0140 www.nsf.org	800/673-6275 734/769-8010
NSI	Natural Stone Institute (formerly Marble Institute of America) 380 E. Lorain St. Oberlin, OH 44074 https://www.naturalstoneinstitute.org/	440/250-9222

NTMA	National Terrazzo and Mosaic Association 209 N. Crockett Street, Suite 2 PO Box 2605 Fredericksburg, TX 78624 www.ntma.com	800/323-9736
OSHA	Occupational Safety and Health Act U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Ave., NW Washington, DC 20210 www.osha.gov	800/321-OSHA (6742)
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077 or 200 Massachusetts Ave NW, Suite 200 Washington, DC 20001 www.cement.org	847/966-6200 202/408-9494
PCA	Painting Contractors Association (formerly Painting and Decorating Contractors of America) 2316 Millpark Drive Maryland Heights, MO 63043 https://www.pcapainted.org/	800/322-7322
PCI	Precast/Prestressed Concrete Institute 8770 W. Bryn Mawr Ave., Suite 1150 Chicago, IL 60631 www.pci.org	312/786-0300
PDI	Plumbing & Drainage Institute 800 Turnpike Street, Suite 300 North Andover, MA 01845 http://pdionline.org	978/557-0720 800/589-8956
PEI	Porcelain Enamel Institute, Inc. P.O. Box 920220 Norcross, GA 30010 www.porcelainenamel.com	770/676-9366

PG&E	Pacific Gas & Electric Company P.O. Box 997300 Sacramento, CA 95899-7300 www.pge.com	800/743-5000
PLIB	Pacific Lumber Inspection Bureau (formerly West Coast Lumber Inspection Bureau) 1010 South 336th Street, Suite 210 Federal Way, WA 98003-7394 https://www.plib.org/	253/835-3344
RFCI	Resilient Floor Covering Institute 115 Broad Street, Suite 201 La Grange, GA 30240 www.rfci.com	706/882-3833
SDI	Steel Deck Institute P.O. Box 426 Glenshaw, PA 15116 www.sdi.org	412/487-3325
SDI	Steel Door Institute 30200 Detroit Road Westlake, OH 44145 www.steeldoor.org	440/899-0010
SJI	Steel Joist Institute 140 West Evans Street, Suite 203 Florence, SC 29501 http://steeljoist.org	843/407-4091
SMA	Stucco Manufacturers Association 5753 E Santa Ana Cyn Rd, #G-156 Anaheim, CA 92807 www.stuccomfgassoc.com	714/473-9579
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Drive Chantilly, VA 20151-1219 www.smacna.org	703/803-2980
SPI	SPI: The Plastics Industry Trade Association, Inc. 1425 K St. NW, Suite 500 Washington, DC 20005 www.plasticsindustry.org	202/974-5200

TCA	The Tile Council of North America 100 Clemson Research Blvd. Anderson, SC 29625 www.tcnatile.com	864/646-8453
TPI	Truss Plate Institute 2670 Crain Highway, Suite 203 Waldorf, MD 20601 www.tpinst.org	240/587-5582
TPI	Turfgrass Producers International 444 E. Roosevelt Road #346 Lombard, IL 60148 www.turfgrasssod.org	800/405-8873 847/649-5555
TCIA	Tree Care Industry Association (formerly the National Arborist Association) 670 N Commercial Street, Suite 201 Manchester, NH 03101 www.tcia.org	603/314-5380 800/733-2622
TVI	The Vermiculite Institute c/o The Schundler Company 10 Central Street Nahant, MA 01908 www.vermiculiteinstitute.org	732/287-2244
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847/272-8800 877/854-3577
UNI	Uni-Bell PVC Pipe Association 201 E. John Carpenter Freeway, Suite 750 Irving, TX 75062 www.uni-bell.org	972/243-3902
USDA	U.S. Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 www.usda.gov	202/720-2791

WA	Wallcoverings Association 35 E Wacker Dr., Suite 850 Chicago, IL 60601 www.wallcoverings.org	312/224-2574
WCMA	Window Covering Manufacturers Association 355 Lexington Avenue 15th Floor New York, NY 10017 www.wcmanet.org	212/297-2122
WDMA	Window & Door Manufacturers Association 2001 K Street NW, 3rd Floor North Washington, D.C. 20006 www.wdma.com	202/367-1157
WI	Woodwork Institute 1455 Response Road, Suite 110 Sacramento, CA 95815 www.wicnet.org	916/372-9943
WRI	Wire Reinforcement Institute 942 Main Street, Suite 300 Hartford, CT 06103 www.wirereinforcementinstitute.org	860/240-9545
WWCA	Western Wall & Ceiling Contractors Association 1910 N. Lime St. Orange, CA 92865 www.wwcca.org	714/221-5520
WWPA	Western Wood Products Association (formerly Redwood Inspection Service) 1500 SW First Ave., Suite 870 Portland, OR 97201 www.wwpa.org	503/224-3930

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 014219

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Comply with applicable laws and regulations of authorities having jurisdiction.

B. Obtain approval from authorities having jurisdiction for each temporary utility before use. Obtain required certifications and permits. Pay connection fees.

C. Construction Signs:
   1. Except for specified sign, no other construction signs will be allowed on site.
   2. Sign: Construct and install to withstand 70 mph wind velocity.
   3. Graphics Painter: Professional sign painter, minimum 2 years experience.
   4. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
   5. Permit: Obtain and pay for permit if required to display sign on Project site. Coordinate requirements with authorities having jurisdiction.

1.2 SCHEDULING

A. Prepare schedule indicating dates for implementation and termination of each temporary utility.

B. At earliest feasible time, when acceptable to Owner, change over from use of temporary utility service to use of permanent utility service.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for temporary facilities may be new or used suitable for intended purpose, but of adequate capacity for required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Water: Provide potable water approved by local health officials.

2.2 TEMPORARY FIELD OFFICES

A. Field Office:
   1. Structurally sound, weathertight, equipped with heating, air conditioning, ventilation system, electric power outlets, lighting, and telephone.
   2. Temporary Building: Portable or mobile buildings may be used. Floor raised above ground.

3. When permanent facilities are enclosed with operable utilities, relocate office into building upon written approval of Owner, and remove temporary building.
4. Size:
   a. As required for Contractor's operations.
   b. Provide space in field office for project meetings, with table and chairs to accommodate 6 people.
5. Equip with copier, high speed internet connection, and facsimile telecopier.

2.3 CONSTRUCTION AIDS

A. Provide scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, chutes, and other devices and equipment necessary to facilitate execution and construction contract administration of Work.

B. Provide cranes, hoists, rigging, material lifts, and other conveyances or apparatus as necessary to facilitate execution of Work.

C. Provide storage areas and sheds sized to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to requirements of Section 016000.

2.4 VEHICULAR ACCESS AND CONTROLS

A. Provide signs, signals, traffic cones and drums, flares and lights, and flag equipment of types required by authority having jurisdiction.

2.5 TEMPORARY BARRIERS AND ENCLOSURES

A. Partition performance requirements:
   1. Maximum flame spread index of 25 in accordance with ASTM E84.
   2. Insulate to "R" value of 11 at 75 degrees F mean temperature in accordance with ASTM C518.

B. Partition Framing Options:
   1. Lumber: Stud grade; fire-retardant treated in accordance with AWPA C20.
   2. Steel stud framing in accordance with ASTM C645.
   3. Provide FSC certified lumber.

C. Gypsum Board: ASTM C1396; Type X for fire-rated assemblies.

D. Plywood: PS-1; fire-retardant treated in accordance with AWPA C27.

E. Polyethylene: Fire-rated, reinforced, polyethylene sheet.

F. Doors:
   1. Non-fire-rated partitions: Wood or steel doors and frames.
   2. Hardware:
      a. Provide each door with hinges, lockset, closer, and dust-tight gasketing.
      b. Provide fire-rated hardware on doors in fire-rated partitions.

c. Construction masterkey locksets.

G. Temporary Fence:
1. Contractor Options:
a. Solid wood fencing:
1) Plywood: Exterior type PS-1, C-D Plugged, thickness as appropriate for framing requirements.
2) Framing: 4 by 4 inch treated posts and 2 by 4 inch rails, spaced to support plywood.
3) Paint: Exterior type in colors directed by Architect. Required at surfaces exposed to public view.
b. Open mesh fencing:
1) Fabric: Hot dip galvanized steel wire woven into 2 inch mesh.
2) Framing: Galvanized steel posts or roll-formed sections spaced to support fabric. Equip with top rail and bottom tension wire.
2. Equip with gates and locks.

2.6 CONSTRUCTION SIGN

A. Support Structure and Framing: Wood or metal, in sound condition structurally adequate and suitable for specified finish.

B. Sign Surfaces: New exterior grade plywood with medium density overlay, minimum 23/32 inch thick, sized to minimize joints.

C. Nails, Bolts, and Fasteners: Types and sizes as required, galvanized or corrosion resistant.

D. Primers and Paints: Exterior type, colors as selected by Architect, two coats consisting of an appropriate primer followed by one coat of paint for support structure, framing and sign surfaces.

E. Graphics: Design, sizes, colors, and styles of lettering as selected by Architect. Apply over painted background.

F. Sign: One painted assembly of not less than 32 ft^2 with painted graphics to include:
1. Title of Project.
2. Name of Owner.
3. Names and titles of Architect, Engineer, and Consultants.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, maintain, and operate temporary utilities and services to ensure continuous operation. Modify and extend systems as Work progresses.

B. Install temporary facilities and controls in manner to produce reasonable uniform appearance, structurally adequate for required purposes, and properly maintained.

C. Modify and relocate temporary facilities and controls as necessary to accommodate progress of Work.

3.2 TEMPORARY ELECTRIC POWER AND LIGHTING

A. Provide temporary electrical service required for power and lighting, arrange provisions with utility company, and pay costs for service and energy consumed. Equip service with meter, main disconnect, and over current protection.

B. Complement existing power service capacity and characteristics as required.

C. Provide electrical service sized to provide adequate temporary power and lighting for construction operations.

D. Provide branch distribution system from temporary power source with distribution boxes and outlets located so that power and lighting is available throughout active work areas.

E. Permanent receptacles may be utilized during construction.

F. Replace receptacle plates and wiring devices damaged during construction.

G. Provide lighting to conduct construction operations.

H. Permanent lighting system may be utilized during construction.

I. Restore permanent lighting systems used during construction to original condition. Maintain lighting and provide routine repairs.

3.3 TEMPORARY HEATING AND VENTILATING

A. Provide heating as necessary to protect materials, products, and finishes from damage due to temperature or humidity.

B. Provide temporary heating and ventilating system that complies with codes and regulations.

C. Except where indicated otherwise in individual Specification sections, maintain minimum ambient temperature of 50 degrees F in enclosed areas where construction is in progress.

D. Provide heating system as necessary to maintain specified conditions during construction.

E. Permanent heating plant may be utilized for source of temporary heat, extended and supplemented with temporary heating devices as required.

F. Provide and pay for costs of supervision, operation, maintenance, fuel, and energy consumed.

G. Mold Prevention: Provide heating and ventilation as necessary to keep mold growth products dry during construction operations until Substantial Completion.
   1. Heat and ventilate as required to dissipate excessive humidity.
   2. Heat and ventilate as required to properly cure and dry materials.

3. Heat and ventilate as required to dry wet areas and materials before installation of materials susceptible to moisture damage.
    a. Exception: Exterior skin of exterior enclosure assemblies.
    b. Use moisture meter to confirm that materials are sufficiently dry.
4. Remove products exhibiting mold growth from project site, whether built into project or stored on site.

H. Use of permanent heating/ventilating and associated distribution systems will be permitted only upon meeting following requirements:
1. Verify that installation is approved for operation, equipment is lubricated, and filters are in place.
2. Equipment installed complete with accessories, started-up, maintained, serviced, and operated in strict accordance with manufacturer's instructions.
3. Provide and pay for regular replacement of filters and worn or consumed parts.
4. Operation of permanent systems or any portion thereof to provide temporary heat/ventilation does not constitute acceptance of system or portion of system.
5. Immediately before Substantial Completion, completely clean each permanent unit used, install new filters, and perform service functions required for placing units in use and qualifying for specified warranties.

I. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

3.4 TEMPORARY WATER

A. Provide, maintain, and pay for water service required for construction operations.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

C. Wash Facilities: Supply with potable water for personnel to wash-up for sanitary condition. Dispose of drainage properly. Provide cleaning compounds appropriate for each condition.

3.5 TEMPORARY FIELD OFFICE

A. Provide temporary field offices at time of project mobilization. Maintain during progress of Work.

3.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain sanitary facilities and enclosures. Provide temporary facilities until such time that designated permanent facilities become available.

B. Restore permanent facilities used during construction to new condition. Replace damaged fixtures, partitions, and accessories.

3.7 TRAFFIC REGULATION

A. Construction Parking Control:

1. Provide temporary parking areas to accommodate construction personnel.
2. Control vehicular parking to prevent interference with public traffic, access by emergency vehicles, and Owner's operations.
3. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.
4. Prevent parking on or adjacent to access roads or non-designated areas.

B. Flagpersons: Provide trained and equipped flagpersons to regulate traffic when construction operations or traffic encroaches on public traffic lanes.

C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and guide traffic.

D. Access Roads and Approaches:
1. Construct and maintain temporary roads and approaches accessing public thoroughfares to serve construction area.
2. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow.
3. Provide and maintain access to fire hydrants free of obstructions.
4. Track-equipped vehicles not allowed on paved areas.
5. Designated existing on-site roads may be used for construction traffic.
6. Keep streets, drives, and walks adjacent to site and haul routes clean and free of dirt, debris, and litter caused by construction operations.

E. Haul Routes:
1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
2. Confine construction traffic to designated haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

F. Traffic Signs and Signals: Comply with requirements of authorities having jurisdiction.

3.8 TEMPORARY BARRIERS AND ENCLOSURES

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

C. Exterior Enclosures:
1. Provide temporary weathertight enclosure at exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in specification Sections, and to prevent entry of unauthorized persons.

2. Mold Prevention: Provide temporary weathertight exterior enclosures as required to keep mold growth products dry during construction operations. Refer to Section 014000 for definition of Mold Growth Products.
3. Provide access doors with operating hardware and locks.

D. Site Enclosure Fence:
1. Before construction operations begin, install enclosure fence with lockable entrance gates.
2. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations.
3. Provide minimum 6 foot high fence around construction site.
4. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
5. Adequately set fence posts to resist vandalism, wind loads, and construction operations.
6. Set fence posts in compacted mixture of gravel and earth or in concrete bases.
7. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.

3.9 TEMPORARY CONTROLS

A. Fire Protection:
1. Comply with local fire protection code and governing authorities.
2. Provide and maintain fire protection including, without limitation, fire extinguishers and other appropriate fire-fighting equipment ready for immediate use.
3. Distribute equipment around site, particularly in immediate vicinity of performance of welding or similar hazardous Work.
4. Store gasoline and other flammable liquids in Underwriter's Laboratories listed safety containers in conformance with recommendations of National Board of Fire Underwriters. Do not store gasoline or other flammable liquid within building.
5. Coordination with permanent fire protection systems:
   a. At earliest feasible date in each area of Project, complete installation of permanent fire protection system, including connected services, and place into operation and use.
   b. Instruct key construction personnel on use of systems.

B. Dust Control:
1. Execute Work by methods to minimize raising dust from construction operations.
2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

C. Erosion and Sediment Control:
1. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow, and from waste disposal areas. Prevent erosion and sedimentation.
2. Minimize amount of bare soil exposed at one time.
3. Provide temporary measures such as berms, dikes, silt fences, drains, and other soil and erosion control devices required by authorities having jurisdiction.
4. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

5. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

D. Water Control:
1. Provide methods to control surface water to prevent damage to site or adjoining properties.
2. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
3. Protect site from puddling or running water.
4. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

E. Security:
1. Provide security and facilities to protect Work from unauthorized entry, vandalism, and theft.
2. Conduct operations in manner to avoid risk of loss, theft, or damage by vandalism.

3.10 CONSTRUCTION SIGN

A. Install project identification sign within 30 days after commencement of construction.

B. Place at location designated by Architect.

C. Install assembly plumb and level, rigidly braced, framed, and anchored to resist wind load.

D. Maintain signs; repair deterioration and damage.

E. Remove signs, framing, supports, and foundations at completion of Project and restore area.

3.11 TEMPORARY USE OF PERMANENT SYSTEMS

A. When allowed by Specifications, certain items of new permanent systems (equipment) may be used prior to Substantial Completion.

B. Prior to operating permanent equipment, notify Architect in writing of intended usage. Verify equipment is approved for operation and equipment is lubricated and ready for operation. Arrange for, obtain, and pay for necessary approvals, manufacturer's acceptance, inspections, permits, and other provisions necessary for temporary use.

C. Provide and pay for operation, maintenance, and regular replacement of filters, and worn or consumed parts. Use of permanent equipment shall not affect the warranty which begins at Substantial Completion of Project.

3.12 REMOVAL, CLEANING, AND RESTORATION

A. Remove temporary above grade or buried utilities, equipment, facilities, controls, and materials prior to request for Substantial Completion.

B. Remove temporary paving that is not intended for or acceptable for integration into permanent paving.

C. In areas intended for landscaping, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in landscaped areas.

D. Remove materials contaminated with road oil, asphalt, or other compounds harmful to plant growth.

E. Repair or replace street paving, curbs, and sidewalks at temporary entrances as required by authorities having jurisdiction.

F. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

G. Clean and repair evidence or indication of installation or use of temporary Work.

H. Restore existing facilities and equipment used during construction to original condition. Restore permanent facilities and equipment used during construction to specified condition.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General product requirements.

1.2 BASIC PRODUCT REQUIREMENTS

A. Furnish like products from single manufacturer to greatest extent possible.

B. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and intended use and effect.

C. Product Identifications: Nameplates, trademarks, logos, and other identifying marks on products are not permitted on surfaces exposed to view in public areas, interior or exterior. Plumbing, mechanical, and electrical equipment not exposed to public view are excluded from foregoing limitation. Required testing laboratory labels (such as UL, FM, or WH) are also excluded from foregoing limitation.

1.3 PRODUCT OPTIONS

A. Products specified by reference standards: Select any product by any manufacturer which can be shown to comply to referenced documents. Evidence of compliance will be required at time of product data or shop drawing submittals.

B. Products specified by naming several products: Select any product named.

C. Acceptable Product: The term as used in these Specifications is to assist the user in locating the specified product and is not intended to denote sole source for product specified. The acceptable product listed denotes a typical product by one of listed acceptable manufacturers. Products by other listed manufacturers meeting or exceeding listed product or specified criteria may be used without following substitution procedures.

D. Products specified by naming one manufacturer’s model or performance criteria with reference to other acceptable or approved manufacturers: Products of other listed manufacturers must meet or exceed model number or criteria specified. Equivalent products by other listed manufacturers may be used without following substitution procedures.

E. Products specified by naming one product or indicating option of selecting equivalent products by stating “equivalent to,” “or other approved manufacturers,” or other similar language: Submit “Substitution Request Form” for any product not specifically named.

F. Products specified by naming only one product followed by “no substitutions,” or other similar language: There is no option.

1.4 PRODUCT DELIVERY REQUIREMENTS

A. Arrange deliveries in accordance with construction progress schedules. Schedule deliveries to allow adequate time for product inspection prior to installation. Schedule shall also take into consideration and allow adequate time for reordering of products damaged during delivery or do not meet Contract requirements.

B. Coordinate to avoid conflict with Work and conditions at site.

C. Deliver products in undamaged condition, in manufacturer's original unopened containers or packaging, with identifying labels intact and legible.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.5 PRODUCT STORAGE, AND HANDLING REQUIREMENTS

A. Storage:
1. Store and protect products in accordance with manufacturer's instructions with labels intact and legible.
2. Store environmentally sensitive products in weathertight, climate controlled enclosures.
3. Provide off site storage and protection when site does not permit on site storage.
4. Protect and cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
5. Arrange storage to permit access for inspection. Periodically inspect to ensure products are undamaged and are maintained under specified conditions.
6. Store loose granular materials on solid flat surfaces in well-drained area. Prevent contamination with other materials.

B. Handling:
1. Handle products in accordance with manufacturer's instructions.
2. Do not load structure during construction by storing products with load greater than structure is calculated to safely support.
3. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

C. Mold Prevention: Take precautions in delivery, handling, and storage of mold growth products to keep them dry until time of installation.
1. Refer to Section 014000 for definition of Mold Growth Products.
2. Only install clean and dry mold growth products.
3. Remove wet or dirty mold growth products from project site.

D. Do not use products in Work which have deteriorated, become damaged, or are otherwise unfit for use.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PRODUCT INSTALLATION

A. Refer to Section 017300 - Execution.

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes general administrative and procedural requirements governing execution of the Work, including but not limited to the following:
   1. Construction Layout.
   2. Installation of the Work.
   3. Protection of installed Construction.
   4. Correction of the Work.

1.2 WARRANTY

A. Existing Warranties: Removed, replace, patch and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

1.3 EXAMINATION OF CONDITIONS

A. Examine substrates and conditions under which Work is to be performed. Do not commence work over unsatisfactory conditions detrimental to proper and timely execution of Work.

B. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. Commencement of installation constitutes acceptance of conditions and cost of any corrective measures are responsibility of Contractor.

1.4 PREPARATION

A. Require compliance with manufacturer's printed installation instructions, including each step in sequence. Do not omit preparatory steps or installation procedures unless specifically modified or exempted by Contract Documents.

B. Maintain one set of complete instructions at Project site during installation and until completion.

C. Should Project conditions or specified requirements conflict with manufacturer's instructions, request clarification in writing from Architect before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner's Project Manager promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level and plumb, of every major element as the Work progresses.
   5. Notify Architect and Owner's Project Manager when deviations from required lines and levels exceed allowable tolerances.
   6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

3.2 INSTALLATION OF WORK

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Install, erect, connect, condition, use, adjust, and clean products in accordance with manufacturer's instructions and in conformity with specified requirements.

C. Install products at the time and under the conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Tools and Equipment: Do not use tools and equipment that produce harmful noise levels.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Verify and coordinate clearances, dimensions and installation of adjoining construction, equipment, piping, ducts, conduits, or other mechanical or electrical items or apparatus.

G. Prior to fabrication, field measure actual existing conditions to ensure proper fit.

H. Inspect each item of material or equipment immediately prior to installation. Reject damaged and defective items.

I. Recheck measurements and dimensions of Work, as an integral step of starting each installation. Whenever stock manufactured products are specified, verify actual space requirements for setting or placing into allotted space. No extra cost will be allowed for adjustment of Work to accommodate particular product.

J. Provide attachment and connection devices and methods for securing Work. Secure in place with devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

K. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

L. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

M. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

N. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

O. Allow for expansion of materials and building movement.

P. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration and electrolytic action.

Q. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components to ensure operability without damaging effects.

R. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.3 PROTECTION OF INSTALLED WORK

A. Protect installed Work in manner to prevent damage from subsequent construction operations.

B. Provide special protection where specified in individual Specification sections.

C. Provide temporary and removable materials for protection of installed products. Control activity in immediate work area to minimize damage.

D. Ensure materials, systems, and components will be without damage or deterioration at time of Substantial Completion.

E. Protect finished Work from damage, defacements, stains, scratches, and wear.

F. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

G. Protect finished floors, stairs, and other surfaces from traffic dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

H. Mold Prevention:
1. Provide protection to keep mold growth products dry during construction operations until time of Substantial Completion.
2. Provide temporary protection if permanent protection is not provided in timely manner by sequencing and scheduling of construction operations.

I. Remove or repair damaged items. Remove products exhibiting mold growth.

J. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

K. Prohibit traffic from lawn and landscaped areas.

3.4 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Recycling nonhazardous demolition and construction waste.
   2. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1.4 SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed, unless otherwise specified in ESDS requirements.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons (tonnes).
   4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).

5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. Qualification Data: For waste management coordinator and refrigerant recovery technician.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

J. Refrigerant Recovery: Comply with requirements in Section 024100 "Structure Demolition" for refrigerant recovery submittals.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements.

B. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024100 "Structure Demolition."

C. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

C. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

   1. Total quantity of waste.
   2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
   3. Total cost of disposal (with no waste management).
   4. Revenue from salvaged materials.
   5. Revenue from recycled materials.
   6. Savings in transportation and tipping fees by donating materials.
   7. Savings in transportation and tipping fees that are avoided.
   8. Handling and transportation costs. Include cost of collection containers for each type of waste.
   9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.
   1. Coordinate with ESDS for recycling: 6.03 – Diverting 75% Construction Waste. Provide plan and submit receipts.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
   2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.3 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
2. Crush concrete and screen to comply with requirements in Section 310000 "Earthwork" for use as satisfactory soil for fill or subbase.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 3/4-inch (19-mm) size.

    a. Crush masonry and screen to comply with requirements in Section 310000 "Earthwork" for use as general fill.
    b. Crush masonry and screen to comply with requirements in Section 329300 "Plants" for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

K. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

L. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

M. Conduit: Reduce conduit to straight lengths and store by material and size.

N. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements in Section 329300 "Plants" for use of clean ground gypsum board as inorganic soil amendment.

D. Paint: Seal containers and store by type.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner’s property.

C. Burning: Do not burn waste materials.

D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

END OF SECTION 017419

SECTION 017423 - FINAL CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes administrative and procedural requirements for Final Cleaning.

1.2 SUBMITTALS

A. Product Data: For each type of cleaning agent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

    1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.

q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 - Construction Waste Management and Disposal.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 - Execution before requesting inspection for determination of Substantial Completion.

END OF SECTION 017423

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Substantial Completion Procedures.
   2. Final Completion Procedures.

1.2 PREREQUISITES TO SUBSTANTIAL COMPLETION

A. Complete items in following paragraphs before requesting Certification of Substantial Completion, either for entire Work or for portions of Work.

B. Conduct inspection to substantiate basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or non-conforming work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

C. Submit statement showing accounting of changes to Contract Sum.

D. Advise Owner of pending insurance change-over requirements at final payment.

E. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.

F. Submit project record documents in compliance with Section 017700 – Closeout Procedures, maintenance manuals, digital images of construction photographs, and other similar final record data.

G. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.

H. Make final change-over of locks eliminating construction masterkey system and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.

I. Comply with requirements of Section 015000 – Temporary Facilities and Controls for restoring permanent systems operated prior to Substantial Completion.

J. Complete facility startup, testing, adjusting, and balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in Section 017823 – Operation and Maintenance Data.

K. Discontinue or change over and remove temporary facilities and services from Project site, along with construction tools, mock-ups, and similar elements.

L. Perform final cleaning in accordance with Section 017423 – Final Cleaning.

M. Touch-up and otherwise repair and restore marred exposed finishes.

1.3 SUBSTANTIAL COMPLETION REVIEW

A. When Contractor considers Work to be substantially complete, submit to Architect:
   1. Written certificate that Work, or designated portion, is substantially complete.
   2. List of items to be completed or corrected (initial punch list).

B. Within 7 days after receipt of request for Substantial Completion, Architect will make site review to determine whether Work or designated portion is substantially complete following procedures indicated in Conditions of the Contract.

C. Should Architect determine that Work is not substantially complete:
   1. Architect will promptly notify Contractor in writing, stating reasons for its opinion.
   2. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Architect.
   3. Architect will re-perform review of Work.

D. When Architect finds that Work is substantially complete, Architect will:
   1. Prepare Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Architect and Owner (final punch list). If Contractor fails to generate initial punch list, or if Architect adds more than 500 items to Contractor's list, or ten or more items per room on average, Owner will re-imburse Architect for time spent in adding to or generating list, and will deduct amount of compensation from payment to Contractor.
   2. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.

E. After Work is substantially complete, Contractor shall:
   1. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
   2. Complete work listed for completion or correction within time period stipulated.

1.4 PREREQUISITES FOR FINAL COMPLETION

A. Complete items in following paragraphs before requesting final acceptance and final payment. List known exceptions, if any, in request.

B. When Contractor considers Work to be complete, submit written certification that:
   1. Contract Documents have been reviewed.
   2. Work has been examined for compliance with Contract Documents.
   3. Work has been completed in accordance with Contract Documents.
   4. Work is completed and ready for final inspection.

C. Submit final punch list indicating all items have been completed or corrected.

D. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

E. Submit specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents in accordance with Section 017839 – Record Documents.

F. Submit updated accounting statement for final changes to Contract Sum.

G. Submit consent of surety to final payment.

H. Perform final cleaning for Contractor soiled areas in accordance with Section 017423 – Final Cleaning.

1.5 FINAL COMPLETION REVIEW

A. Within 7 days after receipt of request for final review, Architect will make site review to determine whether Work or designated portion is complete following procedures indicated in Conditions of the Contract.

B. Should Architect consider Work to be incomplete or defective:
1. Architect will promptly notify Contractor, in writing, listing incomplete or defective work.
2. Contractor shall take immediate steps to remedy stated deficiencies and send second written request to Architect that Work is complete.
3. Architect will reinspect Work.

1.6 REVISITS FOR SITE REVIEWS

A. Should Architect have to re-perform site reviews due to failure of Work to comply with claims of completion made by Contractor, Owner will reimburse Architect for such additional services and will deduct amount of compensation from final payment to Contractor.

1.7 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS

A. Submit Contractor’s affidavit of Payment of Debts and Claims on AIA Document G706.

B. Submit Contractor’s affidavit of Release of Liens on AIA Document G706A with:
1. Consent of Surety to Final Payment: AIA G707.
2. Contractor’s Release or Waiver of Liens.
3. Separate releases or waivers of liens from subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.

C. Execute submittals before delivery to Owner.

1.8 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit final statement of accounting to Architect.

B. Show adjustments to Contract Sum:
   1. Original Contract Sum.
   2. Additions and deductions resulting from:
      a. Previous Change Orders.
      b. Allowances.
      c. Unit Prices.
      d. Deductions for uncorrected Work.
      e. Deductions for inspection payments.
      f. Other adjustments.
   3. Total Contract Sum as adjusted.
   4. Previous payments.
   5. Retainage.
   6. Sum remaining due.

C. Architect will prepare final Change Order reflecting approved adjustments to Contract Sum which are not included in Change Orders previously processed.

1.9 FINAL APPLICATION FOR PAYMENT

A. Submit final Application for Payment in accordance with procedures and requirements stated in Conditions of the Contract.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 017700

SECTION 017823 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND PROVISIONS:

A. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:
   1. General Conditions, including, without limitation, Completion of the Work.
   2. Special Conditions.

1.2 QUALITY ASSURANCE:

A. Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.3 FORMAT:

A. Contractor shall prepare data in the form of an instructional manual entitled “OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS” (“Manual”).
   1. Printed Bound Copy
   2. Digital PDF Format

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS"; and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

1.4 CONTENTS, EACH VOLUME:

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, subconsultants, Subcontractor(s), and Contractor with

name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: Contractor shall include any and all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

1.5 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

F. Attic Stock: Provide a tabulated list in Owner’s preferred format of all attic stock.

1.6 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Panelboard Circuit Directories: Contractor shall provide electrical service characteristics, controls, and communications.

C. Contractor shall include color coded wiring diagrams as installed.

D. Operating Procedures: Contractor shall include start-up, break-in, and routine normal operating instructions and sequences. Contractor shall include regulation, control, stopping, shut-down, and emergency instructions. Contractor shall include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Contractor shall provide servicing and lubrication schedule, and list of lubricants required.

G. Contractor shall include manufacturer's printed operation and maintenance instructions.

H. Contractor shall include sequence of operation by controls manufacturer.

I. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Contractor shall provide control diagrams by controls manufacturer as installed.

K. Contractor shall provide Contractor's coordination drawings, with color coded piping diagrams as installed.

L. Contractor shall provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

O. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.7 SUBMITTAL:

A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor’s start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit two (2) copies of a complete Manual in final form prior to final Application for Payment. Copy will be returned with Architect/Engineer comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor’s final Application for Payment.

D. Contractor must submit two (2) copies of revised Manual in final form within ten (10) days after final inspection.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 017823

SECTION 017839 – RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS AND PROVISIONS:

A. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:
   1. General Conditions, including, without limitation, Documents on Work.
   2. Special Conditions.

1.2 RECORD DRAWINGS GENERAL

A. As indicated in the Contract Documents, the Architect will provide Contractor with one set of reproducible, full size original Contract Drawings.

B. Contractor shall maintain at each Project Site one set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings (“As-Builts”) showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit reproducible vellums at the conclusion of the Project following review of the blueline prints.

C. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

D. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI’s, and Addenda, shall be accurately and legibly recorded by Contractor.

E. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

1.3 RECORD DRAWING INFORMATION

A. Contractor shall record the following information:
   1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.
   2. Actual numbering of each electrical circuit to match panel schedule.
   3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.
   4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.
   5. Installed location of all cathodic protection anodes.

6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.
7. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.
8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy.
9. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

B. Contractor shall provide additional drawings as necessary for clarification.

C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked "No Exceptions Taken" or "Approved as Noted."

D. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide electronic copies of the drawings (in PDF format) with one file with all of the sheets and one set of individual sheet files at the conclusion of the Project.

1.4 RECORD SPECIFICATIONS

A. Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

B. After review and approval of the marked-up specifications by the Project Inspector, Contractor shall provide one electronic copy of the specifications (in PDF format) at the conclusion of the Project.

1.5 MAINTENANCE OF RECORD DOCUMENTS

A. Contractor shall store Record Documents apart from documents used for construction as follows:
1. Provide files and racks for storage of Record Documents.
2. Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Contractor shall not use Record Documents for construction purposes.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
1. All software-operated systems.
2. HVAC systems and equipment.
3. Plumbing equipment.
4. Electrical systems and equipment.
5. Conveying systems.
6. Landscape irrigation.
7. Door hardware.
8. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
2. Finishes, including flooring, wall finishes, ceiling finishes.
3. Fixtures and fittings.
4. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 017700 - Closeout Procedures: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 013300 - Submittal Procedures, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
1. Submit to Architect for transmittal to Owner.
2. Submit not less than four weeks prior to start of training.
3. Revise and resubmit until acceptable.
4. Provide an overall schedule showing all training sessions.
5. Include at least the following for each training session:
    a. Identification, date, time, and duration.
    b. Description of products and/or systems to be covered.
    c. Name of firm and person conducting training; include qualifications.
    d. Intended audience, such as job description.
    e. Objectives of training and suggested methods of ensuring adequate training.

f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
g. Media to be used, such a slides, hand-outs, etc.
h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
1. Format: DVD Disc.
2. Label each disc and container with session identification and date.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two-hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.

11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 017900

SECTION 018113 – SUSTAINABLE BUILDING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. To be eligible for grants or loans from the WA State Housing Trust Fund (HTF), a project must comply with all the mandatory (M) provisions of the Evergreen Sustainable Development Standard v4.0 (ESDS) criteria. In addition, new construction must earn 50 points from the Optional (O) Criteria. Applicable mandatory and optional criteria are outlined in the attached Evergreen Project Plan (EPP), Appendix 1.

B. To be eligible for programs from the WA State Housing Finance Commission (WSHFC) requirements for Low-Income Housing Tax Credits (LIHTC), a project must comply with all the mandatory (M) provisions of the Evergreen Sustainable Development Standard v4.0 (ESDS) criteria. In addition, new construction must earn 50 points from the Optional (O) Criteria. Applicable mandatory and optional criteria outlined in the attached EPP, Appendix 1.

1.2 SUMMARY

A. Section Includes
   1. Summary of sustainable building requirements for the project as necessary for certification of this project through HTF's ESDS v4.1 standard.
   2. Related performance and administrative requirements.
   3. Related sections:
      a. Section 013300 - Submittal Procedures.
      b. Section 017419 - Construction Waste Management.
      c. Section 012300 - Alternates.
      d. Section 012500 - Substitution Procedures.

1.3 REFERENCE STANDARDS

A. Evergreen Sustainable Development Criteria, Version v4.1 (ESDS).

B. South Coast Air Quality Management District SCAQMD Rule 1168 (10/6/2017).

C. California Air Resources Board (CARB) Phase 2.

D. California Department of Public Health Standard (CDPH) CA Section 01350 Method V1.1 2010.

E. California Department of Public Health Standard (CDPH) CA Section 01350 Method v1.2 2017.

F. Washington State Energy Code, current edition.

G. American Water Works Association (AWWA) C810-17 Standard.

1.4 SUSTAINABLE BUILDING REQUIREMENTS

A. Integrate sustainable building materials and methods into work as required to meet or exceed HTF's ESDS v4.1 standard certification level for new construction.

B. Satisfy mandatory and optional criteria applicable to Work of this Contract as outlined in the attached EPP, Appendix 1.

C. Implement a quality management system to ensure that all ESDS Mandatory (M) and pursued Optional (O) requirements are met in every unit, common area, and commercial space in the building. Non-compliances found during verification will result in root cause analysis, corrective work, re-inspections, and additional inspections at the Contractor's expense.

D. Coordinate with Evergreen Coordinator and/or Dept of Commerce Third Party Verifier (3PV) to schedule inspections and performance testing as may be required at the following stages of construction:
   1. Foundation prior to backfilling.
   2. Air-sealing/compartmentalization details at framing of early levels, and prior to insulation.
   3. Thermal Enclosure Inspection prior to drywall installation.
   4. Final inspection at substantial completion.
   5. Various stages where draw inspections by third-party verifiers are needed.

E. Submit documentation that demonstrates this performance.

F. Participate as necessary to complete the ESDS certification application.

G. Conform to documentation requirements for Environmental Project Plan (EPP) and onsite/online ESDS Binder maintenance as required for ESDS certification.

H. Refer to Contract Documents for incorporated sustainable/environmental requirements and provisions.

I. Substitutions: Conform to provisions of Section 016000 – Product Requirements.

1.5 CONTRACTOR REQUIREMENTS

A. Coordinate and assist with documentation for ESDS compliance verification.

B. Designate an ESDS representative, responsible for:
   1. Implementing, coordinating, and documenting specified ESDS requirements.
   2. Coordinating ESDS third-party verification (inspection) visits.
   3. Establishing and maintaining the Evergreen Binder, making it available to third party verifiers.
   4. Attending ESDS-related meetings during construction; and
   5. Being present on-site during times that ESDS-related work is in progress.

C. Submit ESDS information and Final Submittal in electronic format to the Evergreen Coordinator for verification in preparation for review by Washington State Commerce Department (Commerce).

D. Maintain a copy of the ESDS v4.1 updated 2/18, at project site construction office (hard copy or digital).

E. Maintain a copy of the ESDS Binder at the project site and/or online in digital format that is readily available to those having ESDS scope, including the 3PVand Evergreen Coordinator.

F. Arrange, conduct, and participate in ESDS review meetings as needed or requested.

G. Combine with project meetings or at other times as directed by Architect.

H. Maintain a smoke-free building as per ESDS 7.17. Enforce smoke-free policy throughout construction. (Division 01.)

1.6 SUBMITTAL PREREQUISITES

A. Conform to following as required for ESDS documentation of Contractor-responsible ESDS credits.

B. Submit ESDS documentation to Evergreen Coordinator and Architect for review.

C. Within fourteen days after receipt of Notice of Award and prior to any waste removal by Contractor from project, develop and submit to Owner and Evergreen Coordinator for review of:
   1. Construction Waste Management Plan: Refer to Section 017419 - Construction Waste Management and Disposal.

D. Preliminary Submittals:
   1. Confirm compliance as required to achieve ESDS credits at start of project by submitting preliminary submittals to the Architect within 120 days of start of construction.

E. Progress Report Submittals:
   1. Confirm compliance for ESDS credits at least every two months, as specified under Submittals, by submitting a progress report to the Architect that includes updated submittals.
   2. Submit new Progress Report with each Application for Payment.

F. Final Submittals:
   1. Submit final submittals within 30 days of Substantial Completion. For listed products, include complete product and supplier contact information.

1.7 SUBMITTALS

A. Submit the following in conformance to Section 013300 – Submittal Procedures.

1.8 INTEGRATIVE PROCESS

A. ESDS 1.01c: Construction Management - Implement a construction team education plan to ensure that those working on-site fully understand their responsibilities in achieving the project objectives. Information in the education plan must include (at a minimum):
   1. A summary of the results of the Project Priorities Survey (Criterion 1.01a).
   2. A summary of the sustainability goals and/or objectives detailed in the IDP.
   3. Responsibilities of each part in regard to the performance expected of the building (energy and water usage) and site.
   4. Details of scope of any commissioning, verification and performance testing, including construction milestones at which such inspections/test will be performed.

1.9 LOCATION AND NEIGHBORHOOD FABRIC

A. No special requirements related to Project Manual.

1.10 SITE IMPROVEMENTS

A. ESDS 3.02a: Landscaping (M) – 50% of plants installed in modified landscape must be native or adaptive, non-invasive, and appropriate to their location. Submit a planting schedule illustrating compliance to this requirement.

B. ESDS 3.02b: Advanced Landscaping (O) – 90% of plants installed in modified landscape must be native or climate-adaptive, non-invasive, and appropriate to their location. Submit a planting schedule illustrating compliance to this requirement.

C. ESDS 3.03: Efficient Irrigation (M) - Install an efficient irrigation system and Submit documentation illustrating compliance to this requirement.

D. ESDS 3.04: Storm Drain Labels (M) – Label all storm drains or storm inlets to clearly indicate where the drain or inlet leads. Submit a documentation or attestation letter for the architect illustrating compliance to this requirement.

1.11 WATER CONSERVATION

A. ESDS 4.01a: Water-Conserving Fixtures (M) – Prior to installing fixtures per plumbing schedule. Submit documentation illustrating compliance with ESDS requirements. See Part 2 Products 2.2 A. below for product requirements.

B. ESDS 4.01b: Advanced Water-Conserving Fixtures (O)– Prior to installing fixtures per plumbing schedule. Submit documentation illustrating compliance with ESDS requirements See Para 2.2 B. below for product requirements.

C. ESDS 4.03b: Lead Service Lines in New Buildings – Determine whether a lead service line (LSL) connects the drinking water main under the street with the existing building. If LSL is present, replace it before or while replacing the water heater. Include documentation of the replacement of any LSL’s.

D. ESDS 4.04a: Water metering (O)– Submit documentation or attestation letter illustrating compliance to this section.

E. ESDS 4.06: Efficient Plumbing Layout and Design (O)– Comply with the plumbing layout drawings and pipe sizes as specified for each trunk and fixture branch to limit water stored between hot water source (or recirc distribution) and furthest fixture to no more than .5 gallons. Submit documentation, drawings, or other details illustrating compliance to stored hot water volume limits.

1.12 ENERGY EFFICIENCY

A. ESDS 5.02a Additional Efficiency (O) – Submit cutsheets for all elements installed, marked to clearly display which credits they support, how they comply, and/or how they contribute.

B. ESDS 5.03: Energy Star Appliances (M) – Submit cutsheets/documentation for all appliances illustrating EnergyStar rating.

C. ESDS 5.04: Central Laundry (O) – Submit cutsheets/documentation for all appliances illustrating EnergyStar rating.

D. ESDS 5.07a: Photovoltaic Ready (M) – Submit cutsheets/documentation for all conduit and any equipment installed under this section.

E. ESDS 5.08a: Domestic Water Heating – Higher Efficiency (M) - Submit cut sheets/documentation for all equipment installed under this section.

1.13 MATERIALS BENEFICIAL TO THE ENVIRONMENT

A. ESDS 6.01a: Healthier Material Selection (M) – Submit cutsheets/documentation containing a compliance declaration demonstrating compliance with the requirements of this section and outlined in section 2 Products, 2.4 Material A. Table 6.01a for the following products:
   1. Wet-applied interior paints coatings and primers.
   2. Wet-applied interior adhesives and sealants.
   3. Sheet wall covering.
   4. Flooring products including fluid applied finish floors.
   5. Insulation: cavity and spray foam (framed floors, walls, attics, etc.).
   6. Composite wood.

B. ESDS 6.04: Reduced Heat Island Effect: Roofing (O) – Submit cutsheets or documentation that clearly states the certified Solar Reflective Index (SRI) values for materials used. See Section 2. Products, Para 2.1, A, 1. below for product requirements.

1.14 HEALTHY LIVING ENVIRONMENT

A. ESDS 7.01: Combustion Equipment (M) –Submit spec or cut sheets for the selected heaters. Ensure that the required performance characteristics are clearly marked/noted.

B. ESDS 7.03: Integrated Pest Management (M) – Provide photo documentation of the installation of screens on openings greater than ¼ inch in diameter and cut sheets of caulking or other sealants that clearly display (or are marked) they are certified non-toxic. Provide a draft of the IPM that includes the required elements listed.

C. ESDS 7.04: Lead-Safe Work Practices (M) – Submit documentation that the relevant contractor or contractors are at minimum Renovation, Repair and Painting certified.

D. ESDS 7.07a: Exhaust Fans (M) – Kitchen: Submit cut sheets for fans to be installed that clearly indicate they are ENERGY STAR certified.

E. ESDS 7.08a: Ventilation (M) –Submit cut sheets of all applicable fans, showing Energy Star qualifications, and/or relevant HVI ratings.

F. ESDS 7.09: Clothes Dryer Exhaust (M) – Clothes dryers must be exhausted directly to the outdoors using rigid-type ductwork. Provide photo documentation of the required installation.

G. ESDS 7.10: Mold Prevention: Surfaces (M) - Submit product cut sheets that show compliance with cleanable, durable product surface requirements. See Part 2 Products 2.5 Gypsum Wallboard A. below for product requirements.

H. ESDS 7.11: Mold Prevention: Tub and Shower Enclosures (M) – Submit as specified, both enclosures and interior sheathing behind. Submit product cut sheets. See Part 2 Products 2.5 Gypsum Wallboard B. below for product requirements.

I. ESDS 7.12: Vapor Barrier Strategies (M) – Submit product cut sheets that show product compliance.

J. ESDS 7.13: Enhanced Building Envelope Design (O):
   1. Option #1 – Water and Moisture Inspection Plan: Include copies of the results of periodic reviews.
   2. Option #2 – Full-Size Mockups of all envelope penetrations: Include photo documentation of all mockups.
   3. Option #3 – Water Penetration Resistance Testing of Windows: Include copies of the laboratory or consultant reports.

1.15 OPERATIONS AND MANAGEMENT

A. ESDS 8.01a: Building Maintenance Manual– Sustainability Supplement (M) – Submit documentation for building maintenance manual to include specifications, operations & maintenance schedules, and replacement guidance for:
   1. HRVs/ERVs.
   2. Renewable energy systems (e.g. solar photovoltaics, solar water heating, ground source heating, microgrid)
   3. Lighting equipment.
   4. Landscaping and hardscaping, including any specific instructions for community gardens or growing spaces and any restrictions regarding pesticides and/or chemical fertilizers.

5. Any other specialized systems.

B. ESDS 8.01b: O&M Instruction for Maintenance Staff -Submit documentation and support training of building maintenance staff.

1.16 DEFINITIONS

A. Sustainable Building: Building materials and methods that promote environmental quality, economic vitality, and social benefit through sustainable construction of built environment. Sometimes called “green building” or “environmentally-friendly” construction.

B. ESDS (Evergreen Sustainable Development Standard): Green building standard required by the Washington State Department of Commerce applying to projects receiving qualifying funds.

C. Evergreen Advocate: The employee of the project sponsor organization tasked with ensuring that the Evergreen Project Plan is implemented. This person will remain attached to the project at least through the initial period of its operation and is responsible for the hand-off of all relevant material to the project’s property manager. This is a senior management level position, on the asset management side, who has executive responsibility for making sure ESDS is properly implemented in the project.

D. Evergreen Coordinator: Person(s) designated to Submit oversight of ESDS related work for the purpose of facilitating compliance with ESDS requirements.

E. Evergreen Binder: Contains the documents necessary for the third-party verifier to complete their on-site review of the ESDS elements of the project. The Evergreen Binder is required to be on the job site, as well as complete and up to date throughout construction. The Evergreen Binder consists of the Contracts Document Table, the EPP, and any necessary attachments.

F. Evergreen Project Plan (EPP): A Commerce-approved outline of the ESDS compliance approach explaining the intended methods of compliance.

G. Third-Party Verifier: Person(s) designated by the Washington State Department of Commerce to conduct on-site inspections and verify compliance at regular intervals, typically as part of a draw inspection, throughout the construction process.

H. Post-Consumer Recycled Content: Percentage of waste material by weight available from consumer waste that has been used as a raw material (feedstock) in building material.

I. Pre-Consumer Recycled Content: Percentage of waste material by weight available from industrial use incorporated into a building material. Pre-consumer recyclable materials are different from industrial scrap, a by-product of industrial processes that can be easily reused as a feedstock. Industrial scrap is not counted as recycled content.

J. Solar Reflectance Index (SRI): A measure of the roof's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100.

K. Definitions of Other Terms Related to Individual ESDS requirements: See Evergreen Sustainable Development Standard version4.0, updated 01/2021.

1.17 COORDINATION

A. Coordinate framers, plumbers, HVAC, insulators, and drywall trades to minimize uncontrolled air leakage pathways between residential units by sealing all penetrations in walls, ceilings, and floors in the units and by sealing vertical chases adjacent to the units.

B. Coordinate with Evergreen Coordinator and Third-Party Verifiers to ensure inspections and performance tests are performed at appropriate times without delaying construction progress. Primary milestones are at pre-drywall and at substantial completion, though additional inspections may be required.

PART 2 - PRODUCTS

2.1 REFLECTIVE MATERIALS

A. ESDS 6.04a/b: Reduced Heat-Island Effect:
1. For roofing and when indicated on plans, products should have:
a. A minimum three-year-aged SRI of 64 for roofs with a slope of less than or equal to 2:12.
b. A minimum three-year-aged SRI of 25 for roofs with a slope of more than 2:12.

2.2 PLUMBING FIXTURES

A. ESDS 4.01b: Advanced Water-Conserving Fixtures (O) –Use WaterSense labeled toilets, showerheads, and bathroom faucets, and water-conserving kitchen faucets in all units and all common space facilities with the following specifications:
1. Toilets- 1.1 GPF or less, or a toilet with dual flush, one of the options being less than 1 GPF, WaterSense labeled with a MaP test performance at minimum 500g.
2. Showerheads- 1.5 GPM or less, WaterSense labeled.
3. Bathroom faucets- 1 GPM or less, WaterSense labeled.
4. Kitchen faucets- 1.75 GPM or less.

2.3 ENERGY EFFICIENCY

A. ESDS 5.03: Energy Star Appliances (M) –
1. Clothes Washers: Specify ENERGYSTAR certified models.
2. Dish Washers: Specify ENERGYSTAR certified models.
3. Refrigerators: Specify ENERGYSTAR certified models.
4. Kitchen exhaust fans or range hoods: Specify ENERGYSTAR certified models.
a. Exemption: Microwaves with integrated range hoods do not need to be EnergyStar certified. However, the exhaust fan must still vent to the exterior.

B. ESDS 5.04: Central Laundry (O) –
1. Clothes Washers: Specify ENERGYSTAR certified models.

2.4 MATERIALS (SITE APPLIED MATERIALS WITHIN THE WEATHER RESISTIVE BARRIER ONLY)

A. ESDS 6.01a Healthier Material Selection: Use products that comply with the specifications below.

Table 6.01a Healthier Material Selection Mandatory Requirements:

Product Category	Mandatory
wet-applied interior paints, coatings, primers*	All products must have been tested and found compliant with the California Department of Public Health Standard (CDPH) Method V1.1 (2010), using CA Section 01350, for school or residential exposure scenarios. (Compliance with v1.2 (2017) is also acceptable). Certification by UL GreenGuard Gold, or SCS Indoor Advantage Gold are evidence of compliance; credible laboratory test reports are also acceptable.
Sheet wall coverings (wallpaper, etc.)	All sheet wall coverings must be phthalate-free. Do not install wall coverings containing PVC/Vinyl
Interior adhesives and sealants	All adhesives and sealants must have VOC content less than or equal to the thresholds provided by the SCAQMD Rule 1168 (dated 10/6/2017).
Flooring	All flooring products (whether carpet or hard surface) must have been tested and found compliant with the California Department of Public Health Standard (CDPH) Method V1.1 (2010), using CA Section 01350, for school or residential exposure scenarios. (Compliance with v1.2 (2017) is also acceptable). Certification by CRI-Green Label Plus (for carpet and carpet pad) or FloorScore (for resilient floor) are evidence of compliance; credible laboratory test reports are also acceptable. Exception: Flooring products that are an inherently non-emitting source of VOCs (stone, ceramic, concrete, clay brick, and unfinished or untreated solid wood) and have no binders, surface coatings, or sealants that include organic chemicals.
Insulation	Cavity insulation, including spray foam (framed floors, walls, attics, etc.) must have been tested and found compliant with the California Department of Public Health Standard (CDPH) Method V1.1 (2010), using CA Section 01350, for school or residential exposure scenarios. (Compliance with v1.2 (2017) is also acceptable). Certification by UL GreenGuard Gold, or SCS Indoor Advantage Gold are evidence of compliance; credible laboratory test reports are also acceptable. If two-part spray polyurethane foam insulation is to be used, both of the following apply: 1. HFC blowing agents must not be used** 2. Your Construction Management Plan (see Criterion 1.01c) must cover all appropriate OSHA approved safety and health measures related to installation – including respirators, PPE, and work area controls.
Composite Wood	Formaldehyde emissions less than or equal to the thresholds provided by CARB Phase 2 and/or TSCA Title IV for plywood, particleboard, MDF, and these materials within other products like cabinets and doors.

*Wet applied within, and not a part of, the weather resistive barrier (“WRB”)
**HFC blowing agents are prohibited in WA as of January 1, 2021 by Chapter 70A.45.080 RCW

B. ESDS 7.07a: Exhaust Fans (M) – Kitchen exhaust fan or range hood should be ENERGY STAR-qualified (microwave/range hoods combo units are exempt).

C. ESDS 7.08a: Ventilation (M) – Exhaust fans, other than HRV/ERVs, whether installed as part of a balanced ventilation system, or as spot exhaust (including range hoods), must be ENERGY STAR qualified.

D. ESDS 7.12: Vapor Barrier Strategies (M) – Use 8-mil minimum thickness cross-laminated polyethylene on the crawl floor, extended at least 12 inches up on piers and foundation walls, and with joints overlapping at least 12 inches.

E. ESDS 7.12: Vapor Barrier Strategies (M) – Use 8-mil minimum thickness cross-laminated polyethylene on the crawl floor, extended at least 12 inches up on piers and foundation walls, and with joints overlapping at least 12 inches.

2.5 GYPSUM WALLBOARD

A. ESDS 7.10: Mold Prevention: Surfaces (M) - Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens, and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion or encourage the growth of mold. Do not use mold-propagating materials such as vinyl wallpaper and unsealed grout.

B. ESDS 7.11: Mold Prevention: Tub and Shower Enclosures (M) – Submit as specified, both enclosures and interior sheathing.
   1. Behind tiled/grouted or multi-piece shower and tub enclosures:
      a. Use moisture-resistant backing materials such as cement board, fiberglass-faced gypsum board or equivalent behind tiled/grouted or multi-piece shower and tub enclosures.
   2. Behind one-piece fiberglass/plastic shower/tub enclosures:
      a. For all walls and ceiling facing the shower, use one of the following:
         1) Non-paper faced backer board.
         2) Paper-faced gypsum backer board that meets mold-resistant requirements per ASTM #D3273 with a score of at least 10.
         3) Plywood with an appropriate D3273-compliant coating.

2.6 ENTRY DOORS

A. All exterior doors and doors into units (whether from corridor or exterior) must be fully weather-stripped, gasketed, and have an air/smoke control door sweep installed that effectively closes the gap between door and floor or threshold.

PART 3 - EXECUTION

3.1 ESDS COMPLIANCE – GENERAL

A. Meet ESDS mandatory and optional criteria identified in the Points Claimed column of Figure 1 EPP, at end of this Section, as required for achieve ESDS Compliance.

B. Prior to beginning work of this contract, verify construction conditions as acceptable to achieve ESDS optional and mandatory requirements.

C. Do not proceed with work until unsatisfactory conditions are corrected in a manner acceptable to the Evergreen Coordinator, Owner, and Architect.

D. Correct non-conforming work failing to meet ESDS requirements at Contractor's expense.

E. Submit documentation as necessary to show conformance of corrected work.

F. Evergreen Coordinator will assist project team to interpret and meet ESDS credit requirements.

G. Commerce will be the sole judge in determining conformance to ESDS requirements.

H. ESDS 2.12a: Access to Broadband: Broadband Ready(M) - Build property to incorporate broadband infrastructure. Include network of mini-ducts or conduits throughout the building, extending from the expected communications access point to each network termination point in the building.
   1. Include:
      a. Conduit from the property line (expected broadband access point) to the utility room.
      b. Conduit from the utility room through risers and/or other infrastructure and leads to the expected network termination points in each dwelling unit and common space.

3.2 PLUMBING

A. ESDS 4.06 Efficient Plumbing Layout & Design (O) To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the hot water source (tank or recirculation trunk) and any hot water fixture. 0.5 gallons of water represents the following maximum pipe runs from the hot water source (tank or recirculation loop) for different pipe materials and nominal sizes.

Table: Maximum Pipe Run lengths, in feet, per material and diameter (in inches).

Pipe Material	3/8"	½"	¾"	1"
K copper	75	45	22	12
L copper	60	40	20	12
M copper	60	40	18	11
CPVC	NA	50	24	15
PEX	95	50	26	16

3.3 WATER METERING

A. ESDS 4.04a: Water metering –
   1. Meter or sub-meter each dwelling unit with a technology capable of tracking water use.
      a. Note: For multifamily projects with riser-fed systems, install a water meter or sub-meter for each of the project's risers rather than for each of the project's dwelling units.
   2. Separately meter outdoor water consumption (deduct meter). Require the vendor to provide documentation of accuracy.

3.4 ENERGY EFFICIENCY

A. ESDS 5.02a Additional Efficiency (O) – Implement efficiency measures that result in energy savings beyond what is required by Code. This can be done through the credit method, referring to WSEC Table C406.1 as appropriate, or through the performance-based method.

B. ESDS 5.07a: Photovoltaic Ready (M) – Integrate features to accommodate installation of photovoltaic (PV) system in the future by demonstrating compliance with the 2018 edition of the Washington State Energy Code, Section C411.

C. ESDS 5.08a/b: Domestic Water Heating (M) Install water heaters which, in addition to meeting the minimum code requirements published in the Washington State Energy Code, do not use oil or propane as an energy source.

3.5 MOISTURE CONTROL AND VENTILATION

A. ESDS 6.01a: Healthier Material Selection (M) – No carpet may be installed within 3 feet of building entryways that are accessible from the ground, or in wet locations such as laundry rooms, bathrooms, kitchens/ kitchenettes, or utility rooms.
   1. Exceptions:
      a. Outdoor-grade carpet tile may be installed within 3 feet of building entryways, but not in other “wet” locations.
      b. No carpet may be installed on slab-on-grade floors. (see exemption for New Construction).
      c. Fluid applied finish floors may only be installed in non-occupied spaces, such as mechanical rooms or garages.

B. ESDS 7.01: Combustion Equipment (M) – If using fossil fuel fired water heaters, specify direct power vented or sealed combustion appliances when the heater is located in a conditioned space. Refer to requirements in 2018 WSEC.

C. ESDS 7.02: Garage Isolation (M) Requirements:
   1. Provide a continuous air barrier between the conditioned (living) space and any attached garage space to prevent the infiltration of any contaminants. Common walls and ceilings between attached garages and living spaces must be visually inspected to ensure that they are air-sealed before insulation is installed.
   2. Do not install ductwork or air handling equipment in a garage, except in the case of equipment installed to provide ventilation specifically for the garage.
   3. All connecting doors between living and garage spaces must be fixed with gaskets or otherwise made substantially airtight with weather stripping.

D. ESDS 7.09: Clothes Dryer Exhaust (M) – Clothes dryers must be exhausted directly to the outdoors using rigid-type ductwork (from the connection point to the exterior exhaust), except for condensing and heat pump dryers, which must be plumbed to a drain. Do not vent to attic or crawl space.

E. ESDS 7.08a: Exhaust Fans (M) – Bathroom Install ENERGY STAR-qualified exhaust fan, as specified, with delay timer, occupancy sensor or humidistat, or continuously operating.

F. ESDS 7.08a: Ventilation (M) Meet Washington State Amendments to the International Mechanical Code Section 403 or International Residential Code Section M1505, as applicable. Balanced ventilation system energy use shall meet the fan power and air flow limits in the Washington State Energy Code, Section R403 or C403

G. ESDS 7.12: Vapor Barrier Strategies (M):
   1. Beneath Concrete Slabs, Including Basements:
      a. Submit vapor barriers under all slabs at conditioned spaces.
      b. Install a capillary break as follows:
         1) Install a 4-inch layer of ½-inch diameter or greater clean aggregate.
         2) Immediately above the capillary break, install polyethylene sheeting with a minimum thickness of 6 mil, overlapped at least 6 inches at the seams to serve as a vapor retarder in direct contact with the slab above.
   2. Beneath Crawl Spaces:
      a. Install 8-mil minimum thickness cross-laminated polyethylene on the crawl floor, extended at least 12 inches up on piers and foundation walls, and with joints overlapping at least 12 inches. (The 8-mil polyethylene and the cross-lamination ensure longevity of the poly.)
      b. Line the likely “high-traffic” areas of the crawl space with foam board, so the polyethylene beneath will not be disturbed.

H. ESDS 7.13: Enhanced Building Envelope Design (O):
   1. Option 1: Prepare a water and moisture plan that Submits, at minimum, for documented independent periodic review of the building enclosure by project architect or building envelope consultant, during construction to ascertain whether construction has been performed in substantial compliance with the building enclosure design documents.
   2. Option 2 : Provide full-size mock-ups of all envelope penetrations, reviewed by the architect or independent building envelope consultant, and made available for reference on the construction site throughout the construction period.
   3. Option 3: Provide water penetration resistance testing of a representative sample of windows and window assembly installations, conducted according to industry standards. The construction review and testing protocols shall be carried out by an independent testing laboratory or qualified building envelope consultant.

3.6 PEST CONTROL

A. ESDS 7.03: Integrated Pest Management (M) – Provide the following physical barriers to pest intrusion.
   1. Requirements:
      a. Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate non-toxic sealing methods.
      b. Install rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh or rigid metal cloth) on all openings greater than ¼ inch in diameter.

3.7 DOCUMENTS INSTRUCTIONS AND PRODUCT LITERATURE

A. ESDS 8.01a: Building Maintenance Manual –Sustainability Supplement (M) – Submit documentation, product cutsheets, instructions and/or literature to owner for the purpose of drafting a building maintenance manual.

B. ESDS 8.01b: O&M Instruction for Maintenance Staff – (O) Submit documentation and support training of building maintenance staff.

C. ESDS 8.02: Emergency Management Plan (M) – Submit documentation of, and operation instructions to emergency management systems to building owner/management.

D. ESDS 8.03: Resident Manual and Orientation (M) - Submit documentation for in-unit equipment for tenant operation to owner for the purpose of a maintenance manual.

E. ESDS 8.04: Project Data Collection – (O) Verify that utility metering is installed and fully functional.

F. ESDS 8.05: Educational Signage (O) – Submit and install per construction documents.

G. ESDS 8.06: ESDS Certification Plaque (O) – Provide a space in a highly visible location (e.g. main building entry/foyer, project entry sign) for a (minimum 8.5” by 11”) plaque certifying ESDS compliance to include the Department of Commerce logo and the text “Certified ESDS Compliant.”

3.8 GENERAL ESDS COMMISIONING REQUIREMENTS

A. ESDS: 5.01a Building Performance – Commissioning (M)
   1. Plan and conduct performance testing or a commissioning process that meets the minimum requirements of the 2018 Washington State Energy Code. The following systems should be included in commissioning scope:
      a. Air Barriers (per WSEC R402.4.1.2)
      b. Ducts (per WSEC R403.3.3)
      c. Ventilation system, including Whole House and Local Exhaust (see WAC 51-52.0403, sections 403.4.6.6 and 403.4.7). See ESDS Criterion 7.08 for additional information regarding sample size.
      d. Any equipment containing refrigerant (e.g., ductless heat pumps).
      e. testing must minimally include refrigerant piping leakage, refrigerant charge.
      f. installation of exterior grade piping insulation, and operation in both cooling and heating modes.
      g. Domestic Hot Water.
   2. Where a commissioning requirement is determined by installed capacity, the threshold shall be considered as the aggregate of all elements.
   3. When commissioning includes at least 20 multiple pieces of repetitive, identical equipment other than life safety equipment (e.g. heaters, plumbing fixtures, lighting sensors on the same schedules), the functional tests may be limited to a representative sample. The sample shall cover at least 15% of each group of similar equipment, but no fewer than 8.

4. If any of the sampled equipment fails any portion of the functional test, then all remaining units must be tested for at least the feature or component that failed. In this case, the contractor shall test and document all remaining units on their own and then the representative sample may be repeated with the commissioning professional back-checking a different 15% group.

END OF SECTION 018113

SECTION 024100 –STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of buildings or structures.
   2. Demolition and removal of selected site elements.
   3. Disconnecting, capping or sealing, and removing site utilities.

1.2 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off-site.

B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

C. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled, as indicated in Shoring drawings.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities, indicate the following:
   1. Detailed sequence of demolition work, with starting and ending dates for each activity to comply with requirements in Section 013200 - Construction Progress Documents.
   2. Coordinate for shutoff, capping of utility service.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 – General Requirements.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Owner assumes no responsibility for buildings and structures to be demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, drives, or other facilities used by occupants of adjacent buildings.
a. Do not close or obstruct walkways, exits, drives, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies. Contact all utility companies, including but not limited to the following: Electric, Gas, Water, Telephone, Storm Sewer, And Sanitary sewer for field location of all underground and overhead utility lines.
      a. Note: Side sewer capping per City of Seattle requirements and inspections.
   2. Prior to commencement of any demolition work, identify all electrical circuits servicing the area involved with demolition. Circuits shall be locked out and tagged out if they do not service any of the remaining building. Circuits which are identified to service both the area to be demolished and the remaining building shall be split so as to kill all electrical power to the area to be demolished while maintaining power to the remainder of the building.
   3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways during demolition operations.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished. Comply with requirements of shoring design.
1. Strengthen or add new supports when required during progress of demolition.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 SELECTIVE DEMOLITION, GENERAL

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Explosives: Use of explosives is not permitted.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist or other device that will convey debris to grade level in a controlled descent.
4. Comply with LEED v4 requirements for disposal of demolished materials.

B. Burning: Do not burn demolished materials on-site.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024100

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Columns.
   5. Elevated floor slabs of unbonded post-tensioned concrete.
   6. Stormwater detention vault.
      a. Steps for vault access.

B. Related Sections:
   1. 033500 – Concrete Finishes for Sealed Concrete Floor Finishes
   2. 033800 - Post Tensioned Concrete

1.2 EVERGREEN (ESDS) AND ENTERPRISE (EGC) SUSTAINABLE DESIGN REQUIREMENTS

A. Credit 6.4 (EGC 6.7): Use “Environmentally Preferable Materials”.

   1. Local Materials (see Section 018113 for definition)]: Provide cement and aggregate for concrete qualifying as local.
      a. Documentation: Product data for local materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each local material and the fraction by weight that is considered local.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

   1. Do not use photocopies or reproductions of Contract Drawings.

D. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications (revels), construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

1. Drawings shall be prepared by or under the supervision of a professional engineer licensed in the State of Washington detailing fabrication, assembly, and support of formwork.

2. Design and engineering of formwork are the responsibility of the Contractor.

1.4 QUALITY ASSURANCE

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
4. ACI SP-66-04, "ACI Detailing Manual."

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

B. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Refer to Structural Drawings

2.3 CONCRETE MATERIALS

A. Refer to Structural Drawings for materials and mix requirements.
1. Portland Cement: ASTM C150, Type I/II
2. Normal-Weight Aggregate: ASTM C 33, uniformly graded.
3. Water: Complying with ASTM C 1602.
a. Non-potable sources of water and that come from concrete production shall be tested before first used and thereafter at frequencies listed for tests in Table 1 and 2 of ASTM C 1602.
4. Fly ash: ASTM C 618, Class F
a. Provide 20 percent fly ash content for concrete used for foundations.
b. Not more than 3 percent of cementitious material for interior floor slab.

B. Refer to Sections 033500 – Concrete Finishes for additional requirements for sealed floors.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

2.5 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete.

1. Products: Subject to compliance with requirements, provide the following:
    a. Cetco Waterstop RX:
        1) RX-101 (3” Min Coverage)
        2) RX-101T (3” Min Coverage)
        3) RC-102 (2” Min Coverage)
    b. De-neef Swellseal Waterstop:
        1) WA (3” Min Coverage)
        2) Swellseal-Joint (3-3/4” Min Coverage)
        3) Swellseal-2010 (4” Min Coverage)

B. Accessories:
1. Adhesive: Cetco Cetseal Waterstop Adhesive or De-neef equivalent.
2. Hilti Concrete Fasteners (where necessary to prevent displacement with concrete pour).

2.6 STORMWATER VAULT STEPS

A. Steps: Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.

2.7 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class B, 1/4 inch for rough-formed finished surfaces.

C. Chamfer exterior corners and edges of permanently exposed concrete unless shown otherwise in the architectural drawings.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 WATERSTOPS

A. Install waterstops of type appropriate for cover at all control and construction joints where exposure exists for water intrusion, should the water migrate beyond primary waterproofing protection.

B. Comply with manufacturer’s recommendations for installation and protection until concrete placement.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 TENDON INSTALLATION

A. Install tendons according to installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

B. Refer to Structural Drawings for additional requirements.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. Hot-Weather Placement: Comply with ACI 301.

3.8 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view,

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

END OF SECTION

SECTION 033500 – CONCRETE FINISHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete Sealer.
   2. Standard concrete finishing.

1.2 REFERENCES

A. American Concrete Institute (ACI): ACI 302.1R - Guide for Concrete Floor and Slab Construction.

B. American National Standards Institute (ANSI): Standards B-101.1/2009.

C. ASTM International (ASTM):
   1. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   2. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete.
   3. ASTM C 779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

D. National Floor Safety Institute (NFSI): NFSI Test Method 101-A - Standard for Evaluating High-Traction Flooring Materials.

1.3 SUBMITTALS

A. Product Data: Submit product data, including manufacturer's data sheet for specified products.
   1. Material Safety Data Sheets (MSDS).

B. Shop Drawings:
   1. Flooring Shop Drawings: Indicate information on shop drawings as follows:
      a. Plan view of floor and joint pattern layout.
      b. Hardener, sealer, densifier identified in notes.
   2. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly and support of formwork.
      a. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal and installing and removing reshoring.
   3. Joints: Show proposed location of construction joints, expansion/contraction joints and control joints and obtain approval from Architect prior to construction.

C. Quality Assurance Submittals:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in Performance Requirements.

2. Certificates:
   a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions.

D. Warranty: Submit warranty documents specified.

E. Operation and Maintenance Data: Submit operation and maintenance data for installed products.
1. Manufacturer's instructions on maintenance renewal of applied treatments.
2. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
1. Manufacturer capable of providing field service representation during construction and approving application method.
2. Manufacturer shall have a minimum 5 years of experience in manufacturing components similar to or exceeding requirements of project.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
1. Obtain cement and aggregates from a single source for specialty concrete finishes to provide uniformity in appearance and color.

C. Mock-Up: Provide in place sample for approval. Approved mock-up may remain.
1. Expansion/contraction joint and control joint: 4 inch long.
2. When accepted, mock-up will demonstrate minimum standard of quality required for this work.

D. Pre-installation Meetings: Conduct a pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Review the following:
1. Environmental requirements.
2. Scheduling and phasing of work.
3. Coordinating with other work and personnel. Remind all trades that they are working on a surface that is to become a finished surface.
4. Protection of adjacent surfaces.
5. Surface preparation.
6. Repair of defects and defective work prior to installation.
7. Cleaning.
8. Protection of finished surfaces after installation.
9. Placing of materials on the concrete surface that may cause staining, etching or scratching.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Store materials at the site off the ground and in a manner to prevent damage to the materials.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Protect Concrete Slab:
1. Protect from petroleum stains during construction.
2. Diaper hydraulic power equipment.
3. Restrict vehicular parking.
4. Restrict use of pipe cutting machinery.
5. Restrict placement of reinforcing steel on slab.
6. Restrict use of acids or acidic detergents on slab.

C. Waste Management and Disposal:
1. Separate waste materials for Reuse and Recycling in accordance with Section 017419 – Construction Waste Management and Disposal.
2. Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.7 PROJECT AMBIENT CONDITIONS

A. Installation Location: Comply with manufacturer's written recommendations.

1.8 SEQUENCING

A. Sequence with Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.9 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Refer to Structural Drawings for concrete materials, mixing, curing, joint compound, grout and reinforcement.

2.2 ACCESSORIES

A. Sealing Compound: ASTM C309, Type I, Class B, dissipating, non-yellowing product.
   1. Acceptable Products:
      a. MBCC - Sika; MasterKure CC 160 WB.
      b. Dayton Superior Corporation; Cure and Seal 309 J18.
      c. Euclid Chemical Company (The), an RPM company; Aqua-Cure VOX.
      d. Laticrete; L & M Dress & Seal WB 25.

B. Sealing/Densifying Compound: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens and densifies concrete surfaces.
   1. Acceptable Products:
      a. CureCrete; Ashford Formula.
      b. Laticrete; L & M Seal Hard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:
   1. Verify that concrete substrate conditions, which have been previously installed under other sections are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Verify Concrete Slab Performance requirements:
   1. Verify concrete is cured to 28 day duration and 3500 psi strength.
   2. Verify overall floor flatness is a minimum of Ff 40.

3.2 PREPARATION

A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.

3.3 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
   1. Exterior Building Exposed to view Surfaces: Class A Finish. Smooth form finish per ACI 5.3.3.3.b. Tie holes, voids and honeycombed areas are to be patched. All fins are to be removed. A smooth rubbed finish per ACI 301-5.3.3.a or grout cleaned finish per ACI 301-5.3.3.4.b is to be provided. Exception: Surfaces specifically called out to receive a coating or architectural finish.

a. Exterior walls, planters, stairs, stem and rail walls: Class B Finish. Grind large offsets, fins and other irregularities, patch voids, offsets and irregularities, patch major voids, rock pockets, honeycombs and tie holes. Small bug holes to remain unpatched.

2. Interior formed cast-in-place, Exposed to view Surfaces: Class A Finish. De-fin only, no patching or sacking. Fill all holes larger than 1/4" in diameter.
3. Walls and columns in common core areas: Class B Finish (grind large offsets, fins and other irregularities, patch voids, offsets and irregularities, patch major voids, rock pockets, honeycombs and tie holes. Small bug holes to remain unpatched.
4. Interior Stairwells: Class C Finish. Knock off major fins, offsets and irregularities, patch major voids, rock pockets, honeycombs. Tie holes to remain unpatched.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
a. For surfaces to be covered with carpet: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
b. For all surfaces not otherwise indicated: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
3. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
a. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

E. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer’s written instructions.

1. Apply 2 coats if recommended by manufacturer, allowing first coat to dry before applying second coat.

3.4 FINISHING WALL SURFACES

A. Sack and Patch Concrete Finish:
   1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
   2. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
   3. Maintain required patterns or variances as shown on Drawings or to match field sample panels.

3.5 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

3.6 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

3.7 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer’s written instructions.
   1. Defer joint filling until concrete has aged a minimum of 30 days.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install joint filler per manufacturer’s recommendations. Overfill joint and trim joint filler flush with top of joint after hardening.

3.8 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas concealed from view. Do not patch, repair or replace exposed architectural concrete except upon written direction of Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Concealed Locations: Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension. Remove defective concrete to a depth of 3/4-inch to 1-inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Surfaces exposed to view: Repair defects by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Surfaces that affect concrete's durability and structural performance: Repair defects upon direction of Architect and Structural Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place

patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.9 PROTECTION

A. Protect finished surfaces from stains or abrasions. Protect surfaces or edges by leaving forms in place or by providing temporary covers. Protect concrete from rain, flowing water or mechanical injury.

B. Protect floor slabs from the droppings of plaster, paint, dirt, and other marring by covering with polyethylene plastic sheet, well lapped and sealed. Provide a continuous covering of 1/2 inch particle board, joints tightly butted and cut to sizes tight to wall construction, over entire floor area over polyethylene plastic sheet.

3.10 CLEANING

A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION 033500

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Polished concrete finishing.
   2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 - Cast-in-Place Concrete.

B. Related Requirements:
   1. Section 033000 - Cast-in-Place Concrete, for concrete not designated as polished concrete.

1.2 DEFINITIONS

A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Cast-in-place concrete subcontractor.
      e. Polished concrete finishing Subcontractor.
   2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Laboratory Test Reports: For liquid floor treatments, indicating compliance with requirements for low-emitting materials.

C. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

D. Samples for Initial Selection: For each type of product requiring color selection.

E. Samples for Verification: For each type of exposed color.

F. Qualification Data: For Installer.

G. Material Certificates: For each of the following, signed by manufacturers:
   1. Repair materials.
   2. Liquid floor treatments.

1.5 QUALITY ASSURANCE

A. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
   1. Locate panels as indicated or, if not indicated, as directed by Architect.
   2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
   3. Demolish and remove field sample panels when directed.

B. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Demonstrate curing, finishing, and protecting of polished concrete.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
   1. Moxie International: Moxie Shield 1500.
   2. NewLook International: Nanoset Densifier NS.
   3. Or approved equal.

4. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 POLISHING

A. Polish: Level 2: Low sheen, 400 grit. Match design reference sample.

B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
   1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
   2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
   3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
   4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
   5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
   6. Control and dispose of waste products produced by grinding and polishing operations.
   7. Neutralize and clean polished floor surfaces.

END OF SECTION 033543

SECTION 033800 – POST-TENSIONED CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes all labor, material, equipment and related services necessary to furnish and install all post-tensioned steel indicated on the drawings or specified herein.

B. Related Sections:
1. 033000 - Cast-in-Place Concrete

1.2 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. ACI 347, "Recommended Practice for Concrete Formwork."

B. American Society for Testing and Materials (ASTM):
1. ASTM A416, "Specification for Uncoated Seven-Wire Stress-Relieved Strand for Pre-Stressed Concrete," including supplement, "Low Relaxation Strand."
2. ASTM E328, "Recommended Practice for Stress-Relaxation Tests for Materials and Structures."
3. ASTM A615, "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement."

C. American Welding Society (AWS):

1. AWS D1.1, "Structural Welding Code-Steel."

2. AWS D1.4, "Structural Welding Code-Reinforcing Steel."

D. Concrete Reinforcing Steel Institute (CRSI):
1. CRSI MSP-2, "Manual of Standard Practice."

E. Post-Tensioning Institute (PTI):
1. PTI, "Guide Specifications for Post-Tensioning Materials."
2. PTI, "Performance Specification for Corrosion Preventative Coating."
3. SP-15, Field Reference Manual
4. PTI, "Specification for Unbonded Single-Strand Tendons."

F. International Code Council (ICC):

1. IBC, "International Building Code."

1.3 DEFINITIONS

A. Tendon: The complete assembly consisting of anchorage and prestressing steel with sheathing. The tendon imparts prestressing forces to the concrete.

B. Anchorage: The means by which the prestressing force is permanently transmitted from the prestressing steel to the concrete.

C. Prestressing Steel: That element of a post-tensioning tendon which is elongated and anchored to provide the necessary prestressing force.

D. Sheathing: Enclosure around the prestressing steel.

E. Coating: Material used to protect against corrosion and lubricate the prestressing steel.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Section 013300. Convene a pre-installation conference 2 weeks prior to commencing work in this section. The owner, city, contractor, architect, engineer, and inspector shall attend. Shop drawings shall be reviewed and approved by the Engineer, Architect, and Authority Having Jurisdiction (AHJ), prior to the pre-installation meeting.

B. Product Data: Product data indicating specifications, sizes, and materials used shall be provided for prestressing steel, anchorages, sheathing, couplings, accessories, and water-tight tape.

C. Shop Drawings: Shop drawings shall be provided for Architect's/Structural Engineer's review. Shop drawings shall include the following:

D. Post-Tensioned Concrete: Include the following, prepared by or under the supervision of a qualified professional engineer licensed in the State of Washington, detailing tendon layout and installation procedures:
1. Installation drawings including plans, elevations, sections, and details.
2. Numbers, arrangement, and designation of post-tensioning tendons.
3. Tendon profiles and method of tendon support including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points, with their associated heights.
4. Tendon anchorage details including bundled tendon flaring.
5. Tendon clearances around slab openings and penetrations.
6. Construction joint locations, pour sequence, locations of anchorages and blockouts required for stressing.
7. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
8. Calculated elongations for each tendon.
9. Details for horizontal curvature around openings and at anchorages.
10. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.

11. Locations of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to, the following:
    a. Support bars.
    b. Backup bars and hairpins at anchorages.
    c. Hairpins at locations of horizontal curvature.
    d. Supplemental reinforcement at blockouts.
12. Refer to the Structural Drawings for additional requirements. comply with PTI specification section 7.4, "stressing records" as well as City of Seattle Department of Construction and Inspection Rule 14-2014.
13. Include Structural Engineer's seal on shop drawings which incorporate changes to the design indicated on the Contract Drawings.

E. Calculations: Calculations shall be prepared under the supervision of a structural engineer registered in the State of Washington, showing. losses due to anchorage, seating, elastic shortening, creep, shrinkage, relaxation, friction and wobble, used to determine the effective prestress force and anchor reinforcing. Shop drawings and calculations shall both be sealed by a registered structural engineer. The post-tensioned slabs are designed based on the tendons being continuous between edges of slabs as shown on the Drawings. Any additional intermediate stressing joints or closure strips required by the Contractor will require additional reinforcement in accordance with the Drawings and shall be described in detail in the calculations and shop drawings. The shop drawings shall be submitted prior to commencing fabrication and/or installation of any post-tensioning material.

F. Experience Record: Post-tensioning experience record of contractor who is to perform post-tensioning work, demonstrating compliance with the "Installer" paragraph below.

G. Marking: Marking method in accordance with the "Marking" paragraph below.

H. Test Reports: Certified Mill Test Reports for each coil or pack of strand containing, as a minimum, following test information:
1. Heat number and identification.
2. Standard chemical analysis for heat of steel.
3. Ultimate tensile strength.
4. Yield strength at 1% extension.
5. Elongation at failure.
6. Modulus of elasticity.
7. Diameter and net area of strand.
8. Certification that the type of material is low relaxation.
9. Certified Test Reports confirming the post-tensioning system anchorage meets or exceeds the minimum test requirements of PTI.
10. Evidence that the proposed post-tensioning system anchorage has been successfully used on projects of similar magnitude.
11. Relaxation losses for low relaxation type material shall be based on relaxation tests of representative samples for a period of 1000 hours, when tested at 70 degrees F and stressed initially to not less than 70% of minimum guaranteed breaking strength of strand. Tests shall be in accordance with ASTM E328, and ASTM A416.
12. Evidence of satisfactory performance on similar projects in United States of America, if strand is manufactured outside the USA.

I. Stressing Records: Submit stressing records to the engineer for approval prior to cutting of tendon tails. Stressing records shall provide the information specified in paragraph "Stressing Records" below. See Quality Assurance section for additional requirements.

J. Record Documents: Provide documents which accurately show field placed location of tendons accurate to +/- 1 inch.

1.5 QUALITY ASSURANCE

A. Qualifications: All post-tensioned concrete work shall be under the immediate control of a superintendent employed by the Prime Contractor with experience in this type of work. Superintendent shall exercise close check and rigid control of all operations as necessary for full compliance with the Contract Documents.

B. Installer: The post-tensioning work shall be performed by a single Contractor which specializes in engineering, installation, and stressing of post-tensioned concrete systems and that has successfully performed five previous installations similar to the one in this project. The post-tensioning Contractor shall supply and install the post-tensioning system. The post-tensioning Contractor shall employ a superintendent who has had five years experience and technical knowledge using the post-tensioning supplied and who will oversee all field handling, placement and stressing.

C. Quality Assurance:
1. The post-tensioning system shall be an unbonded system and shall conform to requirements of ACI 301, ACI 318, CRSI MSP-2, and PTI "Specification for Unbonded Single-Strand Tendons," except where more stringent requirements are shown on Drawings or specified in this Section.
2. Welder and welding procedures shall conform to requirements as AWS D1.1 and AWS D1.4. Except where shown on Drawings, welding is prohibited unless accepted in writing by Architect.

D. Flat Slab Penetrations:
1. Fastener lengths for attachment of miscellaneous items: 7/8-inch maximum at slabs.
2. X-ray surveying of coring locations in post-tensioned flat slabs may be performed by testing and inspection agency or by another testing agency under contractor’s direction. Surveying costs shall be paid by trades requesting the coring.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Furnish concrete materials, nonprestressed reinforcing members, and formwork as specified in Section 033000.

B. Mix and proportion concrete as indicated in the General Structural Notes in the Structural Drawings.

2.2 PRESTRESSING STEEL

A. Prestressing steel shall be 1/2-inch diameter, seven-wire strand, low-relaxation tendons for prestressed concrete manufactured in accordance with ASTM A416, Grade 270 and shall have a minimum ultimate strength of 41,300 pounds.

1. See structural drawings for sizes of post-tensioned members, and dimensions.

2. The structural drawings indicate the minimum number of prestressing strands and minimum final effective forces required. The post-tensioning Contractor shall verify that his system will achieve these requirements. See "Submittals" Section for additional information.

B. Low relaxation strand shall be provided with mill supplied continuous permanent physical marking to permit field identification or verification that proposed supplier has adequate safeguards to insure that only low relaxation strand is furnished.

C. The material shall be packaged at the source in a manner which prevents physical damage to the strand during transportation and protects the material from deleterious corrosion during transit and storage.

1. Tendons shall be stored in weatherproof enclosures at the job site to ensure that the tendons remain dry until they are placed in the formwork. Tendons shall be shipped in weathertight enclosures, such as enclosed semi-trailers. Tendons shall not be exposed to any moisture from the time they are manufactured until the time that concrete is placed around them.

2.3 ANCHORAGES AND COUPLINGS

A. The anchorages shall develop at least 95% of the actual ultimate strength of the prestressing steel, without exceeding anticipated set. The actual strength of the prestressing steel shall not be less than specified by applicable ASTM Standard, and shall be determined by tests of representative samples of the tendon material in conformance with ASTM Standards. The anchorage shall be so arranged that the prestressing force of the tendon may be verified prior to removal of the stressing equipment.

B. Castings shall be non-porous and free of sand, blow holes, voids, and other defects.

C. The post-tensioning system anchorage shall be specifically suited for unbonded tendons. Anchorages shall provide a watertight, fully encapsulated, connection of the tendon sheathing to the anchorage or coupling with watertight closures and with additional requirements as noted in the structural drawings.

D. Bearing Stresses: The average bearing stresses on the concrete created by the anchorage plates shall not exceed the values allowed by ACI 318 or PTI Guide Specification.

E. All post-tensioning system stressing anchorages shall be capable of lift-off, detensioning or retensioning a tendon at any time.

F. Additional reinforcement required in the local anchorage zone due to the post-tensioning force shall be part of the post-tensioning system anchorage.

G. Bearing surfaces shall be perpendicular to and concentric with the tendons and the line of action of the tensioning force.

2.4 SHEATHING

A. Materials: Tendon sheathing shall be virgin polyethylene formed by a continuous extrusion process and shall be of sufficient strength to withstand damage during fabrication, installation and tensioning. Include a compatible dye coloring to render it opaque. Tendons shall be marked and color coded for individual zones of construction.

B. Thickness: Waterproof polyethylene sheathing shall be a minimum thickness of 0.040 inches (40 mils) except where noted on the Drawings.

C. Watertightness: Sheathing shall be connected to all anchorages in a manner that makes it watertight at every place along its length.

D. Damage: Any damaged sheathing shall be repaired with compatible waterproof polyethylene tape specifically intended for that purpose. Extensive damage shall be cause for rejection.

E. Details of Construction: Sheathing shall have an inside diameter at least 0.010 inches larger than the maximum diameter of the strand. Sheathing shall be smooth and solid.

F. Non-reactive: Sheathing shall be non-reactive with concrete, steel, and the tendons corrosion preventative coating.

2.5 TENDON COATING

A. Materials: The prestressing steel for unbonded tendons shall be permanently protected against corrosive conditions with a specially compounded, corrosion-inhibiting and lubricating grease meeting PTI recommendations.

B. Application: The grease coating shall be applied under pressure to ensure the filling of the interstices between the individual wires of the strand.

C. The corrosion preventive coating material shall have the following properties:
1. Provide corrosion protection to the prestressing steel.
2. Provide lubrication between the strand and the sheathing.
3. Resist flow from the sheathing within the anticipated temperature range of exposure.
4. Provide a continuous nonbrittle film at the lowest anticipated temperature of exposure.
5. Be chemically stable and nonreactive with the prestressing steel, the sheathing material, and the concrete.

D. Coating: The coating film shall be an organic coating with appropriate polar, moisture displacing, and corrosion preventive additives.

E. Weight: Minimum weight of coating material on the prestressing strand shall be not less than 2.5 pounds of coating material per 100 feet of 0.5 inch diameter strand, and 3.0 pounds of coating material per 100 feet of 0.6 inch diameter strand. The amount of coating material used shall be sufficient to ensure complete filling of the annular space between the strand and the sheathing.

2.6 ULTIMATE STRENGTH

A. Ultimate strength for unbonded tendons shall not be taken greater than the ultimate capacity of the anchorages or couplings when they are located at critical sections under ultimate load.

2.7 ACCESSORIES

A. Tendons shall be supported by typing to conventional reinforcing and/or standard reinforcing steel accessories, as recommended by the post-tensioning material supplier.

B. If standard reinforcing steel accessories are recommended, they shall meet the requirements contained in Section 033000.

2.8 FABRICATION

A. Post-tensioning tendons shall be manufactured in accordance with detailed shop drawings approved by the Engineer.

B. Post-tensioning tendons shall be of the non-fixed length type to allow for possible form adjustments in the event field conditions generate unscheduled increase or decrease in member length. Two feet minimum additional length shall be provided at each end of each tendon.

C. All prestressing steel shall be satisfactorily protected from rust of other corrosion prior to placement. Sufficient protection shall also be provided for exposed prestressing steel at the ends of members to prevent deterioration by corrosion.

PART 3 - EXECUTION

3.1 PLACING REINFORCING AND TENDONS

A. Placement of mild steel reinforcement shall be coordinated with placement of post-tensioning tendons. Tendons shall not be displaced to clear reinforcing bars, embedments, and embedded electrical conduit except as noted on the Drawings. Place heads where indicated. Coordinate placement of heads with Architectural Drawings. Bring discrepancies to the attention of the Architect.

B. Tendons shall clear openings and drains by a minimum of 3 inches or as noted on the structural drawings.

C. Deviation in horizontal spacing of the slab tendons is permitted in accordance with Structural Drawings, where required to avoid openings and inserts which are specifically located with engineers approval. Minimum horizontal radius of curvature of 24 feet shall be provided.

D. Post-tensioning tendons shall have a parabolic profile and shall conform to the control points shown on the drawings. Dimensions locating this profile apply to the center of gravity of the tendon. Low points of the tendons are at mid-span unless otherwise noted.

E. Suitable horizontal and vertical supports or chairs shall be installed as shown on the shop drawings to hold the tendons in true position. Tendons shall be tied to supports or chairs at a maximum dimension indicated on the structural drawings. Tendons shall be tied to chairs and supports in such a way that the sheathing is not damaged. Slab tendons shall not be chaired off of beam tendons.

F. Post-tensioning tendons and anchorages shall be firmly supported to prevent displacement during concrete placement.

G. Tendons shall be placed with a vertical tolerance as indicated in Post-Tensioning General Notes. Tolerance on minimum cover shall be -0, +1/4 inch in slabs, and -0, +3/8 inch in beams. Additional tolerances per ACI 318.

H. Post-tensioning anchorages shall be installed perpendicular to the tendon axis.

I. Where the end of a post-tensioned tendon will not be covered by concrete, the anchorages shall be recessed so that the ends of the prestressing steel will be at least 1 inch inside the edge of the concrete.

J. Post-tensioning tendons shall not be exposed to abrasion, chemicals, flexing movements, excessive temperatures, welding sparks or electric ground currents.

3.2 ANCHORAGES

A. Anchorages shall be attached rigidly to secure formwork by bolting. Minimum concrete cover for anchorages shall be that for reinforcing bars.

B. Pockets for intermediate stressing anchorages shall be formed to positively prevent intrusion of concrete into the anchor cavity. Minimum concrete cover over the face of the anchorage shall be 2 inches.

C. At intermediate anchorages, sheathing shall be repaired with waterproof polyethylene tape as stated in the paragraph "Damage" above.

D. Fixed-end anchorages shall be shop-installed, furnished with a shop-installed watertight cover. The cover shall be shop installed after filling the void around the wedge grips with a corrosion preventative coating. Fixed end anchorages shall be seated with a load between 75 to 80% of the minimum ultimate tensile strength of the tendon. Minimum clear concrete cover over fixed-end anchorages shall be 2 inches.

E. During stressing of an intermediate anchorage, the sheathing must be locally removed. After stressing, the continuity of the watertight sheath to the intermediate anchorage should be reestablished by wrapping the sheath in polythene tape or by using a telescopic pipe section. It must be shown that the notches in the strand produced by the teeth of the jack grips during stressing do not significantly reduce the ultimate tensile stress of the strand. This is required because the notch marks of the stressing grips will lay in the subsequently stressed tendon section. Double-acting intermediate anchorages should be used for tendons over several bays.

3.3 SHEATHING INSPECTION

A. Prior to placing tendons in the forms, the sheathing shall be inspected for damage and repaired as stated in the paragraph "Damage" above. Torn sheathing shall be grounds for rejecting the tendon if, in the opinion of the Engineer, the damage cannot be adequately repaired in the field. See Post Tensioning General Notes.

B. After installation, the contract's testing agency shall reinspect all sheathing and verify a watertight installation.

3.4 MARKING

A. Immediately before new concrete is placed, the position of tendons shall be marked on the forms with a chamfer strip or other embedded item such that a clear, permanent mark is left on the underside of the slab as shown on the structural drawings. The Contractor's proposed method of marking shall be reviewed and accepted by the Engineer before starting construction.

3.5 CONCRETE PLACEMENT

A. Concrete shall be placed in conformance with the requirements as outlined in Section 033000, Cast-in-Place concrete.

B. Calcium Chloride shall not be used as an admixture in post-tensioned concrete.

C. No concrete shall be placed until the tendons have been inspected and approved.

D. Concrete shall be placed in such a manner as to insure that the position of the post-tensioning tendons and conventional reinforcement remains unchanged. If the post-tensioning tendons move out of their designed positions, they shall be adjusted to their correct positions prior to proceeding with concrete placing operations.

E. Special provisions shall be made to insure proper consolidation of concrete in anchorage zones to eliminate any voids or honeycombing and ensure complete concrete filling under anchorages.

3.6 STRESSING

A. The stressing operations shall not begin until tests of the concrete cylinders cured under job-site conditions indicate that the concrete in the members has attained the compressive strength specified on the Contract Drawings. See Section 033000, Cast-in-Place Concrete, for testing and curing procedures. Compressive strength shall be a minimum of 3,000 psi for application of full prestress.

B. The post-tensioning tendons shall be stressed by means of hydraulic jacks equipped with calibrated hydraulic pressure gauges to permit the stress in the prestressing steel to be computed at any time. A calibration chart shall accompany each jack. In no case shall a jack and gauge combination be used which have not been calibrated to each other. In order to insure that proper calibration is maintained, care shall be exercised in the handling of all stressing equipment. Stressing rams and gages shall individually be identified and calibrated

against known standards within 2 weeks of commencing the first stressing operation and every 8 weeks thereafter. Calibration certificates for each jack used shall be available upon request. Hydraulic stressing rams used to stress unbonded single strand tendons shall be equipped with stressing grippers which will not notch the strand more severely than normal anchoring wedges.

C. The stressing operations shall be conducted so that accurate elongation of the prestressing steel can be measured and recorded to the nearest 1/8 inch and compared with predicted elongations. An agreement within + or 7% between measured and predicted elongations shall be satisfactory. If inconsistencies exceeding + or - 7% occur, the cause of the inconsistency shall be determined and resolved prior to proceeding with further stressing. Elongation shall be made at each stressing location to verify that the tendon force has been properly achieved. See also Post Tensioning General Notes.

D. Stressing from both ends of the prestressing steel shall be performed when there is excessive friction between the prestressing steel and the sheathing. This shall be clearly called for on the approved shop drawings.

E. The maximum temporary tensile strength (jacking stress) in the prestressing steel shall not exceed 80% of the specified guaranteed minimum ultimate tensile strength of the prestressing steel. The prestressing steel shall be anchored at stresses (initial stress) that will result in the ultimate retention of working forces of not less than those shown on the Contract Drawings, but in no case shall the initial stress at the anchorage exceed 70% of the specified guaranteed minimum ultimate tensile strength of the prestressing steel. Hydraulic stressing rams used to stress unbonded single strand tendons shall be equipped with stressing grippers which will not notch the strand more severely than normal anchoring wedges.

F. Safety precautions shall be taken to prevent workers from standing over or behind the stressing jacks when tendons are being stressed.

G. Finishing Tendons: Trim excess length of tendons within 5 days of stressing by means of abrasive wheel, hydraulic shears, or cutting torch. Care shall be taken not to heat the anchor assembly during tendon cutting. The tendon length protruding beyond wedges after cutting shall be 0.75 to 1.25 inches.

H. Coating: The exposed strand and wedge areas shall be coated with tendon coating material comparable to that used over the length of the tendon and a water-tight cap shall be applied over the coated area for unbonded tendons.

I. Stressing Pockets: Stressing pockets shall be filled with an approved non-shrink grout within 15 days after tendon stressing and cutting. Non-shrink grout shall conform to the requirements of Section 033000. Under no circumstances shall the grout or mortar used for pocket filling contain chlorides or other chemicals known to be deleterious to the prestressing steel. Prior to installing the pocket mortar, the inside concrete surfaces of the pocket shall be coated or sprayed with a resin bonding agent. Finish exposed surfaces to match architectural concrete requirements.

3.7 SEQUENCING

A. The contractors shall develop a tensioning sequence which meets contract drawing requirements.

B. Stressing Records: Provide reports on stressing of each tendon. Record on each report:
1. Date of stressing operation and mark of tendon, identification of area in project.
2. Calculated elongation, based upon elastic modulus and cross-sectional area of tendons used.
3. Actual field elongation of each tendon.
4. Calculated gage pressure and jacking force applied to each tendon.
5. Actual gage pressures and jacking forces applied to each tendon.
6. Required concrete strength at time of jacking.
7. Actual concrete strength at time of jacking.
8. Range of allowable elongations for jacking force.
9. Submit copies of actual field records to Architect promptly upon completion of each member. At time of stressing first member of each type, check individual tendon to establish procedure for insuring uniform results.
10. Certify that stressing process and records have been reviewed, and that forces specified have been provided.
11. If it appears that design post-tensioning stresses are not being attained, a recheck will be required. Further stressing will not occur until a resolution to this issue is developed by the Contractor and reviewed by the Architect.
12. Do not cut or cover tendon ends until Contractor receives Architect's written review of post-tensioning records.
13. Submit written reports as required within 48 hours of stressing.

3.8 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. A Special Inspector will be employed by the Owner during placement and stressing of the post-tensioning, placement of reinforcing, and placement and testing of concrete. The Contractor is solely responsible for the correctness and accuracy of his construction and shall perform his own independent inspection prior to the Owners inspection.

B. No concrete shall be placed in post-tensioned members until placement of tendons and conventional reinforcement steel have been inspected and approved. Provide 24 hours notice to inspector prior to placing concrete.

3.9 REPAIR OF BROKEN TENDONS

A. Contractor is responsible for repair of any broken tendons regardless of cause. Repair of any broken tendon shall be made in a timely manner such that the original design parameters of the structure are maintained. Broken tendons may be repaired by splicing, inserting a new strand into existing sheathing, or other methods approved by the engineer.

3.10 REMOVAL OF FORMS

A. In accordance with Section 033000.

B. Do not remove forms, shores, and bracing until concrete has been tensioned to strength sufficient to carry its own weight, construction loads, and design loads. Place curing compound on bottom of deck after form removal.

3.11 REPAIR OF SURFACE DEFECTS

A. In accordance with Section 033000.

B. Modify of replace concrete not conforming to required lines, detail, and elevations.

C. Repair or replace concrete not properly placed resulting in honeycomb and other defects.

3.12 FINISHING CONCRETE SURFACES

A. Provide exposed post-tensioned structural concrete surfaces with a trowel finish as specified in Section033500 – Concrete Finishes.

END OF SECTION

SECTION 035413 – GYPSUM-BASED UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Gypsum-cement-based, self-leveling underlayment for application below interior floor coverings.
   2. Acoustical Isolation Mat.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s literature for each type of product indicated.

B. Shop Drawings: Plans indicating substrates, locations, and average depths of gypsum-based underlayment based on survey of substrate conditions.

C. Qualification Data: For Installer.

D. Test Reports:
   1. For fire-resistant ratings, from a qualified testing agency.
   2. For STC-rated assemblies, from a qualified testing agency.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
   1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
   1. STC Rating: As indicated on Drawings.

2.2 GYPSUM-BASED UNDERLAYMENTS

A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in minimum uniform thickness as indicated on the drawings, and that can be feathered at edges to match adjacent floor elevations.
   1. Basis of Design: Gyp-Crete 2000 by Maxxon Corporation.
   2. Acceptable Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Keene/Dependable – GSL K3.4.
      b. Hacker Industries – Firm Fill 3310.
      c. Maxxon Corporation - Duracap.
      d. Formulated Materials – 1-inch with TDS Treadstone Elite System.
   3. Compressive Strength: Not less than psi noted on Construction Documents at 28 days when tested according to ASTM C472.
   4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, coarse sand as recommended by underlayment manufacturer.
   1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
   1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
   2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Sealer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

2.3 ACOUSTIC ISOLATION MAT

A. Acoustic Isolation Mat: ASTM C627, random-filament, entangled polypropylene monofilaments, corrugated sound control mat with a “U” groove core.
   1. Thickness: 1/4 inch.
   2. Fire-Rating: Class A.
   3. Products: Provide cementitious underlayment manufacturer’s recommended product.
      a. Basis of Design: Quiet Qurl by Keene 55-025 MCMT 1/4 inch.
         1) AcoustiMat 1/4 Premium by Maxxon Corporation.
         2) Formulated Materials – 1” with TDS Treadstone Elite System.

B. Perimeter Isolation Strip: Perimeter isolation strip compatible with Acoustic Isolation Mat, as approved by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Install Acoustical Treatment as indicated on the drawings and as required by Acoustically Engineer.

C. Concrete Substrates: Mechanically remove laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
   1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

D. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

E. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces.

F. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment.

3.2 APPLICATION

A. Acoustic Isolation Mat: Install in accordance with manufacturer’s written instructions.

B. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

C. Spread and screed floor underlayment to a smooth surface.

D. Thickness: See Drawings for installation thickness and assembly requirements.

E. Feather edges to match adjacent floor elevations.

F. Maintain top surface level to 1/8 inch in 10 feet.

G. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

H. Apply sealer over prepared substrate at manufacturer's recommended spreading rate.

I. Apply underlayment to produce uniform, level surface.
1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

J. Cure underlayment according to manufacturer’s written instructions. Prevent contamination during application and curing processes.

K. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

L. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

M. Provide continuous ventilation and adequate heat to rapidly remove moisture from the area. Provide mechanical ventilation if necessary.

N. Perimeter Isolation Strip: Install at perimeter or rooms, floor penetrations and any additional locations as recommended by Acoustic Isolation Mat manufacturer, and in accordance with details and drawings.

3.3 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

A. Sealing: Seal areas that receive glue down floor goods with overspray according to the manufacturer’s instructions. Floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used.
1. Verify installation requirements with floor installation system manufacturers.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035413

SECTION 042019 – VENEER UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Brick Veneer.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Show elevations of reinforced walls.
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: Provide samples of each variety and color of brick to be used on the Project showing range of texture and/or color variations of the exposed surfaces. Units provided to the Project shall match these samples.
   1. Face brick, in the form of straps of five or more bricks.
   2. Colored Mortar.
   3. Weep holes/vents.

D. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 – Quality Requirements for mockups.
   1. Build sample panels for typical exterior wall in sizes approximately 60 inches long by 48 inches high by full thickness.
   2. Build sample panels facing south.
   3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
   4. Protect approved sample panels from the elements with weather-resistant membrane.
   5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

F. Material Certificates: For each type and size of product indicated.

1. Masonry Units:
    a. Include data on material properties and material test reports substantiating compliance with requirements.
    b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    c. For exposed brick, include test report for efflorescence according to ASTM C 67 and is rated “not effloresced.”
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes: Include description of type and proportions of ingredients.
5. Anchors, ties, and metal accessories.

G. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.3 QUALITY ASSURANCE

A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical exterior wall in sizes approximately 96 inches long by 72 inches high by full thickness, including face and backup wythes and accessories.
    a. Include a sealant-filled joint at least 16 inches long in mockup.
    b. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    c. Include studs, sheathing, insulation, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

C. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 BRICK VENEER

A. General: Provide shapes indicated and as follows:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Manufacturers:
1. Mutual Materials or approved comparable.

C. Face Brick: Complying with ASTM C 216, Grade SW, Type FBX. Provide face brick, including specially molded, ground, cut or sawed shapes as required to complete the work.
1. Size: 7 1/2 inch by 3 1/2 inch by 2 1/2 inch.
2. Texture: Mission texture.
3. Brick color: Autumn Blend.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91.

E. Mortar Cement: ASTM C 1329.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.-

G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime or masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   2. Pigments shall not exceed 10 percent of portland cement by weight.
   3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

H. Aggregate for Mortar: ASTM C 144.
   1. White-Mortar Aggregates: Natural white sand or crushed white stone.
   2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

K. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

L. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inchsteel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A 951.
   1. Mill galvanized, carbon steel: ASTM A 82 with ASTM A 641 Class 1 coating.
   2. Hot-dip galvanized carbon steel: ASTM A 82 with ASTM A 153, Class B-2 coating. Typical for exterior walls.
   3. Wire Size for Side Rods: 0.148-inch diameter.
   4. Wire Size for Cross Rods: 0.148-inch diameter.
   5. Spacing of Cross Rods: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.5 TIES AND ANCHORS

A. General: Anchoring devices for attachment of brick veneer to substrate must comply with IBC for seismic design category as specified on Structural Drawings.
   1. Provide two-piece adjustable assemblies allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it.
   2. All anchors must be ICBO approved.
   3. Reference structural general notes for additional requirements.

B. Masonry Anchor System: Stainless Steel metal anchorage device and fastener.
   1. For Steel Stud Walls: 2-Seal Thermal Wing Nut Anchor by Hohmann & Barnard, Inc., or approved equal.
   2. For Concrete Walls: 2 Seal Thermal Concrete Wing Nut Anchor by Hohmann & Barnard, Inc., or approved equal.
   3. Screw fastener: Use fasteners as recommended by manufacturer of veneer anchor.

2.6 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Stainless steel, ASTM A 167, Type 304, soft annealed with no. 2D finish, 26 gauge.
   1. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees, unless shown otherwise in architectural drawings.
   2. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
   3. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.

B. Flexible Flashing: Use wall flashing per Section 076500 – Flexible Flashing, over lintels and shelf angles.

C. Application: Unless otherwise indicated, use the following:
   1. Where flashing is indicated to receive counterflashing, use metal flashing.
   2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
   3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
   4. Where flashing is fully concealed, use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 - Sheet Metal Flashing and Trim.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products:
1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1) Mortar Net USA, Ltd.; Mortar Net Weep Vents, or approved equal.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Mortar Trap by Hohmann and Barnard.
2. Provide one of the following configurations:
a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep.
b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
c. Sheets or strips full depth of cavity and installed to full height of cavity.

F. Sealer: See Section 071900 – Water Repellents.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

B. Cleaning Agent: Non-acidic, not harmful to masonry work or adjacent materials.

1. Basis of Design: Enviro Klean 2010 All Surface Cleaner; PROSOCO, www.prosoco.com, or approved equal.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime or masonry cement mortar.
   4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
   5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type S mortar, unless another type is indicated.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Pigments shall not exceed 5 percent of masonry cement by weight.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

F. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Pattern for Exposed Masonry:
1. Bond: Stack bond.
2. Coursing:

a. Running Bond: One unit and one mortar joint to equal 4 inches.
b. Soldier Course: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Raked, typical.

C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick as follows:
1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.7 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten screw-attached and seismic anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
   2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.8 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
   4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Space weep holes 24 inches o.c. unless otherwise indicated.
2. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material.

E. Install vents in head joints in exterior wythes at spacing indicated.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.9 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Testing Prior to Construction: One set of tests.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.10 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect surfaces from contact with cleaner.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
4. Clean masonry with a proprietary non-acidic cleaner applied according to manufacturer's written instructions.

3.11 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste and dispose of in approved dumpster onsite.

END OF SECTION 042019

SECTION 042113 – MANUFACTURED BRICK VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured thin brick masonry veneer units.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s data on manufactured brick veneer units and recommended sealer, if required.

B. Sustainable Design Requirements:
1. Product Data: See Section 018113 – Sustainable Building Requirements for Document Instructions and Product Literature.

C. Samples: Submit samples for review prior to constructing job-site mock-ups, delivering materials to the site or commencing the work in this Section.
1. Submit sufficient quantity of samples of manufactured brick veneer, showing range of texture and/or color variations of the exposed surfaces.

D. Quality Assurance/Control Submittals:
1. Qualifications: Proof of manufacturer and installer qualifications.
2. Regulatory Requirements: Evaluation reports.

E. Shop Drawings: Submit Manufacturer's installation instructions and field erection or setting drawings indicating layout, pertinent dimensions, anchorages, reinforcement, head, jamb and sill opening details, and jointing methods. Include requirements for the installation of materials connected to the work.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company with minimum 3 years experience in the installation of manufactured brick veneers of the type specified.

B. Manufacturer’s Qualifications: Furnish manufacturer’s certification that thin brick units provided meet or exceed the requirements of this specification.

C. Regulatory Requirements: Materials and workmanship shall meet requirements of the building codes which are applicable to the jurisdiction in which Project is located.

D. Pre-Installation Conference: Conduct as specified in Division 01.

E. Mock-Ups:
1. Prior to start of work, construct a sample panel from the approved materials, containing each different kind or color of manufactured brick veneer, approximately 4 feet high x 4

feet wide. Provide a larger wall if required to illustrate wall design under the direction of the Architect.

2. Sample wall shall provide a standard of workmanship, bond, thickness and tooling of joints, range of color and texture of the manufactured brick veneer and mortar.
3. Construct successive sample panels until the standard is approved.
4. When accepted by Architect, sample wall shall be the standard of comparison for the remainder of the manufactured brick veneer work.
5. Upon completion of the Project, remove the sample wall from the site and dispose of in a legal manner.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store masonry units above ground to prevent contamination by mud, dust or other materials likely to cause staining or other defects.

B. Cover and protect masonry units from inclement weather to maintain quality control and physical requirements.

C. Transport and handle manufactured brick veneer in such a manner as to prevent chipping and breakage.

D. Locate storage piles, pallets, stacks or bins to avoid or protect material from heavy or unnecessary traffic.

E. Remove chipped, cracked, and otherwise defective units from jobsite upon discovery.

1.5 PROJECT/SITE CONDITIONS

A. Hot Weather Requirements: In accordance with 2104.4.
   1. When the ambient air temperature exceeds 100 degrees F., or when the ambient air temperature exceeds 90 degrees F. and the wind velocity is greater than 8 mph, the manufactured brick veneer Contractor shall implement hot weather protection procedures as submitted to the Architect.
   2. Wet mortar board before loading and cover mortar to retard drying when not being used.
   3. Do not spread mortar beds more than 4 feet ahead of placing manufactured brick veneer.
   4. Place manufactured brick veneer within one minute of spreading mortar.

B. Cold Weather Requirements: In accordance with IBC 2104.3. Provide adequate equipment for heating masonry materials when air temperature is below 40 degrees F.

C. Wetting of Brick: Required at the time of laying if the units initial rate of absorption (IRA) exceeds 30 grams per 30 square inches per minute or 1 g/645 mm2.

D. Field Measurements:
   1. Verify measurements shown on Drawings by taking field measurements.
   2. Proper fit and attachment of manufactured brick veneer is required.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard warranty coverage against defects in materials when installed in accordance with manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURED BRICK VENEER

A. Basis of Design: Slimbrick, Architectural Series by Mutual Materials.

B. Type: ASTM C1088, Grade Exterior, Type TBX thin veneer brick.

C. Size: Norman size 3/4 inch by 2-1/2 inch by 11-1/2 inch.

D. Surface Texture: Mission texture.

E. Color: Desert white.

F. Special Sizes and Shapes: As required for window and door locations and custom sills where indicated, corners, and other special applications to minimize cutting.

2.2 BOND-COAT MORTAR

A. Site mixed mortar: Meet requirements of ANSI A118.4 or A118.15.

B. Preblended: Meet requirements of ANSI A118.4 or A118.15.

C. Mortar for use with cement backer board substrate: Comply with ANSI A118.4 or A118.15.

2.3 POINTING MORTARS

A. Mortar used to grout or tuck-point mortar joints (sometimes called grouting mortars) between thin brick units after they are adhered to the substrate wall. Mix by proportion: 1 part Portland cement (ASTM C150); 1 part hydrated lime (ASTM C207); 6 parts sand (ASTM C144), or Modified Epoxy emulsion mortar/grout conforming to ANSI 118.07.
   1. Site Mixed: Meet requirements of ASTM C270 Type N or Type S.
   2. Preblended: Meet requirements of ASTM C1714 Type N or Type S.

2.4 INSTALLATION ACCESSORIES

A. Weather Barrier to be thin, cold applied, single component liquid and load bearing. Reinforcing fabric to be non-woven rot-proof specifically intended for waterproofing membrane.

   1. Basis of Design: MVIS Air and Water Barrier by Laticrete.

B. Mortar Bed: Latex Portland Cement pointing mortar to be weather, frost and shock resistant, as well as meet the following physical requirements:

1. Compressive Strength, ASTM C91: Greater than 4100 psi.
2. Total VOC Content: Less than 0.05 mg/m^3.
3. Basis of Design: MVIS Premium Pointing Mortar by Laticrete.
4. Color: Grey.

C. Sheet Goods: For exterior wall applications. Compatible with Cementitious plaster and mortar capable of bond capacities of 50 psi shear and tension bond.

D. Anchorages: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.
1. Wood Studs: Minimum 3/4 inch crown galvanized staples or minimum 1/8 inch shank diameter galvanized nails that penetrated the stud minimum 3/4 inch.

2.5 ACCESSORIES

A. Sealant: Elastomeric as specified in Section 079200 – Joint Sealants.

B. Fasteners: ASTM C1063.
1. For steel studs: Corrosion resistant screws; coated or bi-metallic (mild tip with stainless threaded shank) for fastening drainage plane material and lath material to substrate wall; rated for resistance to moist environments. Penetrate stud to expose 3 full threads through steel studs.
2. For wood studs: Corrosion resistant staples, corrosion resistant roofing nails, or corrosion resistant screws and washers, all of sufficient length to penetrate a minimum of 3/4 inch into wall framing members.
3. For concrete or CMU: Corrosion resistant concrete screws (with 1 1/4 minimum penetration into sound substrate) or corrosion resistant powder actuated fasteners (with 1 inch minimum penetration into sound substrate).
a. Follow fastener manufacturer’s recommendations for installation into CMU.
4. Fasteners intended to secure lath shall have sufficiently large heads or added corrosion resistant washers large enough to not pull through the lath.

C. Bonding Agent: Exterior integral bonding agent meeting ASTM C932. Fluid-applied on the face of rigid insulation.

D. Water Repellent: Water based silane or siloxane masonry water repellent. See Section 071900 – Water Repellents for additional information.

E. Flashing: As specified in Section 076200 – Sheet Metal Flashing and Trim.

F. Cementitious Backer Board: As specified in Section 092900 – Gypsum Board.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect.
2. Failure to observe this requirement constitutes a waiver to subsequent claims to the contrary and holds Contractor responsible for correction(s) Architect may require.
3. Commencement of Work will be construed as acceptance of subsurfaces.
4. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.

B. Coordination with other Work: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.2 PREPARATION

A. Protection: Protect sills, ledges, offsets and other projections from materials and mortar.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Clean manufactured brick veneer prior to erection. Do not use wire brushes or implements which will mark or damage exposed surfaces.

3.3 WEATHER BARRIER

A. Weather barrier (exterior locations):
1. Starting at bottom of wall or lowest level, apply 2 layers of weather barrier horizontally. Install subsequent layers in shingle fashion with the upper layer lapped over the lower layer not less than 50 percent. Lap vertical end laps 6 inches minimum
2. Fasten at 12 to 18 inches on center spacing at each vertical stud using the following fasteners:
   a. Fasten to sheathed wood frame construction with staples, large head nails, or plastic washer nails.
3. Wrap weather barrier a minimum of 16 inches around all inside and outside corners.
4. Lap upstanding flashing with 4 inch minimum sealed overlap.
5. Completed installation shall be free of holes or breaks.

3.4 MASONRY INSTALLATION

A. Dry Stacked:
1. Moisten surface of cured scratch coat.
2. Apply mortar to back of each manufactured brick unit to a nominal thickness of 1/2 inch, ensuring entire surface is uniformly coated. Alternatively, trowel mortar onto scratch coat, completely covering scratch coat.
3. Apply corner unit’s first, alternating short and long legs of each course.
4. Press buttered manufactured brick units firmly into position into scratch coat, joggle each piece slightly to bond firmly, causing mortar to extruded slightly around edges of units. Apply pressure to the manufactured brick unit to ensure a good bond and complete coverage between the mortar bed and back surface of the brick.

5. Use a trowel to strike off the excess mortar around the edges of the component prior to placing the next component, allowing the adjacent component to fit tightly with a mortar-less joint between bricks.

B. Do not lay chipped, cracked or otherwise defective units in the wall where exposed to view. Units that are cut in field and therefore expose non-integrally colored portions of unit shall not be used and shall be considered defective. Remove and replace units that chipped, cracked, broken, or otherwise defective whether before or after setting.

C. Openings: Provide openings in manufactured brick veneer walls where required or indicated.

D. Cutting of manufactured brick veneer: Plan work to minimize jobsite cutting. When required, exposed units shall be cut with a power driven Carborundum or diamond disc blade saw to provide uniform edges. When using "wet" cutting methods, clean water shall be used on exposed units. Take care to prevent breaking unit corner or edges.

E. Where fresh manufactured brick veneer joins manufactured brick veneer that is partially or totally set, the exposed surface of the set manufactured brick veneer shall be cleaned and lightly wetted to obtain the best possible bond with the new Work. Loose manufactured brick veneer and mortar shall be removed.

F. Coordinate sealant application as specified in Section 079200 – Joint Sealants as detailed and as required to maintain waterproof integrity.

3.5 REPAIRS

A. Remove and replace manufactured brick veneer which has cracks, blisters, pitting, discoloration or other defects.

B. Repairing of defects will be permitted only when approved by the Architect.

C. Repairs shall match existing work.

3.6 QUALITY CONTROL

A. Continuous Inspection: Engage a qualified masonry inspector for continuous inspection of the masonry work. Acceptance by a State or municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall be at the site during all masonry construction and perform the following duties:
   1. Review Drawings and Specifications and meet with the Contractor to discuss requirements before work commences.
   2. Before masonry work commences, Contractor and Contractor’s Quality Control Representative shall attend meeting with Engineer to review the requirements for surveillance and quality control of the masonry work.
   3. Check brand and type of cement, lime (if used) and source of sand.
   4. Ensure that the backing is continuous, rough and moisture resistant to receive units.
   5. Observe field proportioning of mortar. Visually check aggregate to determine uniformity of grading, cleanliness, and moisture.
   6. Ensure that joints are full of mortar and kept tight during work.

7. Continuously observe placing of grout.
8. Perform or supervise performance of required sampling and testing.

B. Keep complete record of inspections. Report daily to the Contractor's Quality Control Representative the progress of the masonry inspection.

3.7 CLEANING

A. Daily Cleaning: Keep walls clean. Soiled manufactured brick veneer from mortar spills which will be exposed to view at the completion of the Project shall be cleaned immediately with stiff fiber brushes until the wall is free of dropped or spattered mortar.

B. Remove scaffolding and equipment used in the Work.

C. Clean up debris, refuse and surplus material and remove from premises.

3.8 PROTECTION

A. Furnish temporary protection for exposed manufactured brick veneer corners subject to injury.

B. Carefully cover tops of walls left incomplete at the conclusion of the day's work with tarpaulins or other approved covering, securely held in place.

C. In hot and dry weather, protect manufactured brick veneer against too rapid drying.

D. Protect finished work against freezing for a period of not less than 48 hours by means of enclosures, artificial heat, or such other protective methods as may be required.

E. Allow no construction activity on opposite side of wall to which manufactured brick veneer work is being applied during and for 48 hours after completion of work.

END OF SECTION 042113

SECTION 051200 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Provide steel and accessories stipulated on the drawings (Structural General Notes).

2.2 BOLTS, CONNECTORS, RODS, AND ANCHORS

A. Steel Materials:

1. High-Strength Bolts, Nuts, and Washers: ASTM A 325 Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436 Type 1, hardened carbon-steel washers; all with plain finish.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Minimum compressive strength: 6000 psi.

2.4 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
1. Mark and match-mark materials for field assembly.

2. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Weld threaded nuts to framing and other specialty items indicated to receive other work.

E. Remove backing bars or runoff tabs, back gouge, and grind steel smooth where indicated or where welded connections will be exposed to view.

2.5 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.6 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize members as indicated on drawings. Do not galvanize steel items indicated to receive paint finish.

2.7 SHOP PAINTING

A. Typical Primer Paint: Zinc-rich, micaceous iron oxide (MIO), moisture-cured urethane:
1. AISC-certified for Class B slip-critical connections.
2. Minimum 8000 hours salt-spray resistance when tested in accordance with ASTM B 117.
3. Acceptable products:
a. Tnemec Series 394 "PerimePrime".
b. Wasser "MC MIO-Zinc".
c. Or approved equal.
4. Preparation: SSPC SP-6 “Commercial Blast Clean”

B. Interior Primer Paint: Anti-corrosive primer meeting GS-03; VOC limit of 100 g/l.

1. Use only for items installed within conditioned space.

C. Primer Application: Immediately after surface preparation, apply primer to provide dry film thickness of not less than 3 mils for typical primer paint 1.5 mils for interior primer paint.

1. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, including those to be embedded in concrete. Comply with SSPC-PA 1 for shop painting.
   a. Hold back primer 2 inches from edges to be field welded.

PART 3 - EXECUTION

3.1 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

C. Splice members only where indicated.

D. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

END OF SECTION

SECTION 054000 – COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold formed metal framing consisting of structural studs and channel bracing.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data for studs, fasteners, anchors, and accessory items to show compliance with this specification.

B. Shop Drawings: Submit shop drawings showing layout, spacing, size, thickness, and type of structural studs; show fastening and anchorage details, welding procedures and electrodes, and all erection accessories required, stamped and signed by a professional structural engineered as indicated below. Engineers stamp not required at exterior wall framing shown in Structural Drawings.
1. Show supplemental strapping, bracing, bridging, splices, accessories and details required for proper installation.
2. Layout framing at wall penetrations to allow uniform clearance from effects of wind and thermal movement.

C. Coordination Drawings: Provide coordination drawings for fabrication of embedded inserts and anchors as requirement for installation by other trades.

D. Welding certificates: Signed by Contractor certifying that welders comply with requirements specified under Article entitled "Quality Assurance".

E. Research/Evaluation Reports: Current ICC-ES reports with installation instruction for each component.

1.3 QUALITY ASSURANCE

A. Welders: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel". Field welders shall have Washington Association of Building Officials (WABO) certification within the previous 12 months.

B. Fasteners: Expansion anchors and powder driven fasteners shall be furnished and installed in accordance with the framing and fastener manufacturer's current ICC-ES Reports.

C. Allowable Tolerances: Provide framing fabricated and erected to conform with the following allowable tolerances:
1. Variation From Plumb, Level and True To Lines: 1/8 inch in 10 feet (1:960).
2. Member Spacing: Not more than 1/8-inch plus or minus from spacing indicated, but none accumulative.

3. Squareness: Not more than 1/8 inch, maximum of out square, each framing assembly.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M (ASTM C955), structural Grade, Type H, G60 metallic coated, steel of grade indicated.

B. Sustainable Aspects of Steel Products
1. Recycled Content: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
2. Regional Material: To the greatest extent possible, obtain regionally manufactured steel products.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
1. Consolidated Fabricators Corp.
2. Custom Stud, Inc.
3. Frametek Steel Products
4. Olmar Supply, Inc.
5. Quail Run Building Materials, Inc.
6. SCAFCO Corporation.
7. Steel Construction Systems
8. United Metal Products, Inc.
9. Other members of the Steel Stud Manufacturer’s Association

D. Grade Limitations for Studs:
1. Grade: ST33H; Fy = 33 ksi minimum for 43 mils (nominal 18 ga.) and lighter.
2. Grade: ST50H; Fy = 50 ksi minimum for 54 mils (nominal 16 ga.) and heavier.

2.2 STUDS AND RUNNERS

A. Studs: See Structural Drawings for requirements at exterior walls. Elsewhere, thickness and grade as required by structural design calculations, except for following:
1. ‘C’-shape design, roll formed with punched web with manufacturer's standard return lip.
2. Sheet Metal Thickness: Not less than 43 mils (nominal 18 ga.).
3. Stud Web Depth: As indicated on drawings.
4. Flange Width: 2 inch, minimum.

B. Runners: See Structural Drawings for requirements at exterior walls. Elsewhere, same width as studs, tight fit; solid web.
1. ‘U’-shaped steel channel.
2. Sheet Metal Thickness: Same as studs.
3. Flange Width: 1-1/4 inches, minimum; coordinate actual width with related sections where direct anchoring is required.

C. Steel Box or Back-To Back Headers: See Structural Drawings for requirements at exterior walls. Elsewhere, manufacturer's standard 'C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges.
   1. Sheet Metal Thickness: As required to carry loading, but not less than that required for studs.
   2. Flange Width: Same as studs.
   3. Optional Proprietary Products for Framed Openings: Jambs and headers as "JamStud" manufactured by Steel Network, Inc., thickness and grade as required meeting structural design requirements.

2.3 FRAMING ACCESSORIES

A. Framing Accessories: Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Steel Grade, Type H, metallic coated, of same grade, coating weight and manufacturer used for framing members; thickness required by structural design calculations.
   1. Provide with manufacturer's name stamped on each component.
   2. Connector devices shall include supplementary framing; bracing, bridging, and solid blocking; web stiffeners; anchor clips; end clips; foundation clips; gusset plates; stud kickers, knee braces, and girts; joist hangers and end closures; hole reinforcing plates and backer plates.

2.4 ANCHORS, CLIPS AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M; refer to Section 055000.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel, hex-headed bolts, headless, hooked bolts, headless bolts, with encased end threaded, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere

D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
   1. Refer to Structural Drawings for minimum embedment requirements.

E. Welding: In conformance with AWS D1.3.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Touch-Up Paint: ASTM A 780.

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

C. Insulation: Refer to Section 072100.

2.6 FINISHES

A. Exterior (Applications) Wall Components: Galvanized, ASTM A1003/A1003M, G90 (Z275) minimum coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:
1. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
2. Determine that conditions are acceptable to receive the work of this Section. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer. Starting of the work will be construed as acceptance of conditions.

3.2 PREPARATION

A. General: Prepare substrates and connecting work to enable the best and most complete installation per industry standards of the work of this Section.

B. Coordination:
1. Isolation Between Concrete/Masonry and Sill Plates and Vertical Walls: Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations, and between vertical framing and concrete/masonry wall or structure.
2. Coordinate installation of anchorage devices for suspended ceilings/soffits and walls, verifying that spacing and rated strength are correct for anticipated load conditions.

3.3 INSTALLATION, GENERAL

A. General Requirements: Install metal framing systems in accordance with AISI's Standard for Cold-Formed Steel Framing – General Provisions, ASTM C1007 and manufacturer's printed or written instructions and recommendations and approved shop drawings.
1. Use saw or shear for cutting of steel framing members; torch cutting is not permitted.
2. Bearing surfaces shall provide complete uniform and level bearing support for bottom tracks.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as indicated under installation requirements. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

C. Fit cold-formed metal framing and accessories to other construction; scribe and cope as needed for accurate fit. Locate supplemental supports to comply with requirements for attaching other construction.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

G. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.4 EXTERIOR WALL INSTALLATION

A. Runner Tracks: Install continuous tracks, sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks per structural drawings, except do not exceed 24 inches on center spacing for nail or powder-driven fasteners; provide fasteners at corners and ends of tracks.
1. Fasten both flanges of studs to bottom track, unless otherwise indicated where clip angles are specified. Space studs as indicated on Drawings.
2. Isolate non-load-bearing steel framing from building structure as indicated to prevent transfer of vertical loads while providing lateral support.
a. Install deep-leg deflection tracks without slotted legs and anchor to building structure where indicated at tops of walls.
b. Where indicated, connect vertical deflection clips to bypassing studs or to infill studs below and anchor to building structure.
3. Install continuous length by full width Isolation gasket under all exterior facing sill, end and top runners, as applicable to reduce thermal bridging.

B. Studs: Set studs plumb and true with the stud web and flanges abutting the track web with the open side of studs facing in the same direction. Use full length studs between runner tracks.
1. Space studs not to exceed 16 inches on center, unless otherwise indicated on drawings.

2. Secure studs to top and bottom runner tracks by welding at both inside and outside flanges except where specifically noted on drawings at deflection joints. Use fillet welds for attachment; size of welds as indicated on drawings.
3. Align all punch-out holes in studs within a continuous length of wall to receive utilities and horizontal stiffeners within plus or minus 1/2 inch.
4. Install horizontal bridging in wall studs, spaced in rows indicated on Drawings. Fasten at each stud intersection.
    a. Install row of horizontal bridging within 18 inches of single deflection track at tops of walls. Alternately, temporary screws may be installed to attach each stud flange to the deflection track prior to installation of sheathing on each side of the wall. Temporary screws must be removed as sheathing is installed, and sheathing shall not be screwed into the deflection track.
5. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.
6. See Structural Drawings for additional requirements.

3.5 TOUCH-UP OF WELDS & ABRADED AREAS

A. General: Comply with ASTM A780 Repair of Damaged and Uncoated Areas of hot-Dip Galvanized Coatings.

1. Treat field welds and abraded areas using wire brush or other means to remove slag, and clean with a phosphoric acid base compound or strong solvent as recommended by manufacturer of touch-up material.

2. Apply touch-up material with brush over affected areas per manufacturer's directions to achieve a dry film thickness of 3 mils.

END OF SECTION

A. Section Includes:
1. Miscellaneous steel framing and supports.
2. Metal Mesh
3. Shelf angles.
4. Miscellaneous steel trim.
5. Downspout guards.

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Miscellaneous steel framing and supports.
2. Metal ladders.
3. Miscellaneous steel trim.
4. Steel framing and supports for Overhead Door.
5. Steel Canopy.
6. Custom gates and security fence.
7. Elevator machine beams, hoist beams, and divider beams.
8. Steel shapes for supporting elevator door sills.
9. Abrasive metal nosings.
10. Other metal fabrications that may be required.

1.2 SUBMITTALS

A. Product Data: Submit product data for pre-manufactured components and shop applied primer and field applied repair coating for galvanizing. Submit procedures for following:
1. Removing and reapplication of galvanized coating where field welding is required.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections and any other pertinent information. Show anchorage and accessory items.
1. Drawings shall show type and grade or strength of steel for each fabricated item.
2. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
3. Indicate all bolted and mechanically fastened connections showing type, alloy, and size of fasteners.
4. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.
5. For tubular sections to receive hot-dip galvanizing after fabrication, show sizes and locations of all vent and drain holes in accordance with ASTM A385 recommendations.

C. Design Data: Where materials or fabrications are indicated to comply with certain requirements for design loading, include structural data computations, material properties and other information needed for structural analysis certified by registered professional engineer, licensed to practice structural engineering in jurisdiction where Project is located to indicate compliance.

D. Welding Certificates: Submit written certification that the welders to be employed in work meet the requirements as specified under Quality Assurance.

E. Samples: For each type and finish of extruded nosing, and tread.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this Section by the same firm that fabricated them are under their supervision.

C. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedures.” Welders to be employed in work shall be certified by Washington Association of Building Officials (WABO) and AWS within the previous 12 months.

D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassemble and coordinated installation.

E. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

A. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved as required by NAAMM “Metal Bar Grating Standards,” including anchors and connections:
1. Loading Criteria for Sump Gratings: Comply with NAMM MBG 531 “Metal Bar Grating Manual for Steel, Stainless Steel, and Aluminum Gratings and Stair Treads” for Non-Heavy-Duty Metal Bar Gratings, i.e., walkways, capable of withstanding a uniform load

of 125 lbf/sq. ft., or a concentrated load of 2000 lbf, whichever produces the greater stress, unless otherwise indicated.

B. Structural Performance of Steel Ladders: Steel ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Comply with the following codes, standards and Specifications:
1. AISC “Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings,” including “Commentary of the AISC Specifications.”
2. AISC “Specifications for the Design of Cold-Formed Steel Structural Members.”
3. AWS “Code for Welding in Building Construction.”

B. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 MATERIALS

A. Steel:
1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
2. Steel Wide flange members: ASTM A992 and A913.
3. Steel Shapes: ASTM A36.
4. Steel Tubing: Cold-formed, ASTM A500, Grade B.
5. Steel Pipe: ASTM A53; Type E or Type S, standard weight (Schedule 40), unless otherwise required.
6. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205), unless another grade is required by design loads.
7. Metal Panels: Aluminum sheet, custom laser cut pattern.
a. Thickness: 0.040 minimum.

B. Aluminum:
1. Aluminum Extrusions (Shapes): ASTM B221, Alloy 6063-T6.
2. Aluminum Plate and Sheet (Threshold): ASTM B209, Alloy 6061-T6.

C. Grout: Non-Shrink Non-Metallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for exterior applications of type specified in this section.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

E. Miscellaneous: Provide other materials shown or required for complete fabrication and installation of miscellaneous metals.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.

B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Shop Primers: Provide primers that comply with Section 099100 – Painting.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Provide for anchorage of type indicated; coordinate with supporting structure.

E. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

G. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches o.c.

H. Exposed Metal:
1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
2. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
3. Finish exposed welds and surfaces smooth with no visible roughness and with contour of welded surface matching that of adjacent surface.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
   1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3 unless otherwise indicated.
   2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Elevator Ladder:
   1. Space siderails 16 inches apart unless otherwise indicated.
   2. Space siderails of elevator pit ladders 12 inches apart.
   3. Siderails: Continuous 3/8-by-2 inch steel flat bars, with eased edges as shown on Drawings.
   4. Rungs: 1-inch- diameter steel bars.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip abrasive surfaces on top of each rung.
   7. Galvanize exterior ladders, including brackets and fasteners.

C. Steel Access Ladder:
   1. Space siderails 16 inches apart unless otherwise indicated.
   2. Space siderails of elevator pit ladders 12 inches apart.

3. Siderails: Continuous 3/8-by-2-1/2 inch steel flat bars, with eased edges as shown on Drawings.
4. Rungs: 1-inch- diameter steel bars.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Provide nonslip abrasive surfaces on top of each rung.
7. Galvanize exterior ladders, including brackets and fasteners.

2.10 STEEL GRATE AT ELEVATOR SUMP PIT

A. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch (19 mm) in least dimension.

B. Provide steel angle supports unless otherwise indicated.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize miscellaneous steel trim.

D. Prime miscellaneous steel trim with zinc-rich primer.

2.12 METAL CANOPY

A. See Drawing Sheet A3.02 for additional information.

B. Exterior Canopies: Fabricate to sizes, configurations and shapes indicated using steel sheet, tubing, shapes, plate and rod as detailed. Continuously weld all joints and grind smooth. Provide exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness, except where these features are a design feature of the ornamental item.
1. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
2. Provide anchorage devices as indicated on Drawings and as required for complete installation.

2.13 CUSTOM GATE AND SECURITY FENCE

A. Security fence located on northeast and southeast of building and security fence at east side of Level 3 courtyard – see Drawings.

B. Frame (and Columns): Fabricate from steel shapes as indicated. Miter corners and weld full perimeter.

C. Gate (Door): Fabricate from steel tube (HSS) as indicated. Miter corners and weld full perimeter.

D. Metal Panels: Weld to gate perimeter framing with continuous face weld; grind weld for smooth transition between framing and perforated sheet metal.
   1. Orient slots with long dimension horizontal.

E. Provide mounting plates for gate hardware; coordinate with Section 087100 – Door Hardware.
   1. Hinges: Weld hinges to gates and frame prior to shop painting. Surface weld; no mortise required.

F. Finish: Shop prime for field painting. Field painting per Section 099100 – Painting and Exterior Finish Legend.

2.14 OVERHEAD DOOR SUPPORTS

A. Fabricate supports for operable doors from continuous steel beams of sizes recommended by manufacturer with attached bearing plates, anchors, and braces as recommended by manufacturer.

2.15 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.16 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast aluminum, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. Source Limitations: Obtain units from single source from single manufacturer.
   2. Nosings: Cross-hatched units, 4 inches wide with 1/4 inch lip for casting into concrete.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units.

D. Refer to Drawings Sheet A6.01 for additional information.

2.17 MISCELLANEOUS METAL FABRICATIONS

A. Metal Vent Shroud (M-3): Fabricate from 24 gauge, precoated galvanized steel.
   1. See Drawings for additional information.
   2. Finish: Painted per Section 099100 – Painting.

B. Break Metal Shapes: (M-5): Fabricate from 24 gauge, precoated galvanized steel.
   1. See Drawings for shapes.

2. Finish: Painted per Section 099100 – Painting.

2.18 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.19 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces to comply with requirements indicated below:
1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
1. Typical Primer Paint: Zinc-rich, micaceous iron oxide (MIO), moisture-cured urethane:
a. AISC-certified for Class B slip-critical connections.
b. Minimum 8000 hours salt-spray resistance when tested in accordance with ASTM B117.
c. Acceptable Products:
1) Tnemec Series 394 “PerimePrime.”
2) Wasser “MC MIO-Zinc.”
3) Or approved equal.

E. Shop Painting: Comply with SSPC-PA 1, “Paint Application Specification No. 1: Shop, Field and Maintenance Painting of Steel,” for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation;

with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055100 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel stairs with concrete-filled treads.
   2. Steel stairs with precast concrete treads.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.3 SUBMITTALS

A. Product Data: For installed product indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for preparation.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
   1. Preassembled Stairs: Commercial class.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
1. Uniform Load: 100 lbf/sq. ft. live loading.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit live load deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI7; as designated on Contract Documents.
1. Component Importance Factor: As indicated on the Drawings.
2. Capable of withstanding B-level earthquake motions.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
1. Provide type of bracket with threaded anchor for concealed anchorage to blocking in metal stud walls and for drilled insert in masonry and concrete walls
2. Bracket shall provide 1/2-inch clearance from inside face of handrail to finished wall surface, unless otherwise indicated on the Drawings.
3. Basis-of-Design Product: Subject to compliance with requirements, provide “Pismo Series” wall-mounted handrail bracket as manufactured by C.R. Laurence Company, or comparable product of an approved manufacturer.

2.3 STEEL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

D. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25, unless another grade is required by design loads; exposed.

E. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30, unless another grade is required by design loads.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.

D. Machine Screws: ASME B18.6.3.

E. Lag Screws: ASME B18.2.1.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Non-Shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE TREADS

A. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete.

1. Metal Pan Stairs: Minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
2. Precast Concrete Treads: Minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.

B. Precast Concrete Treads:
1. Color: Standard Grey.
2. Finish: Light sandblast – sealed.
3. Reinforcement: Galvanized, welded-wire reinforcement, 2 by 2 inches by 0.062 inch diameter steel wire; comply with ASTM A1064, except for minimum wire size.

2.7 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Metal Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: Completely sanded joint, some undercutting and pinholes okay for exterior exposed stairs.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.8 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Commercial Class, complying with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," unless more stringent requirements are indicated.

B. Stair Framing:
1. Fabricate stringers of steel channels unless otherwise indicated on the Drawings.
a. Provide closures for exposed ends of channel stringers.
2. Construct platforms of steel channel headers unless otherwise indicated on the Drawings and miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
1. Steel Sheet: Uncoated cold-rolled steel sheet.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.

2.9 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize all interior and exterior stair components to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Comply with Sections 09 91 00 - Painting for priming and painting of galvanized stair and stair rail surfaces where indicated on the Drawings to be painted.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

G. Place and finish concrete fill for treads and platforms to comply with Structural Drawing Notes.

3.2 INSTALLING METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Install stair stringers to landings only.
   1. Maintain minimum 1/2 inch wide gap between edge of stringer and face of adjacent walls.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size

limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

G. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

H. Metal Pan Stairs: Place and finish concrete fill for treads and platforms to comply with Structural Drawings.

I. Precast Tread Stairs: Place finished precast concrete treads making connections as shown on Structural Drawings.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 055100

SECTION 055200 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel pipe and tube railings.
2. Aluminum pipe and tube railings and guardrails.
3. Picket Railing.
4. Swing Gates.

1.2 SUBMITTALS

A. Product Data: Manufacturer's product lines of mechanically connected railings, gate posts, gates and hardware.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For delegated-design professional engineer and testing agency.

E. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

F. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
1. AWS D1.1, "Structural Welding Code – Steel."
2. AWS D1.2, "Structural Welding Code – Aluminum."

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings and gates by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Railings and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.

C. Wind Loads: for exterior glazed decorative metal railings, capable of withstanding the following wind loads in accordance with the IBC and ASTM E1300:
   1. Wind Load: As indicated on Drawings.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL RAILINGS

A. Tubing: ASTM A500 (cold formed) or ASTM A513, Type 5.

B. Pipe: ASTM A53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes and Bars: ASTM A36.

2.4 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated on contract Documents and to meet industry standards below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B221.

C. Plate and Sheet: ASTM B209, Alloy 6061-T6.

D. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.

E. Castings: ASTM B26, Alloy A356.0-T6.

2.5 SWING GATES

A. General: ASTM F900 for gate posts and single swing gate types.
1. See Section 323119 – Ornamental Fences and Gates for additional information.
2. Gate Leaf Width: As shown on Drawings.
3. Framework Member Sizes and Strength: Based on the gate fabric height of more than 72 inches as indicated on Drawings.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the as indicated on Contract Documents and to meet all industry standards. If retaining first paragraph below, indicate loads on Drawings and verify safety factors with Project's structural engineer.
1. Fasteners for Interconnecting Railing Components:
a. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

B. Post-Installed Anchors: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Shop Primers: Provide primers that comply with Division 09 painting Sections.

H. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

I. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

J. Shop Primer for Galvanized Steel: Cementitious galvanized metal primer complying with MPI#26, Vinyl wash primer complying with MPI#80 or Water based galvanized metal primer complying with MPI#134.

K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form work true to line and level with accurate angles and surfaces.

D. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

F. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

G. Form changes in direction by bending or by inserting prefabricated elbow fittings.

H. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.

2.8 STEEL FINISHES

A. Galvanized Railings:
   1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
   2. Hot-dip galvanize indicated steel railings, including hardware, after fabrication.

B. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Do not apply primer to galvanized surfaces.

E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
   1. Color: Match Architect's sample or as selected by Architect from manufacturer's full range.

2.9 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: With a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
   1. Color and Gloss: As Shown on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Anchor posts in concrete by inserting as indicated on Contract Documents or into preset metal pipe sleeves or formed or core-drilled holes and grouting annular space.

D. Anchor posts to metal surfaces with oval flanges.

E. Anchor railing ends at walls with round flanges anchored to wall construction.

F. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

G. Attach railings to wall with wall brackets, except where end flanges are used. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt or as indicated on Contract Documents.

H. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
   4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
   5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
   6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.2 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

B. Ground fence on each side of gates and other fence openings.
   1. Bond metal gates to gate posts.
   2. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chain-link fences and gates.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finish damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055200

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Plywood subflooring.
4. Wood furring blocking and nailers.

B. Related Sections:
1. 061600 - Sheathing
2. 074646 - Fiber Cement Panels:
   a. Installation of preservative treated wood furring for cladding.
3. 074646 - Fiber Cement Siding
   a. Installation of preservative treated wood furring for cladding.

1.2 EVERGREEN (ESDS) AND ENTERPRISE (EGC) SUSTAINABLE DESIGN REQUIREMENTS

A. Credit 6.2: For adhesives and sealants used within building weather enclosure, use low or zero VOC products.
1. Documentation: Product data or laboratory test reports indicating that construction adhesives and sealants have VOC within limits specified in this section or Section 018113 if VOC limit is not specified in this section.

B. Credit 7.1: Use particleboard, plywood, OSB, medium density fiberboard, cabinetry and any other applicable wood products that do not contain added urea-formaldehyde.
1. Documentation: Product data or laboratory test reports indicating that manufacturing adhesives and composite wood products contain no urea formaldehyde.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER FRAMING

A. Load-Bearing Partitions and Exterior Walls: See Structural General Notes.

B. Non-Load-Bearing Interior Partitions: Construction, Stud, or No. 3 grade.
1. Application: Interior partitions not indicated as load-bearing.
2. Species:
a. Western woods; WCLIB or WWPA.

2.2 ENGINEERED WOOD PRODUCTS

A. Parallel-Strand Lumber (PSL): Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559. Members shall conform to ICC ES Report No. ESR-1387 or CCMC Report No. 11161-R.
1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for minimum 12-inch actual depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi.

B. Laminated Strand Lumber (LSL): See Structural General Notes. Members shall conform to ICC ES Report No. ESR-1387 or CCMC Report No. 12627-R.

C. I-Joists: APA-Performance Rated I-Joists (PRI); designations as shown on Structural General Notes . Members shall conform to ICC ES Report No. ESR-1153.
1. Fabricated by bonding stress graded lumber flanges to webs with exterior type adhesive.
2. Flange material: As standard with joist manufacturer.
3. Web material: Oriented strand board or plywood.
4. Manufactured using low-emitting, urea formaldehyde-free binders.
5. Acceptable Manufacturers - Prefabricated Wood I Joists:
a. Weyerhauser.
b. Or approved equal.

2.3 WOOD STRUCTURES, INC.PLYWOOD

A. Provide APA performance rated panels per Structural General Notes.

2.4 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.

1. Preservative Chemicals: Alkaline Copper Quaternary (ACQ) or other preservative acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2.5 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Furring.

B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

2.7 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Simpson Strong-Tie Co., Inc.
2. Or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with requirements of Structural Drawings.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, unless otherwise indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

END OF SECTION

A. Section Includes:
   1. Miscellaneous steel framing and supports.
   2. Metal Mesh
   3. Shelf angles.
   4. Miscellaneous steel trim.
   5. Downspout guards.

SECTION 061001 – MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Lumber.
   2. Treated wood blocking.
   3. Plywood backing panels.
   4. Miscellaneous lumber for support or attachment to other construction.
   5. Sheathing.
   6. Plywood subtops.

1.2 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   4. SPIB: The Southern Pine Inspection Bureau.
   5. WCLIB: West Coast Lumber Inspection Bureau.
   6. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2; Use Category UC2 for interior construction not in contact with ground and Use Category EC3b for exterior construction not in contact with ground, treated with waterborne, inorganic boron (SBX) or other Borate-derived products.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. Wood products treated with Pentachlorophenol are not allowed in interior occupied spaces or in exterior applications where the possibility of human contact exists.
   3. Wood products treated with creosotes are not permitted in any interior or exterior application.
   4. VOC Certification: Verify product’s volatile organic compounds compliance with California Environmental Protection Agency “Test Method 310.”

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:
1. All locations where rough carpentry materials are provided as concealed blocking.
2. Roof construction.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.

B. Grounds and Furring: Construction Grade Douglas Fir or No. 2 White Pine.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD PANELS

A. Plywood Panels: DOC PS 1-07, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
1. Moisture Content: Maximum 15 percent, kiln-dried.

B. Each panel of softwood plywood shall be identified with the APA grade-trademark and shall meet the requirements of PS-1-83 for softwood plywood.
1. Softwood Plywood: DOC PS1, Douglas Fir face species, rotary cut, exterior glue, sanded finish. Provide marine grade at locations subject to moisture.

C. Provide Plywood Panels for:
   1. Telephone and Electrical Equipment Backing Panels.
   2. Handrail Backing Panel.
   3. Blocking for upper cabinets.

2.6 SHEATHING

A. Sheathing: DOC PS1 or DOC PS2, unless otherwise indicated. Each panel of softwood plywood shall be identified with the APA grade-trademark and shall meet the requirements of PS-1-83 for softwood plywood.
   1. Shear Walls: Thickness as needed to comply with requirements specified but not less than thickness indicated on General Structural Notes or Drawings.
   2. Exterior Wall Sheathing: 3/4 inch thickness. OSB is acceptable.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.

Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

C. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 PLYWOOD SUBTOPS

A. Secure to supports as indicated on Drawings.

B. Variation from Level: 1/8 inch in 5 feet maximum.

3.4 PLYWOOD BACKING PANELS

A. Install with the “C” or best face on exposed side.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

3.5 SHEATHING

A. Install sheathing in accordance with Drawings and General Structural Notes and Drawings. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit.
   1. Comply with acceptable recommendations contained in APA Form No. E30K, “APA Design/Construction Guide: Residential and Commercial,” for types of structural-use panels and applications indicated.
   2. Comply with “Code Plus” provisions in above referenced guide.
   3. Install with the “C” or best face on exposed side.
   4. Install wall sheathing with long dimension vertical.
   5. Sheathing shall have edges blocked and nailed for diaphragm or shear wall stresses as shown on the drawings.
   6. Fastening Methods:
      a. Screw to cold-formed metal framing.
      b. Nail to wood framing.
      c. Space panels 1/8 inch apart at edges and ends.

3.6 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.

3.7 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061001

SECTION 061600 – SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Plywood floor sheathing (subfloor).
2. Gypsum wall sheathing.
3. Roof sheathing.

B. Related Sections:
1. 061000 – Rough Carpentry.
a. Plywood subflooring.
2. 072500 – Weather Resistive Barriers.

1.2 EVERGREEN (ESDS) AND ENTERPRISE (EGC) SUSTAINABLE DESIGN REQUIREMENTS

A. Credit 7.1: Use particleboard, plywood, OSB, medium density fiberboard, cabinetry and any other applicable wood products that do not contain added urea-formaldehyde.
1. Documentation: Product data or laboratory test reports indicating that manufacturing adhesives and composite wood products contain no urea formaldehyde.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Plywood: DOC PS 1.

B. OSB and Composite plywood: DOC PS 2.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

A. OSB or Plywood at Contractor’s Option: See Structural Drawings for the following requirements:
1. Span Rating.
2. Nominal Thickness.

B. Plywood Wall Sheathing: Exposure 1, Structural I sheathing.

C. Oriented-Strand-Board Wall Sheathing: Exposure 1, Structural I sheathing.

D. Gypsum Sheathing Board: “Paperless” with siliconized gypsum core.
   1. Acceptable Products:
      a. USG “Securerock”
      b. Georgia-Pacific “Dens-Glas Gold”
      c. BPB America, Inc. “Glas-Roc Sheathing”
   2. Thickness/Width: 5/8 inch thick by 48 inches wide; maximum permissible lengths, except as otherwise indicated.

2.3 ROOF SHEATHING

A. Plywood Roof Sheathing: Softwood veneer plywood meeting PS-1; Exterior, A-D or A-C.

B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1, Structural I sheathing.

C. See Structural Drawings for the following requirements:
   1. Span Rating.
   2. Nominal Thickness.

2.4 FLOOR SHEATHING (SUBFLOOR)

A. OSB or Plywood at Contractor’s Option: See Structural Drawings for the following requirements:
   1. Span Rating.
   2. Nominal Thickness.

B. Plywood Sheathing: Exposure 1, Structural I sheathing.

C. Oriented-Strand-Board Sheathing: Exposure 1, Structural I sheathing.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

2.6 ADHESIVES

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
   1. VOC: Not more than 70 g/l.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum oint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, “Engineered Wood Construction Guide,” for types of structural-use panels and applications indicated.

B. Roof Sheathing: Install with “A”-face down (exposed to view from below):
   1. Wall and Roof Sheathing:
      a. Nail to wood framing.
      b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Interior trim, including non-fire-rated interior door and sidelight frames.
2. Interior paneling.
3. Shelving.

B. Related Requirements:
1. Section 061001 - Miscellaneous Rough Carpentry for furring, blocking, and other carpentry work not exposed to view.
2. Section 099100 – Painting.

1.2 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

C. PVC: Polyvinyl chloride.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples: For each exposed product and for each color and texture specified.

C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

D. Samples for Verification:
1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
2. For foam-plastic moldings, with half of exposed surface finished; 50 sq. in.

3. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Quality Standard:
1. Unless otherwise indicated, comply with the following NAAWS's "Architectural Woodwork Standards," for grades of interior architectural woodwork, construction, finishes, and other requirements.
a. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
b. Grade: Premium, as shown in Interior Finish Legend and Room Schedule.
2. Provide certificates from WI certification program indicating that woodwork, including installation, complies with requirements of grades specified. Certified Compliance:
a. Before delivery to the jobsite the woodwork supplier shall provide a Woodwork Institute Certified Compliance Certificate indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
b. Each elevation of casework and each laminated plastic top, shall bear a Woodwork Institute Certified Compliance Label.
c. At completion of installation the woodwork installer shall provide a Woodwork Institute Certified Compliance Certificate indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
d. All fees charged by the Woodwork Institute for their Certified Compliance program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.

C. Regulatory Requirements: Flame spread and smoke developed shall conform to applicable code requirements for laminates and fire retardant treated wood in accordance with ASTM E84, unless otherwise indicated on the Drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be

stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Softwood Plywood: DOC PS 1.

C. Hardboard: ANSI A135.4.

D. MDF: ANSI A208.2, Grade 130.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC1 or UC2; as applicable.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
   2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
   4. Do not use material that is warped or does not comply with requirements for untreated material.

5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.
    a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
    a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
7. Application: Where indicated in Interior Finish Legend and Room Schedule.

2.3 INTERIOR TRIM

A. Lumber Trim and Molding for Opaque Finish (Painted Finish):
1. Species and Grade: MDO, prefinished.
2. Finger Jointing: Not allowed.
3. Face Surface: Surfaced (smooth).
4. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.
5. Unit base: 1-inch by 4-inch flat stock.
6. Door casing: 2-inch by 3/4-inch flat stock.
7. Bypass trim: 1-inch by 3-inch casing with 1-inch by 2-inch jamb.
8. Interior window trim: GWB wrap on jambs and head. 1-inch thick projected sill.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Paneling Adhesive: Comply with paneling manufacturer's written instructions for adhesives.

D. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.5 FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
1. Interior standing and running trim, except shoe and crown molds.
2. Wood-board paneling.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
   1. Use concealed shims where necessary for alignment.
   2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
   4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF STANDING AND RUNNING TRIM

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
   1. Do not use pieces less than 24 inches long, except where necessary.
   2. Stagger joints in adjacent and related standing and running trim.
   3. Miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
   4. Use scarf joints for end-to-end joints.

5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after gypsum-board joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 INSTALLATION OF PANELING

A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels.
   1. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings.
   2. Install with uniform tight joints between panels.
   3. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners.
   4. Space fasteners and adhesive as recommended by panel manufacturer.
   5. Conceal fasteners to greatest practical extent.
   6. Arrange panels with grooves and joints over supports.
      a. Fasten to supports with nails of type and at spacing recommended by panel manufacturer.
      b. Use fasteners with prefinished heads matching groove color.

3.6 INSTALLATION OF SHELVING

A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
   1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
   2. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
   3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
   4. Remove adhesive that is squeezed out after fastening shelf cleats in place.

B. Install shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

C. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.

D. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

E. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.
   1. Install shelves, fully seated on cleats, brackets, and supports.
   2. Fasten shelves to cleats with finish nails or trim screws, set flush.
   3. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.

3.7 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.
   1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062000

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plywood soffits.

1.2 DEFINITIONS

A. MDO: Plywood with a medium-density overlay on the face.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
   1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples: For each exposed product and for each color and texture specified.

C. Compliance Certificates:
   1. For preservative-treated wood that is not marked with treatment-quality mark.

D. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.

E. Sample Warranties: For manufacturer's warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood panels flat with spacers between each bundle to provide air circulation.
   1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
   2. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
   2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

B. Softwood Plywood: DOC PS 1.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3a.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
   2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
   4. Do not use material that is warped or does not comply with requirements for untreated material.
   5. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
      a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
   6. Application: All exterior plywood soffits.

2.3 EXTERIOR WOOD FOR GATE AT TRASH ENCLOSURE

A. Lumber for Clear Finish:

1. Species and Grade: Western red cedar; NLGA, WCLIB, or WWPA Clear Heart, Grade B.
2. Maximum Moisture Content: 19 percent.
3. Finger Jointing: Not allowed.
4. Face Surface: Smooth.
5. Finish: Clear stain, as approved by Architect.

2.4 PLYWOOD SOFFITS

A. Plywood Type: Exterior, Grade A-B; marine grade plywood.

B. Thickness: 3/4 inch.

C. Face Species: Douglas fir.

D. Pattern: Plain.

E. Surface: Smooth.

F. Finish: Clear sealer stain.
1. Color: As selected by Architect.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
1. For pressure-preservative-treated wood, provide stainless steel fasteners.
2. For applications not otherwise indicated, provide stainless steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Flashing: Comply with requirements in Section 076200 Sheet Metal Flashing and Trim for flashing materials installed in exterior finish carpentry.

D. Insect Screening for Soffit Vents: PVC-coated glass-fiber black fabric, 18-by-14-inch.

E. Continuous Soffit Vents: Aluminum hat channel shape with stamped louvers, 3 inches wide and in lengths not less than 96 inches.
1. Finish: Prefinished Dark Bronze.

F. Sealants: Latex, complying with ASTM C834 and applicable requirements in Section 079200 "Joint Sealants," and recommended by sealant and substrate manufacturers for intended application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
1. Use concealed shims where necessary for alignment.
2. Scribe and cut exterior finish carpentry to fit adjoining work.
3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements.
1. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.5 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

3.6 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wood paneling.
2. Interior trim and molding.
3. Plastic-laminate cabinets and countertops.
4. Closet accessories.
5. Wood handrails.
6. Shop finishing interior woodwork.

B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork, unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature for each type of product indicated, and finishing materials and processes.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, materials, fastening methods, jointing details, and accessories, dimensioned plans and elevations, large-scale details (minimum scale of detail drawings is 1 1/2 inches = 1 foot), attachment devices, and other components.
1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes penetrations through installed architectural woodwork.
3. Drawings are for general intent only. Project contains custom millwork fabrications requiring coordination with additional materials as indicated on Interior Drawings and specified in related specification sections. Millwork fabricator shall submit Shop Drawings indicating intended fabrication of millwork items, including all indicated materials.

C. Samples:
1. Trim and Molding: Submit 2 samples, 12 inches in length, of each type of trim and molding indicated. Samples shall be finished as specified and shall demonstrate expected variation in colors and grain.
2. Laminate: Submit 2 samples, 4x6 inches, of each color of laminate indicated.

D. Product Certificates: Signed by manufacturers of woodwork certifying that products furnished comply with requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Maintenance Data:
   1. Submit methods for maintaining materials and finishes.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

   1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
   2. Installer Qualifications: Manufacturer of products and Licensed participant in AWI's Quality Certification Program.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 – Project Management and Coordination.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

B. Comply with AWS standards for delivery, project humidity levels and acclimation.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Quality Standard: Unless otherwise indicated, comply with the following AWS's "Architectural Woodwork Standards," for grades of interior architectural woodwork, construction, finishes, and other requirements.
   1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
   2. Grade: Custom Grade.
   3. Provide certificates from AWS certification program indicating the woodwork, including installation, complies with requirements of grades specified.

B. Structural Performance: Countertop fabricator shall design countertops, countertop support brackets, and concealed blocking as required to accommodate the following loads:
   1. Dead Loads: Material loads as determined by manufacturer.
   2. Live Loads: Uniform load of 50 lbs/ft; concentrated load of 250 lbs at any location.
      a. Uniform and concentrated loads need not be assumed to act concurrently.

C. Fire-Test-Response Characteristics: Provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
   1. Flame spread and smoke developed shall conform to applicable code requirements for laminates and fire-retardant treated wood in accordance with ASTM E84, unless otherwise indicated on the Drawings.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Sheet Products:
   1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde. Provide Grade MD-Exterior Glue at locations subject to moisture or exterior conditions.
   2. Particleboard: ANSI A208.1, Grade MD. Provide Grade MD-Exterior Glue at locations subject to moisture or exterior conditions. Provide sanded faces for drawer and shelving construction.

C. Wood Trim and Molding:
   1. Quality Standard: Comply with AWS Certification requirements.
   2. Grade: Custom.
   3. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
   4. Wood Species:
      a. Base: Paint Grade, Pre-primed MDF; 4 inch high.
      b. Trim: Paint Grade, Pre-primed MDF; 4 inch wide.
      c. Finger Pine Trim; where indicated.
   5. Wood Types:
      a. Stained Finish:
         1) Species: Solid wood, as indicated on Drawings.
         2) Finish: Stained as shown on Finish Schedule.
         3) Profile: As indicated on Drawings.
      b. Railings: Hard maple, plain sawn.

D. Wood Products: Comply with the following:
   1. Hardboard (WD1): AHA A135.4.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
   3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
   4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

E. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Composite Wood Products: Products shall be made without urea formaldehyde, but in no case shall formaldehyde emission rates be greater than the following when tested according to ASTM D 6007 or ASTM E 1333:
      a. Hardwood Plywood: 0.05 ppm.
      b. MDF More Than 5/16 Inch Thick: 0.11 ppm.
      c. MDF 5/16 Inch or Less in Thickness: 0.13 ppm.
   2. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
   3. Softwood Plywood: DOC PS 1, medium-density overlay.
      a. Wet Areas: Marine grade plywood; APA A-B Marine Grade, medium density overlay.

F. Adhesives:
   1. General: Do not use adhesives that contain urea formaldehyde.
   2. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Wood Glues: 30 g/L.
      b. Contact Adhesive: 250 g/L.

2.3 LAMINATE MATERIALS (PL-1, PL-2, PL-3)

A. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Manufacturer: Provide products indicated on the Drawing "FINISH LEGEND" or comparable products of one the following:
      a. Wilsonart LLC.
      b. Abet Laminati, Inc.
      c. Formica Corporation.
      d. Pionite; Panolam Industries International, Inc.

B. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Vertical Surfaces: Grade VGS.
   3. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish. Hot melt applied.
   4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels, unless otherwise indicated.

C. Materials: for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High pressure decorative laminate.
      a. Edges of Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
      b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade CLS.
   2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
   3. Drawer Bottoms: Thermoset decorative panels.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. See Interior Design Drawings and Finish Schedule.

E. Adhesive for Bonding Plastic Laminate: As recommended by plastic laminate manufacturer to suit application.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

2.5 CABINET HARDWARE AND ACCESSORIES

A. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

B. Frameless Concealed Hinges – (European Type): BHMA A156.9, B01602, 135 degrees of opening self-closing.

C. Pulls:
1. Basis of Design: Delaney bar pulls by Hafele, or approved comparable.
a. Finish: Brushed nickel.
b. Size: 5-1/32 inch.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Shelf Rests: BHMA A156.9, B04013; plastic, two-pin type with shelf hold-down clip.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
1. Box Drawer Slides: 100 lbf.
2. File Drawer Slides: 200 lbf.
3. Trash Bin Slides: 150 lbf.

G. Door and Drawer Silencers: BHMA A156.16, L03011.

H. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. As selected by Interior Designer. See Interior Design Drawings and Finish Schedule.

J. Countertop Support Brackets:
   1. Basis of Design: EH countertop support brackets with rounded edges by Rakks, or approved comparable.
      a. Material: Heavy duty aluminum.
      b. Capacity: Up to 450 pounds per bracket.
      c. Size: 18 inch by 18 inch for counters up to 25 inches deep.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.6 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives:
   1. Do not use adhesives that contain urea formaldehyde.
   2. Adhesive for Bonding Plastic Laminate: Contact cement.
      a. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
   3. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Wood Glues: 30 g/L.
      b. Contact Adhesive: 250 g/L.

2.7 CLOSET AND UTILITY SHELVING

A. Closet Accessories: 12 inch wide wire shelf and rod, white vinyl coated, cut to full length of closet.
   1. Manufacturers:
      a. Shelf Tech Wire Shelving.
      b. Closet Maid “Super Slide.”
      c. Or approved equal.

2.8 WOOD HANDRAILS

A. Handrail Brackets: Cast stainless steel with wall flange drilled for exposed anchor and with support arm for screwing to underside of rail. Size to provide 1-1/2-inch (38-mm) clearance between handrail and face of wall.

B. Handrail/Bumper Rail Brackets: Pairs of extruded-aluminum channels: one for fastening to back of rail and one for fastening to face of wall, assembled in overlapping fashion and fastened together at top and bottom with self-tapping screws. Size to provide 1-1/2-inch (38-mm) clearance between handrail and wall.

2.9 FABRICATION

A. Interior Woodwork Grade: Provide Custom grade interior woodwork complying with the referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

2.10 ACCESSORIES

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, fire-retardant-treated as required, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.11 PLASTIC LAMINATE CABINETS

A. Quality Standard: Comply with AWS Section 10 requirements for cabinets.

B. Basis of Design: MFC Santana Oak, manufactured by An Cuong Wood Working Materials, or approved comparable.

C. Cabinet Construction:

1. Style: Style A, Frameless.
2. Type: Type I, multiple self-supporting units rigidly joined together.
3. Door and Drawer Front Style: Flush overlay.
   a. Reveal Dimension: As shown on Drawings.

D. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

E. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

F. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

2.12 SHOP FINISHING

A. Quality Standard: Comply with AWS Section 5, unless otherwise indicated.
   1. Grade: Provide finishes of same grades as items to be finished.

B. General: Shop finish transparent finished interior architectural woodwork at fabrication shop as specified in this Section.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

D. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
   1. Grade: Custom.
   2. Color: As indicated on Finish Schedule.
   3. Sheen: Semigloss, 55-75 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWS, Custom Grade.

B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces and repair damaged finish at cuts.

D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with recommendations of chemical treatment manufacturer, including those for adhesives used to install woodwork.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
   1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
   2. Install wall railings on indicated metal brackets securely fastened to wall framing.
   3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with appropriate fasteners.

H. Support Bracket Installation:
   1. Provide support brackets at spacing required to accommodate countertop loads. Where typical spacing interferes with lavatory location, revise spacing or add supplemental brackets to accommodate lavatory and loads.
   2. Install flush-mount support brackets to vertical wood stud blocking prior to installation of gypsum board or tile backing panel. Fasten brackets with quantity and type of fasteners as determined by fabricator to achieve full capacity of each support bracket.

3.3 FIELD FINISHING

A. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork.

B. Fill nail holes with matching filler where exposed.

C. Final finishing: As specified in Section 09 91 00 – Painting and Coating.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

C. Protection: Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION 064000

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic sheet paneling.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories.

1.3 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Crane Composites, Inc.
      b. Glasteel.
      c. Marlite.
      d. Newcourt, Inc.
      e. Nudo Products, Inc.
      f. Parkland Plastics, Inc.
   2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E84. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   3. Nominal Thickness: Not less than 0.09 inch.
   4. Surface Finish: Molded pebble texture.
   5. ColorWhite.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels.

B. Adhesive: As recommended by plastic paneling manufacturer.

C. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 - Joint Sealants.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

C. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

3.2 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 066400

SECTION 071413 – HOT FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Protected Membrane.
   2. Detail Membrane.
   3. Surface applied protection board.
   4. Drainage mat components.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Conduct meeting at a location to be determined by architect.
   1. Purpose of Pre-Installation meeting: Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.3 SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins to adjoining waterproofing, and other termination conditions.

C. Samples: For the following products in manufacturer's standard sizes unless otherwise indicated:
   1. Flashing sheet
   2. Membrane-reinforcing fabric
   3. Drainage panel

D. Qualification Data: For qualified Installer.

E. Certificates:
   1. Applicator Certificates: Evidence that applicator selected to apply waterproofing system has applied that system at least five (5) times in the last year, or is certified by the system manufacturer to apply the systems and is eligible to convey manufacturer's system warranty.
   2. Manufacturer Certificates: From each hot fluid-applied waterproofing manufacturer, certifying compatibility of accessory materials with Project materials that connect to or come in contact with the barriers.

F. Sample Warranty: Meet or exceed manufacturer's warranty.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. To be a certified manufacturer approved installer with a minimum five (5) years documented experience installing similar waterproofing membrane system.
      b. Trained and authorized by manufacturer as qualified installer for work of this Section.
      c. Installer to demonstrate five (5) successfully completed projects similar in scope.
   2. Manufacturer:
      a. Company with ten (10) years minimum experience in waterproofing system.
      b. Employ technical representative, available to perform preliminary, intermittent, and final inspection and tests as required to verify watertight application conforming to manufacturer instructions and warranty provisions.

B. Manufacturer's Technical Representative:
   1. Visit the site a minimum of three (3) times:
      a. Start of installation
      b. During the installation of membrane.
      c. Before covering membrane.
   2. Manufacturer to document each site visit in writing with copies sent to the Owner's Representative, Contractor, Building Envelope Consultant, and Architect.

C. Independent Inspection: Inspection service shall produce reports documenting each inspection. Reports shall be made available in a timely manner to the Contractor, installer, material manufacturer, and Architect. Inspections should include substrate examination, beginning of installation, periodic intervals, and final inspection prior to any work covering materials on this Section.

D. Mock-Ups:
   1. Install waterproofing system and requirements to demonstrate surface preparation, crack and termination joint treatment, vertical transition and corner treatment, thickness, and execution quality.
      a. Contractor to arrange for Mock-up review to include Manufacturers' representative, Owners' Representative, and Architect.
      b. If Architect determines mockups do not comply with requirements, reapply waterproofing until mockups are approved.
      c. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
      d. Approved mock-ups may become part of the completed work.
      e. Contractor to prepare and distribute meeting notes within 48 hours of meeting to all parties present.

E. Confirm Substrate Preparation: Conduct adhesion testing of membrane sample in accordance with manufacturer's methods and procedures.

1. Perform testing prior to installation of membrane in the field of the deck.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Conform to applicable provisions of Division 01 and manufacturer's written recommendations.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight, weather, excessive temperatures, and construction operations.

E. Deliver materials in manufacturer's original containers with seals and labels intact.

F. Store rolled materials on end.

1.6 FIELD CONDITIONS

A. Environmental Conditions:
1. Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.
   a. Do not apply waterproofing to a damp or wet substrate.
   b. Do not apply waterproofing when temperature is below 40oF before, during and 24 hours after application.
   c. Do not apply waterproofing in snow, rain, fog, or mist.
2. Maintain adequate ventilation during application and curing of waterproofing materials.

B. Safety and Health Conditions: Conform to waterproof manufacturer's written recommendations.
1. During coating application, protect applicators from breathing vapors or contact of material with skin or eyes.
2. Provide suitable masks or respirators, fabric overalls and neoprene or other resistant gloves. Provide full face mask or OSHA approved protective goggles.

C. Do not install waterproofing until items that penetrate membrane have been installed.

1.7 WARRANTY

A. Manufacturer's Warranty: Upon installation completion and manufacturer acceptance of the work required by this Section, the manufacturer will provide a written manufacturer's standard form agreement to the project Owner, fully transferable to new Owner, non-prorated warranty, covering both materials and labor during specified warranty period without excluding coverage for certain failures.
1. Failures include, but are not limited to, the following:
   a. Adhesive or cohesive failures.
   b. Abrasion or tearing failures.
   c. Surface crazing or spalling.

d. Intrusion of water, oils, gasoline, salt, deicer, chemicals or acids into deck substrate.

2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Waterproofing Membrane: Apply fully-reinforce, monolithic hot applied rubberized asphalt waterproofing membrane with a continuous protection course and continuous drainage mat at horizontal concrete decks and courtyards above occupied spaces including the garage lid, and as otherwise indicated on drawings. Monolithic waterproofing membrane shall be continuous under all curb walls, planter walls, concrete stairs and other landscaping features and should interface continuously with wall assembly and below-grade foundation waterproofing/drainage systems.

2.2 WATERPROOFING MEMBRANE

A. Hot Fluid-Applied Waterproofing Membrane with reinforcing fabric: Single component; 100 percent solids; hot fluid-applied, rubberized asphalt.
   1. Basis of Design: CETCO; Strataseal HR.
      a. Protected Membrane: Fully Reinforced, 215 mils.
      b. Base Coat: CETCO; Strataseal HR
         1) Thickness: Manufacturer written recommended base coat minimum thickness of 90 mils.
      c. Reinforcement Fabric: CETCO; Stratabond 100
      d. Top Coat: CETCO; Strataseal HR
         1) Thickness: Manufacturer written recommended base coat minimum thickness of 125 mils.
   2. Performance Requirements:
      a. Capable of preventing moisture migration to the interior.
      b. Wet mil thickness: 215 mils minimum (not average).
      c. Suitable for installation over concrete substrates.
      d. Water Absorption: Max .35 gram weight gain measured in accordance with CGSB 37.50-M89.
      e. Water Vapor Permeance: Max 1.7 ng/Pa*s* sq. m in accordance with CGSB 37.50-M89 or ASTM E96.

B. Drain Mat: As specified in Section 071700 – Bentonite Waterproofing.
   1. Performance Requirements:
      a. Compressive Strength: 40,000 psf per ASTM D1621.
      b. Thickness: 0.25 inch.
      c. Flow Rate: 150 gpm.
      d. Width Flow Capacity: 7 gpm per ft, per ASTM D4716.

2.3 ACCESSORIES

A. Provide accessories from a single source.

B. Detail Membrane: Used to detail curbs, sills, & penetrations for Protected Membranes.

C. Protection Board: As recommended/approved by Membrane Manufacturer.

D. Drainage mat: Aquadrain G20.

E. Primer: Strataprime SB by CETCO or manufacturer's written recommendation.

F. Sealants: Waterproofing manufacturer's written recommendation.

G. Termination Bars: Aluminum or stainless steel, 14ga 1" minimum width, fastened 8" o.c.

H. Membrane reinforcement:
1. Stratabond 100, non-woven spunbond polyester fabric.
2. N-Flash, uncured neoprene rubber sheet.

I. Rubberized asphalt protection course, RAP 200.

J. Reinforced PMMA liquid flashing: Cetguard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with installation requirements for surface smoothness, surface moisture, and other conditions affecting performance of waterproofing work.

B. Verify that substrates are visibly dry and free of moisture.
1. Test for moisture according to ASTM D4263.
2. Test for moisture content by method recommended in writing by fluid-applied waterproofing manufacturer.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of waterproofing work.

D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by waterproofing manufacturer has passed and after substrates are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

E. Verify expansion and control joints are complete and acceptable to manufacturer.

F. Penetrations through surfaces to be waterproofed: Correctly and rigidly installed, conforming to manufacturer’s written instructions and warranty provisions.

3.2 PREPARATION

A. Prepare all surface in accordance with manufacturer's written instructions.

B. General: Before applying waterproofing membrane, clean and prepare substrates in accord with manufacturer's written instructions to produce clean, dust-free, dry substrate for waterproofing membrane application. Remove projections, fill voids, and seal joints if any, as recommended in writing by waterproofing manufacturer.

C. Remove grease, oil, form-release agent, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Concrete shall be a light broom or board float textured finish. A steel float surface must be sandblasted to roughen the surface to provide a concrete surface profile of ICRI CSP 3-5. Confirm concrete profile with manufacturer and with a field adhesion test.
   1. Scaling, laitance or otherwise unbonded concrete surfaces should be sandblasted from top surface of substrate. Voids, cracks, holes, honeycombs, and other damage to the concrete surface shall be repaired and allowed sufficient cure prior to commencement of membrane installation.

E. Metal surfaces shall be sandblasted or wire brushed to bright metal and painted with a zinc rich primer before application of the membrane.

F. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

G. Mask adjoining surfaces not receiving waterproofing membrane to prevent overspray, spillage, leaking, and migration of coatings. Prevent waterproofing membrane from entering deck substrate penetrations and clogging weep holes and drains

H. Protect adjacent surfaces from work of this Section.

3.3 JOINTS, CRACKS AND TERMINATIONS

A. Review and identify any top side or surface cracks that require reinforcing.

B. Prepare and treat substrates to receive waterproofing membrane, including joints, cracks, deck drains, corners and penetrations according to manufacturer’s written instructions.

C. Install sheet flashings at deck-to-wall transitions, expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 INSTALLATION

A. Membrane:
   1. Conform to fluid-applied membrane manufacturer’s written instructions.

2. Embed reinforcing fabric to waterproofing membrane manufacturer's written instructions.
3. Check thickness using wet film gauge.
4. Start application with manufacturer's authorized representative present.
5. Apply membrane system/assembly over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by waterproofing membrane manufacturer.
6. Cover membrane system/assembly with protection course with overlapped joints before membrane is subject to backfilling, construction, or traffic.

B. Horizontal Drainmat:
1. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 FIELD QUALITY ASSURANCE AND CONTROL

A. Perform Electronic Leak Detection (ELD) over the entire waterproofing membrane installation.

B. Owner shall make arrangements and payments for cost associated with testing the integrity of the waterproofing membrane installation utilizing a proven Electronic Leak Detection (ELD) method as approved by waterproofing manufacturer. The ELD testing method shall be selected and approved prior to waterproofing membrane installation, conducted after waterproofing membrane installation is completed and prior to subsequent assembly materials and/or overburden placement. ELD firm shall document the inspection work and produce reports with digital photographs and site plans recording the inspections. The inspection reports shall be made available in a timely manner to the Installer, General Contractor, Manufacturer, Architect, and Owner.
1. Testing Agency Qualifications
   a. Survey Company Qualifications: Minimum three years' experience in performing roof and/or waterproofing surveys of the same type as specified herein.
   b. Survey Technician to be proficient in all ELD equipment and inspection processes approved for the project.
2. Performance Requirements
   a. Perform ELD testing and survey over the entire waterproofing area in accordance with ASTM D7877.
   b. Achieve a 100% passing test result verifying that the waterproofing is free of defects, breaches, seam voids, and capillary deficiencies at the time of testing. Any repaired areas shall be retested to verify water tightness.

C. For areas to receive ELD testing, the owner's contracted ELD Inspection Service Company shall provide the following:
1. Prior to installation of the waterproofing membrane a complete installation and field testing procedure guideline, as provided by the ELD system manufacturer, shall be provided to the installer, General Contractor, Manufacturer, Architect, and Owner.
2. Thoroughly wet the waterproofing membrane in area of test. Wetting can be accomplished by hand or mechanical spray devices. Membrane must be wet during the

testing procedures. Ponded water is not necessary. Plug all drains and provide barriers necessary to contain water. Allow for overflow to protect the building in the event of rain.

3. Visually inspect and perform ELD testing to locate membrane breaches, if any. Document location of breaches found by the ELD test and visual inspections, and provide reports to the installer, General Contractor, Manufacturer, Architect, and Owner.
4. Repair all breaches found per waterproofing manufacturer's guidelines. When utilizing low-voltage ELD testing, leave the conductor wire grid in place as secured to waterproofing membrane with appropriate access to leads for future testing.
5. Once membrane ELD testing is concluded and all repairs are complete, the membrane shall be immediately protected. General Contractor shall prohibit non-waterproofing construction traffic, activity, and material storage on the tested membrane.

END OF SECTION 071413

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Bentonite waterproofing at foundation walls, elevator pits and other locations indicated on Drawings.
2. Molded-Sheet Drainage Panels.
3. Waterstop.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, and installation instructions.

B. Shop Drawings: Include installation details for waterproofing, penetrations, and interface with other work.

C. Samples: For each of the following products, in sizes indicated:
1. Waterproofing: 6 inches square.
2. Protection Course: 6 inches square.
3. Molded-Sheet Drainage Panels: 6 inches square.
4. Waterstop: 6 inches length.

D. Product Certificates: For each type of waterproofing material.

E. Water Sample Test: Project site water sample supplied to manufacturer by waterproofing contractor to determine type of bentonite system (standard sodium bentonite or contaminate-resistant sodium bentonite) to be utilized on the project.
1. Manufacturer shall conduct test free of charge. Contractor is responsible for collection and shipment of site sample.
a. Collect 72 ounce of water or 3 pounds of soil.
2. In lieu of a site sample, the geotechnical report can be sent to the manufacturer for review, with manufacturer approval. The geotechnical report can act as a preliminary review of the site conditions. Coordinate with the manufacturer if selecting this option to determine if this will be acceptable with the manufacturer.

F. Standard Material Warranty:
1. Manufacturer: Provide manufacturer standard warranty stating that the product will be free from defects in material for a period of five (5) years from the date of completion.

Warranty to be limited to the cost of replacement of defective products or repayment or credit to owner of the purchase price of defective materials.

2. Installer: Provide one (1) year warranty to repair or replace any or all work that is defective. Warranty period to begin from the date of substantial completion.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite waterproofing to be installed according to manufacturer's written instructions and warranty requirements.
   1. Do not apply waterproofing materials to surfaces where ice or frost is visible. Do not apply bentonite waterproofing materials in areas with standing water.
   2. Do not place bentonite clay products in panel or composite form on damp surfaces unless such practice is approved in writing by manufacturer.

PART 2 - PRODUCTS

2.1 GEOTEXTILE/BENTONITE SHEETS

A. Regular Geotextile/Bentonite Sheet: Minimum of 1.0 lb/sq. ft. of bentonite clay granules between two layers of polypropylene geotextile fabric, one woven and one nonwoven, needle punched and heat fused together.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Voltex DS as manufactured by CETCO, a Minerals Technologies company or a comparable product by one of the following:
      a. Miraclay by Carlisle Coatings & Waterproofing Inc.
   2. Grab Tensile Strength: 95 lbf according to ASTM D 4632.
   3. Puncture Resistance: 100 lbf according to ASTM D 4833.

2.2 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced Molded-Sheet Drainage Panels: Composite subsurface drainage panel consisting of studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core, with a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft.
   1. Basis of Design: Aquadrain as manufactured by CETCO.
      a. In Field Wall: Aquadrain X.
      b. At Base of Wall: Aquadrain 100BD.

2.3 WATERSTOP

A. Waterstop: Hydrophilic flexible strip concrete construction joint waterstop that provides a positive seal by expanding upon contact with water.
   1. Basis of Design: Waterstop-RX as manufactured by CETCO.

2.4 ACCESSORIES

A. General: Provide all accessories recommended by the manufacturer for a complete and waterproof assembly, including the following as required:
   1. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 sieve.
   2. Bentonite Mastic: Bentonite compound of trowelable consistency, specifically formulated for application at joints and penetrations.
   3. Bentonite Tubes: Manufacturer's standard 2-inch-diameter, water-soluble tube containing approximately 1.5 lb/ft. of granular bentonite; hermetically sealed; designed specifically for placing on wall footings at line of joint with exterior base of wall.
   4. Termination Bar: Extruded-aluminum or formed-stainless-steel bars with upper flange to receive sealant.
   5. Cement Grout Patching Material: Grout mix compatible with substrate being patched and recommended in writing by waterproofing manufacturer.
   6. Sealants: As recommended in writing by waterproofing manufacturer. Comply with requirements specified in Section 079200 "Joint Sealants."
   7. Tapes: Waterproofing manufacturer's recommended waterproof tape for joints between sheets, membranes, or panels. Provide mechanically attached bentonite tape at center of top of walls where slab to walls intersect.
   8. Adhesive: Waterproofing manufacturer's water-based adhesive used to secure waterproofing to both vertical and horizontal surfaces.
   9. Protection Sheet: 6-mil polyethylene sheet as recommended by manufacturer.
   10. Below-Grade Self-Adhered Membrane (SAM). A 60-mil thick sheet waterproofing membrane compromised of a 4-mil cross laminated polyethylene sheet laminated to a layer of rubberized asphalt compound for use at grade termination as recommended by manufacturer.
      a. Envirosheet by CETCO or Envirosheet LT by CETCO for use in cold weather applications as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations and other conditions affecting performance of bentonite waterproofing.

B. Examine bentonite materials before installation. Reject materials that have been prematurely exposed to moisture.

C. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

C. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of concrete or the effectiveness of waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

D. Excavation Support and Protection System: If water is seeping, use plastic protection sheets or other suitable means to prevent wetting the bentonite waterproofing. Fill minor gaps and spaces 1/8 inch wide or wider with wood, metal, concrete, or other appropriate filling material. Cover or fill large voids and crevices with cement mortar according to manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Prepare substrates, voids, cracks, and cavities; and install waterproofing and accessories according to manufacturer's written instructions.
   1. Before installing, verify the correct side of waterproofing that shall face substrate surface.
   2. Apply granular bentonite around penetrations in horizontal surfaces and changes in plane according to manufacturer's details in preparation for bentonite tubes and mastic.
   3. Apply bentonite tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.
   4. Prime concrete substrates. Primer may be omitted on concrete surfaces that comply with manufacturer's written requirements for dryness, surface texture, and freedom from imperfections.

B. Apply bentonite tubes continuously on footing against base of wall to be waterproofed.

C. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts.

3.4 GEOTEXTILE/BENTONITE SHEET INSTALLATION

A. Install a continuous layer of waterproofing sheets directly against surface to be waterproofed. Lap ends and edges a minimum of 4 inches on horizontal and vertical substrates unless otherwise indicated. Stagger end joints between sheets a minimum of 24 inches. Fasten seams by stapling to adjacent sheet or nailing to substrate.

B. Below Structural Slabs-on-Grade: Place waterproofing sheets on compacted substrate with ends and edges lapped and stapled.

1. Install a layer of waterproofing sheets under footings, grade beams, and pile caps; or continue waterproofing through key joints between footings and foundation walls, and extend a minimum of 8 inches up or beyond perimeter slab forms.

C. Concrete Walls: Starting at bottom of wall, apply waterproofing sheets horizontally against wall. Secure with masonry fasteners spaced according to manufacturer's written instructions. Extend to bottom of footing, grade beam, or wall, and secure.
1. Termination at Grade: Extend waterproofing sheets to underside of concrete slab-on-grade unless otherwise indicated. Secure top edge with termination bar. Apply sealant to top edge of termination bar.

3.5 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.6 WATERSTOP INSTALLATION

A. Prior to installing bentonite panel, ensure that waterstop is installed at, but not limited to, the following:
1. As indicated on Drawings.
2. At vertical-to-horizontal cast-in-place concrete construction joints or cold joints.
3. At vertical-to-vertical cast-in-place concrete construction joints.
4. At vertical and horizontal joints between cast-in-place concrete and shotcrete shoring wall.
5. At penetrations of structural members.
6. At all cold joints exposed to:
   a. Soil.
   b. Weather.
   c. Condensation.
7. To allow minimum concrete coverage on all sides per manufacturer’s written recommendations.
8. Above grade architectural concrete joints.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed waterproofing installation before covering with other construction, and provide written report stating that installation complies with manufacturer's written instructions.
1. Remove and replace applications of bentonite waterproofing where inspection indicates that it does not comply with specified requirements.

END OF SECTION 071700

SECTION 071900 – WATER REPELLENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes penetrating water-repellent treatments for the following vertical and horizontal surfaces:
   1. Masonry Veneer.
   2. Concrete Masonry Units.
   3. Cast-in-place concrete.

1.02 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Attendees: Architect, Contractor, and all subcontractors installing water-repellent and adjacent assemblies, including the following:
      a. Water-repellent subcontractor
      b. Sealant subcontractor
      c. Concrete and unit masonry subcontractor

B. Review requirements for water-repellent products and installation, including surface preparation, substrate conditions, project and manufacturer's details, installation procedures, mockups, testing and inspection requirements, protection and repairs, and coordination and sequencing of water-repellent work with work of other Sections.

1.03 SUBMITTALS

A. Product Data: For each type of product, including:
   1. Technical data indicating compliance with requirements.
   2. Substrate preparation instructions and recommendations.

B. Samples: For each type of water repellent and substrate indicated.

C. Product certificates.

D. Qualification Data: For Installer
   1. Certification of manufacturer’s approval.

E. Product Test Reports: Test data for water-repellent products and system, by qualified testing agency, indicating proposed product meets performance requirements, when requested by Architect.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A manufacturer-approved firm with minimum five years' experience in installation of specified products in successful use on similar projects, employing workers

trained by manufacturer, including a full-time on-site supervisor with a minimum of three years' experience installing similar work, and able to communicate verbally with Contractor, Architect, and employees.

B. Manufacturer Qualifications: A qualified manufacturer with minimum five years' experience in manufacture of water-repellents as one of its principal products.
   1. Manufacturer's product submitted has been in satisfactory operation on five similar installations for at least five years.

C. Mockup: Provide water-repellent mockup installation application as specified in Section “Quality Requirements,” or if not specified, in an area of not less than 4ft by 4ft, on each type of concrete and masonry. Include examples of surface preparation, crack and joint treatment, water repellent application, transition, and termination conditions, to set quality standards for execution. Use the manufacturer’s application instructions. Let protective treatment test area cure before inspection. Keep test panels available for comparison throughout the protective treatment project.
   1. Coordinate schedule with Owner and Architect. Provide minimum 48 hours advance notice so that representatives from each party can attend and observe installation of the mockup.
   2. Provide safe access for observation of the mockup.

1.05 DELIVERY, STORAGE AND HANDLING

A. Accept materials on site in manufacturer's unopened original packaging.

B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.

C. Construction Waste: Store and dispose of packaging materials and construction waste in accordance with requirements of Division 01.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Provide waterproofing products manufactured by **PROSOCO, Inc.,** 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. Email: CustomerCare@prosoco.com, or comparable products of other manufacturer approved by Architect in accordance with Instructions to Bidders and Division 01 General Requirements.

B. Source Limitations: Provide waterproofing system materials and accessory products from single source from single manufacturer.

2.02 PENETRATING WATER REPELLENTS

A. Water-based silicone emulsion with graffiti repellent:
   1. Clear-drying, with 20g/L or less of VOCs
   2. Basis of Design Product: Block-Guard 15, manufactured by Prosoco, Inc.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in representative locations by method recommended by manufacturer.
   2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   3. Verify that required repairs are complete, cured, and dry before applying water repellent.
   4. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

3.02 PREPARATION

A. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet. Follow manufacturer’s written instructions to prepare substrate and water repellant for application.

B. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.

C. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

3.03 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. First coating, General: Follow water-repellent manufacturer’s written application instructions.
   1. Apply coating of water repellent on surfaces to be treated using low-pressure spray to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure.
   2. Spray Application:
      a. Using low-pressure (<50 psi) spray equipment, saturate, “wet-on-wet” spraying from the bottom up. Avoid excessive overlapping.

1) For textured and porous surfaces, apply enough material to create 6 to 8 inch rundown below the contact point.

b. Let first application penetrate masonry surface for 2 to 3 minutes.

1) For textured and porous surfaces, reapply in same saturating manner to ensure complete coverage of recessed surfaces.

c. Immediately brush out runs and drips to prevent build up.

3. Brush or Roller Application:
   a. Saturate uniformly. Let product penetrate for 2 to 3 minutes. Re-saturate. Brush out heavy runs and drips that do not penetrate.
4. Split-faced architectural block and Limestone Veneer:
   a. Saturate from the bottom up. Spray in an "overlapping X pattern" for complete coverage of recessed surfaces. Let the first application penetrate for 2 to 3 minutes. Re-saturate. Less will be needed for the second application.
5. Dense, Smooth Surface Application:
   a. Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. Do not over apply. Over application may cause unacceptable color change. One application is normally enough. Always test for application rate.
6. Precast Concrete and Cast Stone: At Contractor's option, first application of water repellent may be completed before installing units. Mask mortar and sealant bond surfaces to prevent water repellent from migrating onto joint surfaces. Remove masking after repellent has cured.

3.04 PROTECTION

A. Protect installed product from weather and subsequent construction activities during manufacturer’s recommended curing duration, and from construction activities and incidental damage throughout project duration.

3.05 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 071900

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Foam-plastic board insulation.
2. Glass fiber insulation.
3. Mineral-wool board insulation.
4. Mineral-wool fiber insulation.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

C. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

D. Foam insulation: Provide documentation showing compliance with state and federal regulations regarding HFCs.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation (Foundation Insulation): ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
   1. General: Type X, 15 psi.
   2. Perimeter insulation under slabs-on-grade and perimeter foundation wall insulation (supporting backfill) to the limits indicated: Type IV, 25 psi.
   3. Basis of Design: Sopra-XPS by Soprema, or approved comparable.
      a. Above-grade exterior walls: Sopra-XPS 20.
      b. Exterior foundation walls and under slab-on-grade: Sopra-XPS 30.
      c. Insulate masonry cavity walls: Sopra-XPS 25 CW.
      d. Inverted roof: Sopra-XPS 35.
   4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Foamular NGX by Owens Corning.
      b. Styrofoam Brand ST-100 Series XPS by DuPont.
      c. GreenGuard GG25/40/60-LG by Kingspan.
      d. Or approved comparable.

B. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
   1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   2. Labeling: Provide identification mark indicating R-Value of each piece of insulation 12 inches and wider in widths.
   3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Coatings and Waterproofing.
      b. Johns Manville.
      c. R-Max.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Basis of Design: Unfaced Building Insulation by Johns Manville; www.jm.com.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation.
b. Guardian Building Products, Inc.
c. Johns Manville
d. Knauf Insulation.
e. Owens Corning.
f. Or approved equal.

2.3 MINERAL-WOOL BOARD INSULATION

A. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Clip and Rail Systems or Masonry Ties. For use in exterior wall applications between cladding attachment elements such as masonry ties or thermal clips. Provide insulation with a black facer for open joint cladding applications.
      a. Insulation density: 4.5 pcf.
         1) Basis of Design: Cavityrock by ROCKWOOL.
            a) Open Joint Cladding: Cavityrock Black by ROCKWOOL.
         2) RainBarrier 45 by Thermafiber.
            a) Open Joint Cladding: RainBarrier Dark 45 by Thermafiber.
         3) CladStone 45 by JM.
            a) Not for use with UV exposure.
         4) Or approved comparable.
      b. Long screws through furring and insulation or masonry ties. For use in exterior continuous insulation applications where furring attachment is made through the insulation with long screws and relies on the compressive strength of the insulation.
         1) For use with light-weight cladding (<5 psf) – 8.0 pcf insulation density.
            a) Comfortboard 80 by ROCKWOOL: 439 psf at 10 percent deformation.
            b) RainBarrier ci HC by Thermafiber: 475 psf at 10 percent deformation.
            c) CladsStone 80 by JM: 630 psf at 10 percent deformation.
            d) Or approved comparable.

2.4 MINERAL-WOOL BLANKET INSULATION

A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed index of 0, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Basis of Design: Sound and Fire Block Mineral Wool by Johns Manville.
   2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Fibrex Insulations Inc.
      b. Johns Manville
      c. Owens Corning.
      d. Rockwool
      e. Thermafiber
      f. Or approved equal.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
   2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   3. Low-Pressure SPF Products:
      a. Foam Detailing Insulation:
         1) Low expansion foam complying with AAMA 812.
         2) Basis of Design Product: Froth-Pak by Dupont.
         3) Comparable products by one of the following area also acceptable. See Section 016000 - Product Requirements for submittal requirements.
            a) HandiFoam High Density by HandiFoam.
            b) Touch ‘n Foam Professional Low GWP by DAP.
            c) Or approved comparable.
         4) Performance Criteria:
            a) Two-component closed-cell urethane foam with low-expansion pressure, 10 percent flexibility, and 1.75 to 2.0 pounds per cubic foot, suitable for installation adjacent to fenestration,

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrate without damaging insulation and substrate.

C. Adhesively Attached, Spindle-Type Anchors with Washers: Plate formed from perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square, welded to projecting steel spindle with a diameter of 0.105 inch and length capable of holding insulation of thickness indicated securely in position with 1 ½ inch square or diameter self-locking washers complying with the following:
   1. Washers formed from 0.016 inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place.
   2. Where anchors are located in ceiling plenums, provide capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
   1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
   2. Press units firmly against inside substrates.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
      a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.

b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches up either side of partitions.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
5. Where installed on interior face of an exterior concrete wall, seal and tape all joints and terminations.

3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072500 – WEATHER RESISTANT BARRIER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Weather Resistant Barrier (W.R.B.).
   2. Air Barrier.
   3. Rainscreen.
   4. Sill Pan.
   5. Accessories.

B. Conform to relevant local Energy Code requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meeting: Conduct meeting at a location to be determined by architect.
   1. Purpose of Pre-installation Meeting: Review air barrier requirements and W.R.B. installation, penetrations, special details, mockups, air leakage and bond testing, air barrier protection, and work scheduling that covers air barriers.
   2. Attendees to include:
      a. Architect
      b. Contractor
      c. Owner/ Owner Representative
      d. Building Envelope Consultant
      e. Installer
      f. Manufacturer’s Technical Representative
   3. Agenda:
      a. Review schedule
      b. Review substrates
      c. Review mock-up requirements
      d. Review locations
      e. Review details

1.3 SUBMITTALS

A. Product Data: For each type of product.
   1. For W.R.B., include data on air and water-vapor permeance based on testing according to referenced standards.

B. Shop Drawings:
   1. Show details of W.R.B. at terminations, openings, and penetrations.
   2. Show details of S.A.M. applications.
   3. Show details of sheet metal fabrication.

C. Certificates:

1. Applicator Certificates: Evidence that applicator selected to apply air barrier system, has installed that system at least five (5) times in the last year, or is certified by the system manufacturer to apply the systems and is eligible to convey manufacturer's system warranty.
2. Manufacturer Certificates: From each weather resistant and air barrier manufacturer, certifying compatibility of accessory materials with Project materials that connect to or come in contact with the barriers.

D. Qualification Data: For qualified Installer.

E. Evaluation Reports: For water-resistant barrier, from ICC-ES AC38.

F. Manufacturer's Installation Instructions: Indicate installation requirements, special procedures, and conditions requiring special attention.

G. Field quality-control reports.

H. Sample Warranty: Meet or exceed manufacturer's warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Independent Inspection: Inspection service shall produce reports documenting each inspection. Reports shall be made available in a timely manner to the Contractor, installer, and Architect. Inspections should include substrate examination, beginning of installation, periodic intervals, and final inspection prior to any work covering materials on this Section.

C. Mock-Ups:
1. Install W.R.B. during window mockup to demonstrate surface preparation and application workmanship.
    a. Contractor to arrange for Mock-up review by Manufacturers' representative, Owners' Representative and Architect.
    b. If Architect determines mockups do not comply with requirements, reapply W.R.B. until mockups are approved.
    c. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
    d. Approved mock-ups may become part of the completed work.
    e. Contractor to prepare and distribute meeting notes within 48 hours of meeting to all parties present.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Conform to applicable provisions of Division 01 and manufacturer's written recommendations.

1.6 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

A. Manufacturer's Warranty: Upon installation completion and manufacturer acceptance of the work required by this Section, the manufacturer will provide a fully transferable, non-prorated warranty, manufacturer’s standard form agreement to the project Owner covering materials during specified warranty period.
   1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: VaproShield; WrapShield IT Integrated Tape

B. Primary W.R.B. (SA)/ W.R.B. (SA) Liner:
   1. VaproShield; WrapShield IT Integrated Tape (Primary W.R.B.)
   2. VaproShield; WrapShield SA Self-Adhered (W.R.B. SA)
      a. Primary W.R.B. at steel and concrete.

2.2 PERFORMANCE AND DESIGN CRITERIA

A. Weather Resistant Barrier (W.R.B.):
   1. Performance:
      a. ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
      b. Water-Vapor Permeance: Not less than 28 perms (1609 ng/Pa x s x sq. m) per ASTM E96, Method B.
      c. Air Permeance: Not more than 0.0019 cfm per sq. foot at 0.3 in.w.g. (0.009 L/s x sq. m at 75 Pa) when tested according to ASTM E2178.
      d. Allowable UV Exposure Time: Not less than 180 days.
   2. Design:
      a. The building envelope shall be constructed with a continuous, air and water-resistant barrier to control air leakage, avoid condensation in the interior wall assembly and prevent water intrusion.
      b. Joints, penetrations and paths of water and air infiltration shall be made watertight and airtight.
      c. System shall be capable of withstanding positive and negative combined wind, stack and HVAC pressures on the envelope without damage or displacement.
      d. System shall be installed in an airtight and flexible manner, allowing for the relative movement of systems due to thermal and moisture variations.

2.3 ACCESSORIES

A. Liquid Applied Flashing: VaproShield; VaproLiqui-Flash

B. Self-Adhesive Membranes (S.A.M.): See Section 076500 - Self-Adhesive Membrane.

C. Air Barrier Sealant: VaproBond at vertical sheet laps and other areas as air barrier sealant.

D. Wall Sheet Metal Flashings: See Section 076200 - Sheet Metal Flashing and Trim.

E. Screw Head Caps: Mechanically fasten W.R.B. to sheathing.
   1. VaproShield; VaproCaps
      a. Screws: Corrosion-resistant, stainless steel, penetrating through solid backing or steel studs by 3/4 inch.

F. Quickflash Device: Combination HDPE/LDPE flashing panel with integrated weatherproof seal.
   1. Quickflash Weatherproofing Products; Flashing panels to match penetrations as detailed.

G. Shims/ SA Shims: Dimensions as indicated in the Construction Documents.
   1. VaproShield; 1/4” VaproShims SA Self-Adhered
      a. Used behind horizontal furring or as applicable.
   2. Atlas Supply; 1/8” Plastic Horseshoe Shims
   3. Grove Products; 1/8” Grove Structural Shims

H. Rainscreen:
   1. Furring Systems: Furring of all material types to be minimum of 3/4 inch deep.
      a. Furring: Pressure Treated Wood 1x4
   2. Insect Screen: All rainscreen cavities shall have appropriate metal or vinyl mesh strips inserted as shown in the Contract Documents to prevent the entry of debris and insects.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with installation requirements for substrate preparation and other conditions affecting performance of work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of waterproofing work.

C. Proceed with installation only after substrate preparation has been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

B. Protect adjacent surfaces from work of this Section:
   1. Mask adjoining surfaces not receiving waterproofing membrane to prevent overspray, spillage, leaking, and migration of coatings. Prevent waterproofing membrane from entering deck substrate penetrations and clogging weep holes and drains.

C. Clean, prepare, and treat substrates according to manufacturer's written instructions.

D. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

E. Provide medium broom finish on all concrete to be coated. Provide clean uncontaminated surface for new membrane application.
   1. Remove grease, oil, form-release agent, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

3.3 INSTALLATION

A. Primary W.R.B./ W.R.B. Liner:
   1. Cover exposed exterior surface of sheathing with weather resistant barrier securely fastened to framing soon after sheathing is installed.
   2. Cover sheathing with weather resistant barrier as follows:
      a. Apply with 6 inch, horizontal and vertical, overlaps; fasten to sheathing with screw head cap at frequency recommended by W.R.B. manufacturer.
      b. Apply W.R.B to cover vertical flashings and self-adhered membranes with a minimum 3 inch overlap, unless otherwise indicated.
      c. Seal seams, edges, fasteners, and penetrations with Sealant/S.A.M. as specified in the Drawings.
      d. Rough opening liners shall extend from inside the rough opening onto the face of sheathing.
   3. W.R.B. SA shall be used at all steel and concrete substrates.
      a. W.R.B. SA shall be roller applied to substrate.

B. Screw Head Caps:
   1. Install fasteners within maximum spacing, or pattern, indicated by manufacturer.

C. Quickflash Devices:
   1. Select flashing panel required for specific penetration.
   2. Push flashing panel over penetration, with label facing to exterior, to form weather proof seal around penetration.
   3. Seal seams/flanges as indicated in the Drawings.

D. Rainscreen:
   1. Furring: Maintain a continuous open space between water-resistant barrier and exterior cladding to create a drainage plane and shall be used under siding.

a. Fasten in accordance with the Construction Documents.
b. All vertical furring shall maintain a 1 inch gap at butt joints and floor plates.
c. All horizontal furring shall be installed on min. 1/4 inch SA shims.

2. Insect Screen: Install insect screen in cavities preventing the entry of debris and insects. (For vertical furring application.)
   a. Place approximately 50 percent of insect screen behind furring, leaving remainder loose.
   b. Install furring over insect screen.
   c. Lap insect screen over furring.
   d. Fasten insect screen to the face of furring.

3.4 FIELD QUALITY ASSURANCE AND CONTROL

A. Independent Inspection:
   1. Contractor to arrange for Building Envelope Consultant to observe completed installation prior to carrying out subsequent work.
   2. If inspection results show products in this Section does not comply with requirements, remove and replace or repair as recommended in writing by manufacturer.

B. Testing services may be required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with contract document requirements.

C. At no additional cost to Owner, remove and replace Work of this section found to be deficient or incomplete.
   1. Additional testing and inspections, at Contractor's expense, may be required to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

A. In areas where adjacent finished surfaces are soiled by work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their recommendations and instructions. Remove all tools, equipment and remaining product on-site. Dispose of section work debris and damaged product following all applicable regulations.

B. Clean dust, dirt and debris from the surface of W.R.B. prior to installation of furring and/or cladding materials.

3.6 PROTECTION

A. Protect W.R.B. from damage during application and remainder of construction period, according to manufacturer’s written instructions.

B. Cladding shall be installed within W.R.B. UV time limit specified.

END OF SECTION 072500

SECTION 072616 - UNDERSLAB VAPOR BARRIER

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Underslab vapor barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data for each type of manufactured material and product indicated.

B. Product certificates signed by the manufacturer of the products certifying that their products comply with specified requirements.

C. Manufacturer's installation instructions for placement, seaming and pipe boot installation.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Manufacturer's Field Reports: Manufacturer' Representative shall provide Field Reports including project, report date, activity and location, environmental conditions, recommendations, results and acceptance or non-acceptance of on-site conditions.

F. Qualifications: For Manufacturer and Installer.

G. Sustainable Design Requirements: See Section 018113 – Sustainable Building Requirements for Document Instructions and Product Literature.
   1. ESDS 7.12: Vapor Barrier Strategies (M); vapor retarder only.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer with a minimum of 5 years documented experience manufacturing and supplying specified vapor barrier and who also maintains a technical representative to perform testing and inspection on site, to support technical decisions and procedures used.

B. Installer Qualifications: An installer trained and approved by manufacturer as qualified to perform work of this Section with not less than 5 years experience.

C. Field Testing: Provide on site tests patch samples for evaluation of surface preparation techniques and application workmanship.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Handling: Protect materials during handling and installation to prevent damage.

1.5 WARRANTY

A. Manufacturers Warranty: Standard ten year warranty for:
   1. Refund of the verified purchase price paid; or
   2. Replacement of so much of the products as manufacturer deems necessary to repair the damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Stego Wrap 15-mil Vapor Barrier; Stego Industries LLC

2.2 MATERIALS

A. Plastic Vapor Barrier:
   1. Classification: ASTM E 1745, Class A.
   2. Minimum thickness according to ACI 302.2R-06: 15 mils.
   3. Permeance:
      a. Permeance Ratings as per ASTM E-96 or ASTM F-1249
      b. New material: Less than 0.01 perms
      c. After mandatory conditioning as per ASTM E-154 Sections 8, 11, 12, & 13: Less than 0.01 perms

2.3 ACCESSORIES

A. Seam Tape: Water Vapor Transmission Rate: ASTM E 96, 0.3 perms or lower.
   1. 3 3/4 inches, minimum; polyethylene film and acrylic, pressure-sensitive adhesive; Stego Tape, or approved comparable.
   2. 6 inches, minimum; polyethylene film, aperture film and acrylic pressure-sensitive adhesive; Stego Crete Claw Tape, or approved comparable.

B. Vapor Proofing Mastic: Medium-viscosity, water-based, polymer-modified anionic bituminous/asphalt emulsion; Tensile strength, 32 psi per ASTM D412; Stego Mastic, or approved equal.

C. Pipe Boots: Manufacturer’s standard prefabricated pipe boots constructed from vapor barrier material, pressure sensitive tape and/or mastic.

D. Waterstop: As specified in Section 071700 – Bentonite Waterproofing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect or geotechnical firm
   1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 EXAMINATION

A. Examine areas to receive reinforced vapor retarders. Ensure subgrade is smooth, level and compacted with no sharp projections. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected

3.3 INSTALLATION

A. Vapor Barrier: Place, protect, and repair vapor-barrier sheets according to ASTM E 1643 and manufacturer's written instructions.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
   2. Install in largest practical widths.
   3. Lap Vapor Barrier/Retarder over footings or seal to foundation walls.
   4. Overlap Lap joints 6 inches and seal with manufacturers recommended tape.
   5. Do not penetrate vapor barrier except to allow for reinforcing steel and permanent utilities.
   6. Seal all penetrations, including pipes, per manufacturer’s instructions, to create a monolithic membrane between the surface of the slab and moisture sources below and at the slab perimeter.
   7. Tears, punctures and penetrations shall be taped to maintain the moisture vapor resistance integrity of vapor barrier.
   8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.4 FIELD QUALITY CONTROL

A. Manufacturer’ Representative:
   1. Prior to application, verify conditions are acceptable for application.
   2. Make final inspections following installation and prior to concrete pour.
   3. Verify work conforms to manufacturer’s instructions and meets manufacturer’s Warranty provisions prior to installation of concrete.

B. Correct defective work identified by the manufacturer’s representative in accordance with manufacturer’s instructions.
   1. Cost of corrections and subsequent inspections to determine compliance of corrective action shall be at the Contractor’s expense.

3.5 PROTECTION

A. Take precautions when installing reinforcing steel, utilities and concrete not to damage vapor barriers.

END OF SECTION 072616

SECTION 074646 – MINERAL FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes
   1. Wood-fiber cement panel siding.
   2. Wood-fiber cement vented soffit panel.
   3. Wood-fiber cement trim.

1.2 REFERENCE STANDARDS

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM C 1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including fastener patterns.

B. Samples: For each type, color, texture, and pattern required.
   1. Panel: 24 inch wide by 36 inch high sample of panel assembled on plywood backing.
   2. Trim and Accessories: 12 inch long by actual width.

C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

E. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

B. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

C. Mockups: Provide as specified in Section 014500 – Quality Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.6 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace panels that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including cracking, deforming and fading.
   2. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 7 Hunter color-difference units as measured according to ASTM D 2244.
   3. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MINERAL FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested in accordance to ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. James Hardie.
      b. Cemplank.
      c. CERACLAD
      d. CertainTeed Corp.
      e. Nichiha Fiber Cement.
   2. Physical Characteristics: EN 12467 ‘Fiber-cement flat sheets.’
      a. Density Dry: 1500 kg/m3.
      b. Bending Strength at with grain: 32.0 MPa.
      c. Bending Strength at across grain: 22.0 MPa.
      d. Modulus of elasticity at with grain: greater than 16 GPa.
      e. Modulus of elasticity at across grain: greater than 14 GPa.
      f. Hygric movement wet-dry-wet (max), mean: 2.60 mm/m.
      g. Durability classification (EN 12467): Category A.
      h. Strength Classification: (EN 12467): Class 4
      i. Fire reaction (EN 13501-1): A2-s1-d).
      j. Warm Water Test: Ok
      k. Soak Dry test: Ok
      l. Freeze thaw test: greater than 100 cycles.
      m. Thermal conductivity e: 0.4 W/mK.
   3. Fire Testing: ASTM E84.

B. Mineral Fiber-Cement Panels (FCP-1) cement and cellulose fiber; with machined edges.
   1. Basis of Design: James Hardie Building Products, Inc.; www.jameshardie.com; unless noted otherwise.
      a. Panel Siding:
         1) Thickness: 5/16 inch thick
         2) Size: As shown on Drawings.
         3) Texture: Smooth.
         4) Prefinished: Colors as shown on Drawings.
      b. Vented Soffit:
         1) Thickness: 5/16 inch thick.
         2) Width: As shown on Drawings.
         3) Texture: Smooth
         4) Prefinished: Colors as shown on Drawings.
      c. Trim: LP Smart Trim.
         1) Thickness: 3/4 inch thick.
         2) Size: See Drawing Elevation notes for additional trim sizing and details.
         3) Texture: Smooth.
         4) Prefinished: Colors as shown on Drawings.
   2. Finish:
      a. Factory prime one side and all edges with manufacturer's recommended primers.
      b. Painted, Field Finish: Refer to Section 099100 – Painting.

2.2 FURRING

A. Rainscreen Cavity: Install Reveal Panels on a drained and vented rainscreen cavity, with a minimum air cavity, as shown on Drawings.

B. Metal Furring: Galvanized metal hat channels or "Z" furring or 20 gauge steel, 7/8 inch deep, 1 1/2 inch legs, 5 inch total width, unless shown otherwise in assemblies..

C. Wood Furring: Borate treated wood furring; 3/4 inch or greater depth as shown on Drawings; minimum 4 inches wide.

2.3 ACCESSORIES

A. Cladding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by cladding manufacturer for building configuration.
   1. Provide accessories made from same material as adjacent panel.

B. Trim Profile: Reveal Trim, aluminum alloy 6063-T5, 0.050 inch in lengths required for applications as shown on drawings.
   1. Finish for Reveal Trims: Clear anodized; conforming to ASTM B244 and ASTM B136; as recommended by manufacturer.

C. Fasteners: Length as required to penetrate; minimum per manufacturer's recommendations.
   1. Fastener Corrosion Resistance: Provide hot-dip galvanized (HDG) finish, stainless steel, or an equivalent proprietary coating. Fasteners with phosphate and oil coatings (black oxide), zinc electro-plated, or similar should not be used.

D. Weather Barrier: As specified in Section 072500 – Weather Resistant Barrier.

E. Joint Sealer: As specified in Section 079200 – Joint Sealants.

F. Touch Up Paint: As recommended by manufacturer to be compatible with factory finish system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with all terms necessary to maintain warranty coverage.
   2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
   3. Use trim details indicated on drawings.
   4. Touch up all field cut edges before installing.

B. Install through wall flashing trim at bottom of the walls above windows, bay areas, penetrations and every other floor break.

C. Install furring plumb and square. Furring shall be securely fastened to framing in accordance with specified design requirements.
   1. Install metal furring strips in accordance with drawing details.

D. Layout metal trim pieces in accordance with manufacturer’s written instructions.

E. Install panels and related accessories in accordance with manufacturer’s instructions.
   1. Install fasteners no more than 24 inches o.c.

F. After installation, seal all joints. Seal around all penetrations. Paint all exposed surfaces.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 074646

SECTION 075400 - SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fully adhered thermoplastic-polyolefin (TPO) roofing membrane.

B. Insulation, tapered.

C. Cover board.

D. Flashings.

E. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.

B. Coordinate with installation of associated counterflashings installed under other sections.

1.3 SUBMITTALS

A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, fasteners, and cover board.

B. Specimen Warranty: For approval.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and mechanical fastener layout.

D. Samples for Verification: Submit two samples 6 x 6 inches in size illustrating insulation and membrane.

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
   1. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section:
   1. With minimum five years documented experience.
   2. Approved by membrane manufacturer.

D. Moisture Protection: See drawings and details for type, quantity, and location of moisture protection work required. Include all administration, facilities and labor required to furnish the expertise, degree of workmanship, materials and accessories, necessary for the timely and satisfactory integration of the following items into the total building system in compliance with the specifications. The work throughout shall be completed in a manner to assure that no water leakage into the roof system or building results. All details (including metal flashings) relating to the installation of the roof system, shall be approved by the roofing contractor or manufacturer.

E. Contractor's Review: Along with Manufacturer's Data, submit written statement signed by contractor and the roofing subcontractor, stating that the architect's drawings and specifications for roofing and flashing have been reviewed with an agent of the manufacturer of the primary roofing materials, and that he is in agreement that the selected systems for roofing and flashing are proper, compatible, and adequate for the applications shown, and that the conditions and details are not in conflict with the roofing manufacturer's roofing and flashing warranty requirements. Show by copy of transmittal form that copy of statement has been transmitted to roofing manufacturer. (A signed, reviewed copy of the manufacturer's notice of award will satisfy this requirement.)

F. Statement of Application: Upon completion of work, submit a statement signed by contractor and roofing subcontractor, stating that the roofing and membrane flashing comply with these specifications, and that the installation methods comply with the manufacturer's printed instructions and are proper and adequate for the conditions of installation and use.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.6 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C).

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.7 WARRANTY

A. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within 20 years after installation.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. Warranty shall include Inflationary Coverage.
   3. For repair and replacement include costs of both material and labor with no dollar limitation in warranty.
   4. Wind speed Coverage: Roofing Warranty includes coverage of all roof components and installation in wind speeds up to 99 miles per hour. The roofing contractor is responsible for calculations required to achieve the proper uplift requirements for corners, perimeters, and field.
   5. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Materials:
   1. Basis of Design: Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlisle-syntec.com.
   2. Firestone Building Products, LLC; UltraPly TPO: www.firestonebpco.com.
   3. GAF; EverGuard TPO: www.gaf.com.
   4. GenFlex Roofing Systems, LLC; GenFlex TPO: www.genflex.com.

B. Insulation:
   1. As supplied and warranted by roofing membrane manufacturer.

C. Underlayment/Coverboard:
   1. Basis of Design: Georgia-Pacific; DensDeck Prime Roof Board: www.gp.com.
   2. USG; Securock: www.usg.com.

2.2 ROOFING

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over coverboard and insulation, over self-adhered vapor barrier.

B. Roofing Assembly Requirements:
1. Roof Covering External Fire-Resistance Classification: UL Class B.
2. Factory Mutual Classification: Class I and windstorm resistance of IA-90, in accordance with FM DS 1-28.
3. Insulation Thermal Value (R): R-Value of 30, provide insulation of thickness required.

C. Acceptable Insulation Types - Constant Thickness Application:
1. Minimum 6 inches of polyisocyanurate board, install in two layers with staggered seams, shown on Drawings.

D. Acceptable Insulation Types - Tapered Application:
1. Tapered extruded polyisocyanurate board.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. TPO Membrane:
1. Material: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M.
2. Reinforcing: Polyester Scrim.
3. Thickness:
a. Typical: 60 mil, minimum.
b. Where overburden is present: 80 mil, minimum.
4. Sheet Width: Factory fabricated into largest sheets possible.
5. Color: To be selected by Architect from manufacturer's full color range.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Adhesive: As recommended and approved by membrane manufacturer.

D. Flexible Flashing Material: Same material as membrane.

E. Primer: Install over metal flashings and substrate surfaces as required for adhered membrane conditions and seaming as recommended by manufacturer.

2.4 COVERBOARD

A. Cover Board: Glass mat faced gypsum panels, ASTM C1177, fire resistant type, 1/2 inch thick, where indicated.
1. Products:
a. Basis of Design: Georgia-Pacific; DensDeck Prime Roof Board: www.gp.com.
b. USG Securock; Glass-Mat Roof Board: www.usg.com.

2.5 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 2 and with the following characteristics:
   1. Compressive Strength: 20 psi.
   2. Board Size: 48 x 96 inch.
   3. Thermal Resistance: R-value of 30, aged value shall be based upon 15 year time weighted average LTTR (long term thermal resistance).
   4. Board Edges: Square.
   5. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 ACCESSORIES

A. Roofing Expansion Joint Flashing: Same material as membrane or as recommended by roofing manufacturer.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane with metal draw band and sealant at top of boot.

C. Reglets: TPO termination MA Reglet at CMU walls, and manufacturer’s standard, pre-drilled stainless steel or aluminum bars with anchors; or as indicated.

D. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self-adhering.

E. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.

F. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

G. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

H. Insulation Adhesive: As recommended by insulation manufacturer.

I. Sealants: As recommended by membrane manufacturer.

J. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Asphaltic with mineral granule surface or Roofing membrane manufacturer's standard textured and slip-resistant walkway pad.
   2. Size: Manufacturer's standard size(s).
   3. Surface Color: White or yellow.

K. Slip Sheet: Manufacturer’s standard, of thickness required for application.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

B. Do not apply roofing membrane during unsuitable weather.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

F. Coordinate the work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.2 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

3.3 INSULATION

A. Attachment of Insulation: Fully adhered with manufacturer’s recommended adhesive.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.

C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof. Accurately align boards with structure and maintain uniform side and end joints.

F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (450 mm).

H. Do not apply more insulation than can be covered with membrane in same day.

3.4 COVER BOARD APPLICATION

A. Fully adhere in accordance with roofing system manufacturer’s written instructions.

B. Locate edge joints on, and parallel to, deck ribs. Stagger end joints of adjacent lengths of zoof boards. Butt board edges and ends loosely in typical installations. Long, uninterrupted runs (greater than 200 feet) of roof boards may require slight gaping due to thermal expansion.

3.5 MEMBRANE APPLICATION

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
   1. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
   2. Apply roof membrane with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap roof membrane edges and ends and seal seams by heat welding, minimum 4 inches (100 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
   2. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

G. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 8 inches onto vertical surfaces.

2. Fully adhere flexible flashing over membrane and up to counterflashing height and at parapet wall up, across top and down minimum of 2 inches on opposite face.

H. Around roof penetrations, seal flanges and flashings with flexible flashing.
1. Install in accordance with NRCA details and manufacturer’s instructions.

I. Install roofing expansion joints. Make joints watertight.
1. Install in accordance with NRCA details and manufacturer’s instructions.

J. Coordinate installation of roof drains and sumps and related flashings. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

K. Coordinate installation of screws required for roofing and installation so as not to damage any interior mechanical, plumbing, electrical, etc. If damage does occur, Contractor shall repair and/or replace work as acceptable to the Architect at no additional cost to the Owner.

L. Refer to details on drawings and manufacturer's standard details.

3.6 WALKWAY PADS

A. Install walkway pads as per manufacturer's instructions. Space pad joints to permit drainage.

3.7 FIELD QUALITY CONTROL

A. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.8 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.9 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 075400

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.
6. Formed equipment support flashing.
7. Formed overhead-piping safety pans.
8. Metal screen exterior solar shading devices.

B. Related Requirements:
1. Section 061001 - Miscellaneous Rough Carpentry, for wood nailers, curbs, and blocking.
2. Section 077200 - Roof Accessories, for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.

B. Epoxy seam sealer. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counter flashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

D. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

E. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
   1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
   1. Build mockup of typical roof edge, including built-in gutter , approximately 10 feet (3.0 m) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
   1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
   2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
      d. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated on Drawings.

E. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with name of fabricator and design approved by FM Approvals.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. As-Milled Finish: Mill.
   2. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
      a. Color: As selected by Architect from full range of industry colors and color densities.
      b. Color Range: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
   3. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   4. Color: As selected by Architect from manufacturer's full range.
   5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
   1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).
      a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
      b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

         1) Run grain of directional finishes with long dimension of each piece.
         2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

D. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A755/A755M.
   1. Second option in "Surface" Subparagraph below may diminish oil-canning effect. Retain third option only for field painting galvanized-steel sheet. Retain last option only for more uniform weathered appearance of unfinished aluminum-zinc alloy-coated steel sheet.
   2. Surface: Smooth, flat.
   3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

4. Color: As selected by Architect from manufacturer's full range.
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 40 mils thick, consisting of a slip-resistant polyethylene -film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
1. Source Limitations: Obtain underlayment from single source from single manufacturer.
2. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.
4. Basis of Design: Grace Ultra as manufactured by GCP Applied Technologies.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Solder:

1. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

I. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

J. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions.
1. Source Limitations: Obtain reglets from single source from single manufacturer.
2. Material: Stainless steel, 0.0188 inch (0.477 mm) thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:
    a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
    b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
7. Finish: Mill.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
   4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
   5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:
   1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
   2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:
   1. Fabricate nonmoving seams with standing seam coping. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 METAL SCREEN EXTERIOR SOLAR SHADING DEVICES.

A. Basis of Design: McNichols 0.056-inch thick cold rolled steel.
   1. Perforation pattern: 3/16-inch round holes on 5/16-inch staggered centers with 33 percent open area.
   2. Shape: As shown on Drawings.
   3. Size: As shown on Drawings.
   4. Finish: High-performance exterior steel coating system with zinch-rich primer, epoxy intermediate coat, and urethane top coat in custom color as selected by Architect.

B. Performance:
   1. Thermal and wind design per design pressures indicated on Drawings, thickness as required, delegated design.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate round downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
   1. Fabricated Hanger Style: Fig. 1-35A in accordance with SMACNA's "Architectural Sheet Metal Manual."
   2. Manufactured Hanger Style: Fig. 1-34A in accordance with SMACNA's "Architectural Sheet Metal Manual."
   3. Fabricate from the following materials:
      a. Aluminum: 0.024 inch (0.61 mm) thick.
      b. Stainless Steel: 0.0156 inch (0.396 mm) thick.
      c. Galvanized Steel: 0.022 inch (0.56 mm) thick.

B. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.
   2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
   3. Galvanized Steel: 0.028 inch (0.71 mm) thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim,. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.
   2. Stainless Steel: 0.0156 inch (0.396 mm) thick.
   3. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates.
   1. Joint Style: Overlapped, 4 inches (100 mm) wide.
   2. Fabricate with scuppers spaced 10 feet (3 m) apart, to dimensions required with 4-inch- (100-mm-) wide flanges and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
   3. Fabricate from the following materials:
      a. Aluminum: 0.050 inch (1.27 mm) thick.
      b. Stainless Steel: 0.0188 inch (0.477 mm) thick.
      c. Galvanized Steel: 0.028 inch (0.71 mm) thick.

B. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
   1. Coping Profile: Fig. 3-4A in accordance with SMACNA's "Architectural Sheet Metal Manual."
   2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
   3. Fabricate from the following materials:
      a. Aluminum: 0.050 inch (1.27 mm) thick.
      b. Stainless Steel: 0.0250 inch (0.635 mm) thick.
      c. Galvanized Steel: 0.040 inch (1.02 mm) thick.

C. Roof and Roof-to-Wall Transition Expansion-Joint Cover: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.050 inch (1.27 mm) thick.
   2. Stainless Steel: 0.0250 inch (0.635 mm) thick.
   3. Galvanized Steel: 0.034 inch (0.86 mm) thick.

D. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.040 inch (1.02 mm) thick.
   2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
   3. Galvanized Steel: 0.028 inch (0.71 mm) thick.

E. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.
   2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
   3. Galvanized Steel: 0.022 inch (0.56 mm) thick.

F. Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.
   2. Stainless Steel: 0.0156 inch (0.396 mm) thick.

3. Galvanized Steel: 0.022 inch (0.56 mm) thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch (0.477 mm) thick.
2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
3. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.

H. Roof-Drain Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.0156 inch (0.396 mm) thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.0156 inch (0.396 mm) thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill,[**jamb,**] and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Aluminum: 0.032 inch (0.81 mm) thick.
2. Stainless Steel: 0.0156 inch (0.396 mm) thick.
3. Galvanized Steel: 0.022 inch (0.56 mm) thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:
1. Aluminum: 0.040 inch (1.02 mm) thick.
2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
3. Galvanized Steel: 0.028 inch (0.71 mm) thick.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.0188 inch (0.477 mm) thick.
2. Galvanized Steel: 0.028 inch (0.71 mm) thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:
1. Stainless Steel: 0.0250 inch (0.635 mm) thick.
2. Galvanized Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lap joints not less than 2 inches (50 mm).

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
   1. Lap horizontal joints not less than 4 inches (100 mm).
   2. Lap end joints not less than 12 inches (300 mm).

C. Self-Adhering, High-Temperature Sheet Underlayment:
   1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
   2. Prime substrate if recommended by underlayment manufacturer.
   3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
   4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
   5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
   6. Roll laps and edges with roller.
   7. Cover underlayment within 14 days.

D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lapp joints not less than 4 inches (100 mm).

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
   1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder.
   3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
   4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
   5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
   6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
   8. Do not field cut sheet metal flashing and trim by torch.
   9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
   1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
   2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
   3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
   1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel and aluminum sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.
a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.
6. Stainless Steel Soldering:
a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
7. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
8. Copper-Clad Stainless Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Downspouts:
1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

C. Parapet Scuppers:
1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

2. Anchor scupper closure trim flange to exterior wall and solder to scupper.
3. Loosely lock front edge of scupper with conductor head.
4. Solder exterior wall scupper flanges into back of conductor head.

D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper discharge.

E. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch (600-mm) centers.
    b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.

2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).
4. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

C. Reglets: Installation of reglets is specified in Section 033000 "Cast-in-Place Concrete."

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:
1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans:
1. Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings.
2. Pipe and install drain line to plumbing waste or drainage system.

3.8 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.10 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 076500 - FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes: Elastomeric flashing for concealed flashing for the following locations:

1. Surrounding windows, door and other opening.

2. Additional locations as indicated on Drawings.

1.2 SUBMITTALS

A. Manufacturer's Product Data: Submit current catalog data, including typical details and other technical data pertaining to flexible flashing products.

B. Manufacturer's Installation Instruction: Submit current installation instructions and recommendations for applications as on Project.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Waterproofing underlayment shall be listed by the governing model code authority, as evidenced by a current ICBO Evaluation Service (ICBO ES) Research Report or CABO National Evaluation Service Report (NER), as acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened packaging with all labels intact.

B. Storage and Protection: Comply with manufacturer's instructions and recommendations. Protect products from freezing and hot temperatures. Store only as much material at point of use as required for each day's work.

PART 2 - PRODUCTS

2.1 ELASTOMERIC WALL FLASHING

A. Basis of Design: Perm-A-Barrier Wall Flashing manufactured by GCP Applied Technologies, 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

1. Acceptable Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:

a. GCP Applied Technologies.

B. Self-adhering waterproofing membrane with a cross laminated high density polyethylene film laminated to an aluminum foil, coated on one side with a high temperature butyl adhesive.

1. Acceptable Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:

a. Protecto Seal 45 Butyl by Protecto Wrap.

b. Perm-A-Barrier Ultra Wall Membrane and Flashing by GCP Applied Technologies.

c. Or approved equal.

2. Thickness: 40 mils excluding removable release liner.

C. Self-Adhering Waat

PART 3 - EXECUTION

3.1 INSTALLATION OF ELASTOMERIC WALL FLASHING

A. Installation of Elastomeric Wall Flashing: Comply with manufacturer's instructions and recommendations, to suit conditions of the project, for preparation, installation and finishing of elastomeric/wall flashing. Self-adhering membrane to lap shingle style with building paper of metal flashing to direct water away from building.

1. Apply surface conditioner to substrate surfaces, as required by elastomeric flashing manufacturer. Allow surface conditioner to dry before proceeding with elastomeric flashing installation.

2. Precut pieces of elastomeric flashing to facilitate handling.

3. Remove release paper and position elastomeric flashing carefully before placing against substrate.

4. When properly positioned, place elastomeric flashing again substrate and press firmly into place by hand roller or blunt object such as back utility knife. Ensure that flexible flashing is fully adhered to substrate to prevent water from migrating up under flashing.

5. Overlap adjacent pieces minimum 2-inches and roll all overlaps with steel hand roller or blunt object.

6. Trim bottom edge of elastomeric flashing back ½-inch from exposed face of building.

7. At heads, sills and other horizontal terminations of flashing, turn up ends minimum of 2-inches, cut and make careful folds to form a pan and seal with elastomeric mastic as recommended by flashing manufacturer.

B. Sealing: Apply bead or trowel coat of elastomeric mastic along top edges, seam, cuts and penetrations. Seal all penetrations through elastomeric flashing.

3.2 INSTALLATION OF WINDOW FLASHING

A. Attach flashing in accordance with manufacturer's recommendations.

B. Refer to Drawing details for window flashing installation.

3.3 PROTECTION

A. Protection: Perform protective measures as recommended and required by elastomeric flashing manufacturer, to prevent mechanical damage and deterioration from ultra-violet (sun) exposure.

END OF SECTION 076500

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof hatches.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
   4. Required clearances.

E. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
   1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes or roof expansion joints.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 METAL MATERIALS

A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
   1. Mill Finish: As manufactured.

B. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
   1. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, elastomeric siliconepolymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.4 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.
   1. Basis of Design: Bilco Type F-50TB, thermally broken, roof scuttle.
   2. Manufacturers: Subject to compliance with requirements, substitute products by one of the following will be considered:
      a. Bilco Company (The).
      b. J. L. Industries, Inc.
      c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      d. Nystrom.
      e. O'Keeffe's Inc.

B. Type and Size: Single-leaf lid, size indicated on the Drawings.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum sheet, 0.090 inch thick.
   1. Finish: Mill.

E. Construction:
   1. Insulation: Polyisocyanurate board.
   2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
   3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   4. Curb height to be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
   5. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
   2. Hinges: Manufacturer’s recommended type.
   3. Hold open arm with vinyl-coated handle for manual release.
   4. Latch: Upon closing, engage latch automatically and reset manual release.
   5. Manual Release: Pull handle on interior and exterior.
   6. Locking: Padlock hasp on interior.

H. Ladder Safety Post: Steel, zinc coated, safety post.
1. Install on alternating tread ladder below hatch cover. Device shall be designed with a telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be controlled by a stainless-steel spring balancing mechanism. Unit shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's instructions.

2.5 MISCELLANEOUS MATERIALS

A. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Examine openings at expansion joint condition, including surfaces of wall and roof deck, for suitable conditions where expansion joints will be installed.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:
   1. Install roof hatch so top surface of hatch curb is level.
   2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

D. Pipe Support Installation: Install pipe supports so top surfaces are in contact with and provide equally distributed support along length of supported item.

E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 077600 – ROOF PAVERS AND PEDESTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete Paver Units.
   2. Adjustable Pedestals.

B. References:
   1. ASTM – American Society for Testing and Materials:
      a. ASTM C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
      b. ASTM C1782 – Standard Specification for Segmental Concrete Paving Slabs.

1.2 SUBMITTALS

A. Product Data: Manufacturer's current specification, catalogue cuts, installation instructions and material safety data sheets for the safe handling of the specified materials and products.

B. Shop Drawings: Manufacturer's drawings and details indicating perimeter conditions, relationship to adjoining materials and assemblies, expansion and control joints, concrete paver layout, patterns and color arrangement, and installation details.

C. Samples:
   1. Pavers: Four (4) for each type and color.
   2. Accepted samples become the standard of acceptance for the Work.

D. Testing results from independent testing laboratory.
   1. Compressive strength of concrete pavers.
   2. Chemical and physical composition of sand used for the project.

E. Manufacturer's Certification.

F. Installer Certification

1.3 QUALITY ASSURANCE

A. Testing Agency: Provide testing for compliance of paving unit requirements to ASTM C936.

B. Installer Qualifications:
   1. Provide current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
   2. Installer must have completed minimum 5 projects of similar size and complexity. Provide job references including Owner/Client/General Contractor names and phone numbers.

C. Source Quality Control: All pavers shall come from a single manufacturer and from the same batch.

D. Mock UP:
1. Install 4 ft. x 4 ft. paver area.
2. Use this area as the standard by which the work will be judged.
3. Subject to acceptance, mock-up may be retained as part of the finished work.
4. If mock-up is not retained, remove and properly dispose of mock-up.

1.4 DELIVERY, STORAGE AND HANDLING

A. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, type and name, address and telephone number of manufacturer.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by fork lift or clamp lift.
3. Unload pavers at job site in such a manner that no damage occurs to the product.

C. Storage and Protection:
1. Store materials protected such that they are kept free from mud, dirt, and other foreign materials.
2. Protect materials from staining or chipping. Replace damaged or defective stones at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Elevated Roof Paver System on Pedestal complying with the following:
1. Pedestals supported on a foam roof surface have a minimum foam density of 60 psi, unless otherwise more stringent per manufacturer.
2. Paver system complies with the fire life safety review requirements.
3. Paver to Pedestal connection shall be as follows: Mechanical interlock or mechanical fastener between the pavers is provided. The mechanical interlock or fasteners are capable of engaging adjacent pavers. The pedestals shall be mechanically or adhesively connected to the paver or interlock mechanism.
4. Pedestal is not attached to the roof surface and allowed to slide freely.

B. Paver system meets wind uplift requirements as specified on Structural Drawings.

2.2 CONCRETE PAVERS

A. Description: System specified shall be used with pedestrian traffic only with all four sides of a deck system designed to restrain and contain the decking panels with perimeter blocking or walls. Decking panels shall not be allowed to move laterally.

B. Basis of Design: Abbotsford Texada HydraPressed Slabs by Abbotsford Concrete Products.
1. Color: As selected by Architect.
2. Size: 24 inch x 24 inch x 2 inch.
3. Finish: Manufacturer's standard light shot-blast architectural finish.

C. Concrete Paver Units: Comply with material standard in ASTM C1782.
1. Concrete Strength: 8,000 psi.
2. Water Absorption (ASTM C140): 5% maximum.
3. Fluxural Strength: 725 psi when tested in accordance with A231.1-19, ASTM C1782.
4. Center Point Load Test of Pedestal-supported Slab: 1800 lbs.

2.3 PAVER PEDESTALS

A. Paver Pedestals: Adjustable paver pedestals for support of elevated roof pavers, capable of supporting corners of four different paver units above the roof surface, with raised spacer tab to align edge of paver unit. Pedestal will provide for water drainage under paver units and prevent paver units from moving out of position. Tabs shall be constructed with removable tabs or with scored tabs to allow pedestal tabs to be broken in half for support of two paver units and in quarter for a single unit end corner. Made from recycled polypropylene.
1. Product: BlackJack Pedestals.
a. Approved Manufacturers:
1) VERSADJUST Adjustable Deck Support Pedestal by Bison Innovative Products.
2) AWS Pedestals.
2. Height: Variable height units 2 1/4 inches to 36 inches vertical adjustment, as required to maintain level paver surface above roof, maintaining clearance over roof drains.
3. Compressive Strength: 1,250 lbs per pedestal.
4. Integrated Base Levelers: 0-1/2 inch per foot slope.
5. Contain 20% Post-Industrial Recycled material.

B. Accessories: Include manufacturer's recommended accessories, for providing a secure deck.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions meet requirements prior to installation of interlocking concrete paver system. Notify the architect of unsatisfactory conditions prior to proceeding.

B. Inspection: Inspect all pavers to be clean and free of foreign materials before installation.

3.2 PREPARATION

A. General: All membrane and protection board surfaces to receive pedestals shall be broom clean, frost free, and free of dirt, oil or any rough foreign matter, which may impair the TPO membrane manufacturer’s warranty or protection requirements.

3.3 PAVER INSTALLATION

A. Review roof membrane surface in areas to receive pavers and paver support pedestal system. Clean and prepare surface for installation according to roofing system manufacturer's written instructions.

B. Establish accurate lines, levels, and pattern required for location of paver grid alignment and final level.

C. Roof Paver Pedestals: Install pedestals in accordance with manufacturer’s written instructions, and in accordance with Shop Drawing layout. Coordinate locations with roof drains and other roof penetrations.
   1. Set pavers in adhesive recommended by paver manufacturer and approved by roofing manufacturer as compatible with roof membrane.

D. Roof Pavers: Install roof pavers on pedestal system, engaging all corners securely on pedestal top, and sides of pavers at perimeter conditions.

E. Provide perimeter containment on all sides of paver system as required by pedestal manufacturer.

F. Cut pavers as required to fit at perimeter conditions, and around column, wall, and similar penetrations through paver deck surface. Maintain uniform gap at perimeter and penetrations, matching spacing of joints between typical paver units.

3.4 PROTECTION

A. Protect Installed products until completion of project.

B. Touch-up, repair or replace damaged products prior to Substantial Completion.

END OF SECTION 077600

SECTION 078400 - FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a.

B. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems; 2007 (Reapproved 2011).

C. ASTM E2837 - Standard Test Method for Determining Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2011.

D. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

E. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

F. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Underwriters Laboratories Inc.; 2004.

G. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.3 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance ratings, and limitations.

B. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Installer Qualification: Submit qualification statements for installing mechanics.

1.4 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated and ASTM E814.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Penetration Firestopping systems shall bear classification marking of a qualified testing agency.

a. UL: “Fire Resistance Directory.”
b. Intertek Group: “Directory of Listed Building Products.”
c. FM Global: “Building Materials Approval Guide.”

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
1. With minimum 3 years experience installing work of this type.

1.5 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 - PRODUCTS

2.1 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
1. A/D Fire Protection Systems Inc: www.adfire.com.
2. 3M Fire Protection Products: www.3m.com/firestop.
3. Hilti, Inc: www.us.hilti.com.

B. Firestopping: Any material meeting requirements.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.2 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

B. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.3 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E814 that has F Rating equal to fire rating of penetrated assembly and T Rating Equal to F Rating and that meets all other specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Solvent-release-curing joint sealants.
6. Backer Rods.

B. Related Sections:
1. Section 092900 - Gypsum Board for sealing perimeter joints.
2. Section 093000 - Tiling for sealing tile joints.
3. Section 095113 - Acoustical Panel Ceilings for sealing edge moldings at perimeters with acoustical sealant.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.

2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

D. Qualification Data: For qualified Installer.

E. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

F. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

H. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer. All exterior building sealants shall be provided by the same manufacturer.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years.

B. Special Manufacturer's Warranty for High Performance Sealants: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 20 years.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Comply with ESDS measure 6.01a; all adhesives and sealants must have VOC content less than or equal to the thresholds provided by the SCAQMD Rule 1168 (dated 10/6/2017).

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 790.
    b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    c. Pecora Corporation; 890.
    d. Sika Corporation, Construction Products Division; SikaSil-C990.
    e. Tremco Incorporated; Spectrem 1.

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 786 Mildew Resistant.
    b. GE Advanced Materials - Silicones; Sanitary SCS1700.
    c. Pecora Corporation; 860.
    d. Tremco Incorporated; Tremsil 200 Sanitary.

C. Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses NT, G, and A.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 999-A.
    b. GE Advanced Materials - Silicones; Contractors SCS1000.
    c. Pecora Corporation; 860.
    d. Tremco Incorporated; Proglaze.
2. Joint-Sealant Color: Clear.

D. Field Painted Sealant:
1. Products: Subject to compliance with requirements, provide one of the following:
    a. SikaFlex by Sika.
    b. Contractors Paintable Sealant CPS by Dowsil.
    c. Dyomic FC by Tremco.

E. Metal Flashing Laps, Brick, Aluminum:
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dowsil; 795.
    b. GE SCS 2000 SilPruf.
    c. Tremco Spectrum 2.

F. Air Barrier Sealant:
1. Dowsil 758 at interior air barrier sealant at window and door perimeter and as exterior air barrier sealant.
2. Refer to Section 072500 – Weather Resistant Barrier, for sealant at air barrier sealant sheet laps.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. BASF Building Systems; Sonolastic SL 1.

b. Pecora Corporation; Urexpan NR-201.
c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
d. Tremco Incorporated; Vulkem 45SSL.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolastic NP1.
b. Pecora Corporation; Dynatrol I-XL.
c. Sika Corporation, Construction Products Division; Sikaflex - 1a.
d. Tremco Incorporated; DymonicFc.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolac.
b. Pecora Corporation; AC-20+.
c. Schnee-Morehead, Inc.; SM 8200.
d. Tremco Incorporated; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. General: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product shall be non-hardening and permanently flexible, effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

B. Acoustical Joint Sealant:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; AC-20 FTR
b. Tremco; Acoustical Sealant
c. USG Corporation; SHEETROCK Acoustical Sealant

C. Fire Rated Acoustical Joint Sealant:
1. Products: Subject to compliance with requirements, provide one of the following:
a. Hilti; CP 506
b. Pecora; AC-20 FTR
c. Metacaulk 150+

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: Provide sealant backings of material and type that are non-staining, are compatible with joint substrates, sealants, primers, and other joint fillers, and are

approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.
2. Extruded closed cell polyurethane, neoprene or vinyl foam backer rod as required to maintain proper sealant geometry per sealant manufacturer.
3. Size: Diameter of backer rod shall be 1/3 times greater than width of joint where it is to be installed or as otherwise recommended by manufacturer of backer rod.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after

cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Final Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces; Traffic Grade, Urethane Joint Sealant.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Joints in paving units, including steps.
      c. Joints between different materials listed above.
      d. Other joints as indicated.
   2. Urethane Joint Sealant: Single component, pourable, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces; Silicone Joint Sealant, Neutral-Curing.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in cement plastering (stucco) wall and soffit surfaces.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
      f. Control and expansion joints in ceilings and other overhead surfaces.
      g. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces; Traffic Grade, Urethane Joint Sealant.
1. Joint Locations:
   a. Isolation joints in cast-in-place concrete slabs.
   b. Control and expansion joints in paving.
   c. Control and expansion joints in tile flooring.
   d. Other joints as indicated.
2. Urethane Joint Sealant: Single component, pourable, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces; Urethane Joint Sealant.
1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
   e. Other joints as indicated.
2. Urethane Joint Sealant: Single-Component, Nonsag, Urethane Joint Sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical drywall surfaces and perimeter joints in drywall; Latex Joint Sealant.
1. Joint Locations:
   a. Interior non-moving exposed sealant joints in gypsum drywall construction
   b. Perimeter joints between interior wall surfaces and frames.
   c. Other joints as indicated.
2. Latex Joint Sealant: Acrylic Latex Joint Sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces; Mildew-Resistant, Silicone Joint Sealant.
1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Other joints as indicated.
2. Joint Sealant: Single component, nonsag, mildew resistant, acid curing silicone.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Two-sided butt-glazed interior glazed walls; Silicone Joint Sealant, Acid-Curing.
1. Joint Locations: Two-sided butt-glazed glazed interior walls.
2. Joint-Sealant Color: Clear.

H. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Acoustical joints where indicated.
      b. Other joints as indicated.
   2. Joint Sealant:
      a. Acoustical Sealant
      b. Fire Rated Acoustical Sealant in rated partitions.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel doors.
2. Steel door frames.
3. Steel Side Lite and Transom frames.
4. Fire-rated door and frame assemblies.

B. Related Sections:
1. Section 081400 – Wood Doors and Frames
2. Section 087100 – Door Hardware.
3. Section 088000 – Glazing: Glass incorporated into metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

A. Product Data: Submit elevations or each type of door and frame indicated, including door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
1. Fire Rated Doors and Frames: Submit installation instructions identifying the hardware products, other materials and work requirements necessary to maintain compliance with Positive Pressure Fire Tests of Door Assemblies.

B. Shop Drawings: Include the following:
1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

D. Rated Assemblies: For each type of hollow-metal door and frame assembly, provide test reports performed by a qualified testing agency.

1.4 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. Single Source: Provide doors and frames from a single manufacturer.

C. Fire-Rated Door Assemblies:
1. Assemblies shall comply with NFPA 80 or UL requirements and shall be listed and labeled by a qualified testing agency for fire protection ratings indicated.
a. Test Pressure: Test at atmospheric pressure.
b. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.
2. Listing and Labeling: Comply with the following:
a. Fire-Rated Label: Doors designated as "20 minute" or greater require labeled frames.
b. Labels on doors and frames shall be permanent type.
1) "Stick-on" type labels are not acceptable.
2) Embossed frames are not acceptable.
3) Labels must be visible after installation, on hinge edge of doors.

D. Mockups: Provide as specified in Division 01 – Quality Control.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection as required to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames at building site under cover. Place in stacks of 5 units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Non-vented plastic or canvas shelters shall not be used for cover. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to avoid metal to metal contact and to permit air circulation. Do not store in a manner that traps excess humidity.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:

1. Basis of Design: Ceco Door Products; a United Dominion Company.
2. Curries Company.
3. Kewanee Corporation (The).
4. Republic Builders Products.
5. Steelcraft; a division of Ingersoll-Rand.
6. Or approved equal.

2.2 MATERIALS

A. Steel Sheets:
   1. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.
   2. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
   3. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

B. Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Exterior: Level 2 and Physical Performance Level A (Extra-Heavy Duty), 16 gauge cold-rolled steel.
      a. Model 1 – Full Flush door with standard edge seams.
   2. Interior: Level 2 and Physical Performance Level B (Heavy Duty), 18 gauge cold-rolled steel.
      a. Model 1 – Full Flush door with standard edge seams.

C. Frames: Conforming to ANSI A250.8/SDI100
   1. Frames: Fire-rated where noted.
      a. Steel Thickness:
         1) Frames at Doors less than 48 inches wide: 14 gauge.
         2) Frames at Doors 48 inches and wider: 12 gauge.
         3) Frames at Interior Doors: 16 gauge.
      b. Exterior: Provide flange on exterior side of frame for air barrier integration.
   2. Reinforced and prepared for finish hardware.

D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
   1. Interior: Resin-impregnated kraft/paper honeycomb.
   2. Exterior: Polyurethane or Polystyrene.
   3. Fire Rated: As required to provide fire-protection ratings as indicated on drawings.

E. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.
   1. Glazing Beads: Minimum 20 gauge steel.
   2. Glazing: As specified in Section 088000 – Glazing.
   3. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

F. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

G. Door Gasketing: BHMA A156.22
1. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
a. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
b. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
c. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
2. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
3. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
a. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
4. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UBC Standard 7-2.
5. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
6. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

H. Plaster Guards: Provide 0.016-inch- thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

I. Supports and Anchors: Fabricated from 18 gauge, electrolytic zinc-coated or metallic-coated steel sheet.

J. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.

K. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

L. Mineral-Fiber Insulation: As specified in Section 072100 – Thermal Insulation.

2.3 FRAME ANCHORS

A. Jamb Anchors:
1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
3. Postinstalled Expansion Type for In-Place Concrete: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.4 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

C. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

D. Reinforce top and bottom of doors horizontally by 16 gauge steel channels, full width, spot welded to each face at least 3 inches on center. Bevel edge of lock stile.

E. Accurately mortise doors for locks and hinges. Provide adequate box type reinforcement with steel plates welded to the interior reinforcing channels and drilled and tapped. Provide reinforcement for all other items of hardware.

F. Doors and Frames:
1. Fabricate doors, panels, and frames, drip caps and other accessories from metallic-coated steel sheet.
2. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 16 gauge, metallic-coated steel channels with channel webs placed even with top and bottom edges.
3. Secure drip cap to frame of exterior doors.
4. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

H. Frame Construction: Fabricate frames to shape shown.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Fabricate frames with mitered and continuously welded corners and seamless face joints.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) 60 inches high: 3 anchors per jamb
      2) 60 to 90 inches high: 4 anchors per jamb.
      3) 90 to 96 inches high: 5 anchors per jamb.
      4) 5 anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) 2 anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
   b. Compression Type: Not less than 2 anchors in each jamb.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
   1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.

J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

K. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

L. Openings: Reinforce openings in doors for lites and vents on all sides with 14 gauge steel channel.

2.5 VISION LITES

A. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

B. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- thick steel sheet.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.

2.6 FINISHES

A. Shop Finishing:
   1. Clean frames by degreasing process and apply thorough coating of primer, covering inside and outside surfaces, to receive paint finish as specified in Section 099100 - Painting.
   2. Galvannealed Frames: Coat welds and other disrupted surfaces with zinc-rich paint containing not less than 90 percent zinc dust by weight.

B. Field Finishing: As specified in 099100 – Painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, signed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install steel doors, frames, accessories, plumb, rigid, properly aligned and according to Shop Drawings, manufacturer's and data.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 or HMMA 840.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-protection-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Concrete Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
5. In-Place Concrete Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Coordinate installation of frames to allow for solidly filling space behind frames with grout at locations indicated. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
   3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 - Glazing and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's representative shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with Positive Pressure Fire Tests of Door Assemblies and requirements of IBC (current edition). Fire rated doors (including frames and hardware as a unit) which do not comply with shall be removed and replaced at no additional cost to Owner.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in Section 099100 – Painting.
1. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 081113

SECTION 081215 – PREFINISHED KNOCK-DOWN STEEL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire-rated and non-fire prefinished steel door frames for interior applications where indicated, including sidelites where indicated.

B. Related sections:
   1. Section 081400 – Flush Wood Doors and Frames.
   2. Section 087100 - Door Hardware.
   3. Section 088000 – Glazing.

1.2 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently reference herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):
   1. ASTM 366 – Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

1.3 SUBMITTALS

A. Product Data: Submit product data, including manufacturer’s SPEC-DATA product sheet, for specified products.
   1. Submit manufacturer’s product data showing details of design and construction and printed instructions covering installation.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish and textures.
   1. Indicate frame elevations, reinforcement, anchor types, and spacings and location of cutouts for hardware.

C. Samples: Submit selection and verification samples for finishes.
   1. Submit sample of each door frame type.

D. Quality Assurance Submittals: Submit the following:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Certificates: Product certificates signed by the manufacturer certifying materials comply with specified performance characteristics and physical requirements.
   3. Manufacturer’s Instructions: Manufacturer’s installation instructions.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

B. Regulatory Requirements: Fire rated steel frames shall be of the types tested and approved by a testing agency that is acceptable to regulatory agency having jurisdiction. Fire rated steel frames shall bear labels of testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Build mockup of each type of steel frame in typical wall area as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials on manufacturer’s original, unopened, undamaged containers with identification labels intact:
   1. Factory package door frame individually with surfaces protected against shipping and handling damage until time of installation.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and temperature conditions recommended by manufacturer.
   1. Store frames in dry, protected area off ground. Do not cover with tarp. Do not create a moisture chamber over product in storage.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress schedule to avoid construction delays.

PART 2 - PRODUCTS

2.1 PREFINISHED STEEL DOOR FRAMES

A. Basis of Design Manufacturer: Timely Industries, Inc. Contact: 102411 Norris Avenue, Pacioma, California 91331-2292; Telephone (800) 247-6242, (818) 896-3094; Fax (818) 899-2677.

B. Frames: Non-rated and fire rated frames. Classic frame “C” series; 18 gauge. Unmarked, primed for field painting.
   1. Standard Duty Frames: SDK A250.4, Level C.
   2. Fire Rated Frames: See Door Schedule, match doors.
      a. Include Timely TA-46 Weather Strip/Smoke Seal. Color to be selected from Manufacturer’s list.

C. Casings: Manufacturers’ standard profile as listed below. Provide casings with corner alignment clips.

D. Standard Casings: TA-8 Steel Casing, pre-primed, field painted.

2.2 MATERIALS

A. Frame Members: Form interior door frames of ASTM A366 commercial quality cold rolled steel.
   1. Sidelite frames: 18 gauge.

B. Provide manufacturers standard hardware reinforcing for surface applied hardware including backing for door intruder guard at residential unit entry doors.

2.3 FINISHES

A. Door frames and sidelites.
   1. Primed for field painting.

B. Touch-up: Provide aerosol touch-up for after-installation, on-site repair as recommended by manufacturer.

C. Casings: Same as door frame finish.

PART 3 - EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously

B. installed under other sections, are acceptable for product installation in accordance with the manufacturer’s instruction
   1. Verify rough opening sizes and wall thicknesses are acceptable.
   2. Verify finish hardware requirements for each opening; verify frame reinforcement, preparation and anchorage. Verify requirements and coordinate with door and hardware supplier.

3.3 INSTALLATION

A. Steel Door Frames:
1. Install frames plumb and square, per shop drawings and manufacturer's printed instructions. Verify opening and dimensions with the shop drawings. Use door as a template to insure proper alignment and clearances.
2. Install frames over finished walls and anchor through faces in structure as indicated on drawings.
   a. Comply with manufacturer's recommendations for fasteners every 11" (279mm) minimum.
3. Secure frame to wall with appropriate type fasteners. Install casing on the frame.
   a. Anchor frame with one drywall-type screw adjacent to each casing clip.
   b. Use actual door opening to ensure proper alignment and clearances.
4. Align parts with proper clearances to ensure proper fit, tight miters and performance requirements.
5. Install silencers on interior door frames.
6. Adjust strike plate to hold door tight to stops when closed.

B. Final Inspection
1. Inspect each opening for operation, hardware, appearance and installation. Make required adjustments.
2. Replace frames defective under terms of manufacturer's warranty.

3.4 CLEANING AND PROTECTION

A. Cleaning: Remove temporary coverings and protection of adjacent work areas.

B. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

C. Protection: Protect installed product's finish surfaces from damage during construction.
1. Repair or replace all damaged or defective frames.

D. Touch-up all damaged areas of factory applied finishes with aerosol spray cans the same as is used in the factory.

END OF SECTION 081215

SECTION 081400 - WOOD DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Exterior wood doors.
2. Solid-core wood doors.
3. Hollow-core wood doors.
4. Fire-rated wood door frames.
5. Shop priming wood doors.
6. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data for each type of door, including details of core and edge construction and trim for openings.

B. Shop Drawings: Submit drawings showing schedule of doors indicating location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; including stiles, rails, panels, moldings and sticking, location and extent of hardware blocking and other pertinent data. Note discrepancies between the Drawings and door schedules, and the requirements of regulatory and testing agencies. Include the following:
1. Dimensions of doors for factory fitting.
2. Locations and dimensions of mortises and holes for hardware.
3. Undercuts.

C. Fire Rated Doors: Submit installation instructions identifying the hardware products, other materials and work requirements necessary to maintain compliance with UL 10 (c) (positive pressure testing as required by IBC for Fire Tests of Door Assemblies).

D. Samples: Submit corner sections of doors, approximately 8 inches by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
1. Wood Veneer: Submit samples, 8 inches x 10 inches, for each material and factory applied finish.
2. Frames for Light Openings: 6 inches long, for each material, type and finish required.

E. Product Certificates: For each type of door, from manufacturer.

F. Sample Warranty: For special warranty.

G. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with the Architectural Woodwork Standards.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

D. Coordination: Contractor shall be responsible for coordinating and obtaining necessary information from Hardware and hollow metal frame Manufacturers. Door Manufacturer shall be responsible for coordinating necessary information received by Contractor from Hardware and hollow metal frame Manufacturers in order that doors shall be properly prepared to receive hinges and hardware. Contractor shall provide door supplier with approved frame schedule, hardware schedule, and hardware templates a minimum of 60 days prior to desired delivery date of doors.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons or as required to protect door edges and faces.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

D. Store doors flat and protect from construction activity, dirt, and exposure to sunlight.

E. Handling:
1. Always handle doors with clean hands or gloves.
2. Do not drag doors across one another.
3. Maintain factory packaging or other means of protection on doors, until date of Substantial Completion.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inchsection, within specified warranty period.
1. Warranty shall also include removal of defective door, hanging, installation or hardware and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
    a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Quantum Windows & Doors
2. Algoma Hardwoods Inc.
3. Eggers Industries; Architectural Door Division
4. Lynden Door, Inc.
5. Mohawk Flush Doors, Inc.
6. Marshfield Doors Systems
7. Vancouver Door

2.2 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

2.3 DOOR CONSTRUCTION

A. General: Provide AWS Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. AWS Performance Grade: Custom Grade, per Section 9.
1. Heavy Duty unless otherwise indicated.

C. Thickness: As specified on Drawings.

D. Interior Doors Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

E. Exterior Doors:
1. Basis of Design: Wood door with full height glazing by Quantum Windows and Doors.
    a. Species: Clear vertical grain, douglas fir.
    b. Finish: Stained.
    c. Color: As selected by Architect.
    d. Glazing: As specified in Section 088000 – Glazing.

F. Interior Doors:
1. Material: Solid-Core: MDF.
    a. Core:
        1) Solid-Core: Either glued wood stave or structural composite lumber.

2) Hollow-Core: Expanded honeycomb core with 5 inch cell and 3 inch particle board lockblocks.

2. Fire Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   a. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   b. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

G. Exposed Surfaces:
   1. Grade: Custom.
   2. Veneers: Species, cut and match to be selected. Stained or opaque to be determined.
      a. Opaque Finish: Provide the following for paint grade doors:
         1) Faces: Medium-density overlay or MDF. ANSI A208.2, Grade 150 or 160.
            a) Apply medium density overlay to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
   3. Exposed Vertical and Top Edges: Any closed-grain hardwood.

2.4 HARDWARE

A. Door Gasketing: BHMA A156.22
   1. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
      a. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
      b. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
   2. Air Leakage: Not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
   3. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
   4. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
   5. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

2.5 FIRE-RATED WOOD DOOR FRAMES

A. Interior Frames:
   1. Architectural Woodworks Standard: Custom.

B. Wood Species and Cut: Match species and cut indicated for wood doors unless otherwise indicated. Pine, finger-jointed, is allowed. MDF is not allowed.

C. Profile: As indicated on Drawings.

D. Construction: Solid lumber, fire-retardant particleboard, or fire-retardant medium density fiberboard (MDF) with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Drawings.

2.6 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads, unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: As selected by Architect.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048 inch thick, cold-rolled steel sheet; and approved for use in doors of fire-protection rating indicated.
   1. Transparent or Stained Doors: Baked enamel or powder coated finish.
   2. Opaque Finish Doors: Factory primed for paint finish.

C. Glazing: As specified in Section 088000 – Glazing.

2.7 FABRICATION

A. Face Veneers, Crossbands and Backers: When wood veneer or medium density overlay faces are specified, doors shall be 5 ply, made up of a face veneer, crossbanding and a core unit, all securely bonded together utilizing type 1 (fully waterproof) adhesive and the hot press assembly technique. All plies must be placed at right angles to adjacent plies. Face veneers shall have a minimum thickness of 1/50 after factory sanding and the individual pieces of veneer forming the face veneer must be spliced or edge glued together

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated.
   1. Comply with requirements of NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 – Glazing.

2.8 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces and edges of doors, including cutouts, with one coat of wood primer to receive paint finish.
   1. Field finish as specified in Section 099100 – Painting.

2. Color: As selected by Architect from manufacturer's full range.

2.9 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent or stained finish.

C. Transparent (Stained) Finish: As indicated on Finish Schedule or selected by Interior Designer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Section 087100 – Door Hardware.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
   2. Bevel doors 1/8 inch in 2 inches at lock and hinge edges.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Doors that are cut or planed for fitting shall be immediately resealed with a transparent wood sealer. Doors shall operate freely without sticking or binding, without hinge-bound conditions and with hardware installed, properly adjusted and functioning.

F. Site Finishing:

1. Field Finish: Provide as specified in Section 099100 - Painting and in accordance with Door Manufacturer's written instructions

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely. Adjust for smooth and balanced door movement in accordance with manufacturer’s instructions.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

3.4 CLEANING

A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION 081400

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Access doors and frames for walls and ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for vertical access doors and frames.
   2. ASTM E 119 or UL 263 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
      a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
   3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bilco Company
   2. J. L. Industries, Inc.
   3. Karp Associates, Inc.
   4. Larsen's Manufacturing Company.
   5. Milcor Limited Partnership.
   6. Nystrom Building Products Co.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Wall and ceiling surfaces.
   2. Door: 14 gauge thick sheet metal, set flush with exposed face flange of frame.
   3. Frame: Minimum 16 gauge thick sheet metal with 1 inch wide, surface-mounted trim.
   4. Hinges: Spring-loaded concealed pin type.
   5. Door and Frame Dimensions:
      a. Fire-rated: 16 inches by 16 inches.
      b. Non-rated: 18 inches by 18 inches.

6. Lock: Dual-action handles with key lock.

C. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Lock: Dual-action handles with key lock.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For cylinder lock, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083213 – FOLDING ALUMINUM-FRAMED GLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes folding aluminum-framed glass doors.

1.2 SUBMITTALS

A. Product Data: Manufacturer's descriptive data and product attributes for each type of product indicated. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings: For folding aluminum-framed glass doors. Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and the following:
   1. Mullion details for fenestration combinations including reinforcement and stiffeners.
   2. Joinery details.
   3. Expansion provisions.
   4. Glazing details.
   5. Accessories.

C. Samples: For each type of folding aluminum-framed glass door indicated.
   1. Include similar Samples of hardware and accessories involving color selection.

D. Qualification Data: For qualified Installer.

E. Certificate of Compliance: Certification that installed products meet specified design and performance requirements.

F. Maintenance Data: For finishes, operable panels, and operating hardware to include in maintenance manuals.

G. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company experienced in performing work of this section that has specialized in installation of work similar in scope and complexity required for this project for a minimum of two (2) years.

B. Mockup: One full sized system unit. Approved mockup may remain as part of the Work.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.4 PRE-INSTALLATION CONFERENCE

A. Convene a conference, by phone, approximately two weeks before scheduled commencement of the Work. Attendees will include Architect, Contractor and trades involved. Agenda will include schedule, responsibilities, critical path items and approvals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations. Store products in manufacturer's original unopened packaging, covered to protect factory finishes from damage, precipitation, and construction dirt until ready for installation. Store materials off construction grounds in a secure location that is a dry, covered area and protected from weather conditions.

B. Inspect and report any freight damages to the manufacturer immediately.

C. Protect from damage due to weather, excessive temperature, and construction operations.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Perform structural silicone sealant work when air temperature is above 10 degrees F (minus 12 degrees C). 40 – 120 degrees F (4-49 degrees C) is ideal.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Provide folding aluminum-framed glass doors capable of complying with performance requirements indicated, based on testing manufacturer's folding doors that are representative of those specified.

B. AAMA/WDMA/CSA Performance Requirements: Provide folding aluminum-framed glass doors of performance indicated that comply with AAMA/WDMA/CSA 101/I.S.2/A440 unless more stringent performance requirements are indicated.
   1. Performance Class: CW40.
   2. Structural Performance: Provide doors capable of withstanding the following, including wind loads based on passing the Uniform Load Structural Test of the applicable AAMA standard:
      a. Maximum Rate: 0.1 cfm/sq.ft. of area at an inward test pressure of 6.24 psf.

C. Forced-Entry Resistance: Conform to AAMA 1304.

D. Life-Cycle Testing: Tested according to and complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Tested to 250,000 cycles.

E. Thermal Transmittance of Door Assembly: Maximum U-value of 0.36 Btu/sq. ft. per hour per degree F, tested to NFRC 100.

F. Air Infiltration: Maximum 0.05 CFM/sq. ft., tested to ASTM E283 and NFRC 400 at 6.24 PSF.

G. Water Penetration: No uncontrolled water leakage, tested to ASTM E547 and E331 at 10 PSF.

H. Structural Performance: Pass L/175 deflection at 50 PSF positive and 40 PSF negative, tested to ASTM E330.

I. Sound Transmission Class (STC): 33 to 36, tested to ASTM E1425.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Palisades S90 by C.R. Laurence Co., Inc.; or a comparable product as approved by Architect.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B221. Provide alloy and temper recommended by folding aluminum-framed glass door manufacturer for strength, corrosion resistance, and application of required finish. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.

B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive for SC 3 severe service conditions and compatible with members, trim, hardware, anchors, and other components of folding aluminum-framed glass doors. Comply with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for folding aluminum-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Provide aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel reinforcing members that are noncorrosive for SC 3 severe service conditions and that comply with AAMA/WDMA/CSA 101/I.S.2/A440; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated folding doors, provide folding aluminum-framed glass door manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.4 ALUMINUM BI-FOLD/PIVOT DOOR

A. Door Operation: Bifolding, bottom rolling, outward folding.

B. Size and Configuration: As shown on drawings.

C. Frame and Panel Profile:
1. Aluminum extrusions, center glazed, thermally broken.
2. System Depth: 3 1/2 inches.
3. Sightline: 4 3/4 inches.
4. Rail: 1 7/16 inches.
5. Sill: Flush.
6. Compensating channels and adjustable spacers.
7. Adjustable roller height. Plus or minus 1/16 inch.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock folding aluminum-framed glass doors. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze.
1. Hardware Finish: Stainless Steel.

B. Roller Assemblies: Provide movable panels with adjustable-height roller assemblies, complying with AAMA 906, consisting of self-lubricating, dual tandem manufacturer's standard nylon or steel ball-bearing rollers; with two roller assemblies per panel.

C. Threshold and Sill Track: Provide extruded-aluminum threshold and track of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior; with manufacturer's standard finish.

D. Lock: Install manufacturer's keyed multipoint locking mechanism on each movable panel. Adjust locking device to allow unobstructed movement of the panel across adjacent panel in the direction indicated.
1. Keying System: As directed by Architect.

E. Hinges: Provide manufacturer’s standard concealed hinges.

2.6 FABRICATION

A. Fabricate folding aluminum-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate folding aluminum-framed glass doors that are reglazable without dismantling panel framing.

C. Factory-Glazed Fabrication: Glaze folding aluminum-framed glass doors in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

D. Weatherstrip operable sash and frame.

E. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and with glazing system indicated. Provide glazing stops to match panel frames.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
1. Color: Dark bronze, anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight folding aluminum-framed glass door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.

B. Install folding aluminum-framed glass doors level, plumb, square, true to line, without distortion, warp or rack of frames and panels, or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

D. Install folding aluminum-framed glass doors and components to drain condensation, water penetrating joints, and moisture migrating within doors to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112, Section 5.12 "Dissimilar Materials."

3.3 TOLERANCES

A. Maximum Variation from plumb or level: 1/32 inch in 3 feet or 1/16 inch in any 10 feet, whichever is less.

B. Maximum misalignment of members abutting end to end: 1/32 inch.

C. Sealant space between system and adjacent construction: 3/8 inch plus or minus 1/8 inch.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure.

C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

D. Clean aluminum surfaces immediately after installing folding doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, and clean surfaces.

E. Clean glass immediately after installing folding aluminum-framed glass doors. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

G. Protect folding door surfaces from contact with contaminating substances resulting from construction operations. During construction, monitor folding door surfaces adjacent to and below exterior concrete and masonry surfaces for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact folding door surfaces, remove contaminants immediately according to manufacturer's written instructions.

H. Refinish or replace folding aluminum-framed glass doors with damaged finishes.

I. Replace damaged components.

END OF SECTION 083213

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Insulated overhead doors at trash room entrance and service doors.

1.2 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
   1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Rated capacities, operating characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Samples: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
   1. Include similar Samples of accessories involving color selection.

D. Qualification Data: For qualified Installer.

E. Seismic Qualification Certificates: For overhead coiling doors, accessories, and components, from manufacturer.

F. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.
   2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and meeting the acceptance criteria of DASMA 108.
   3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
   4. Operability under Wind Load: Design overhead coiling doors to remain operable under uniform pressure (velocity pressure) of 20 lbf/sq. ft. wind load, acting inward and outward.

B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 MANUFACTURERS

A. Basis of Design: Cornell Iron Works, Inc.

B. Manufacturers:
   1. Cookson Company.
   2. Lawrence Roll-Up Doors, Inc.
   3. Mahon Door Corporation.
   4. McKeon Rolling Steel Door Company.
   5. Overhead Door Corporation.
   6. Wayne-Dalton, a Division of Overhead Door Corporation.

2.3 INSULATED SERVICE DOOR

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

B. Curtain R-Value: R-8.

C. Door Curtain Material: Steel front panels.
   1. Mounting: Interior face mounted.
   2. Nominal Slat Size: 3 inches wide x 15/16 inches deep x required length; as shown on Drawings.
   3. Slat Profile: Flat.
   4. Insulated-Slat: CFC-free and HCFC-free polyurethane, fully encapsulated.
   5. Finish: Manufacture’s standard Powder Coat.
      a. Color: As selected by Architect.

D. Curtain Jamb Guides: Galvanized steel; provide track and guides as recommended by manufacturer to suit loading required and clearances available.

E. Hood: Galvanized steel.

1. Shape: As shown on Drawings.
2. Mounting: As shown on Drawings.

F. Operation: Manufacturer's standard overhead door electric motor operation.
1. Operation cycles: Rated for not less than 20,000 cycles.

G. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: As selected by Architect from manufacturer's full range of colors.

2.4 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.

2.5 CURTAIN ACCESSORIES

A. Weatherseals: Equip each insulated exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
1. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
1. Provide pull-down straps or pole hooks for doors more than 84 inches high.

2.6 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.7 ELECTRIC MOTOR OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

B. Electric Operators:
1. Motor Rating: 1/3 hp; continuous duty.
2. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
3. Controller Enclosure: NEMA 250, Type 1.
4. Opening Speed: 12 inches per second.
5. Brake: Adjustable friction clutch type, activated by motor controller.
6. Manual override in case of power failure.
7. Retractable Cord.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
1. 24 volt circuit.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Finishes:
1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

D. Steel and Galvanized-Steel Finishes
1. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
a. Color: As selected by Architect and approved by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior storefront framing.
   2. Window Framing.
   3. Manual-swing entrance doors and door-frame units.

B. Related Sections:
   1. Section 084113.13 – Fire-Rated Aluminum Framed Entrances and Storefronts.
   2. Section 088000 – Glazing.

1.2 SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
   4. For aluminum exterior shades: Include plans, elevations, sections, blade angles, blade spacing and attachments to system.

C. Samples for Initial Selection: Provide 12-inch-long samples for units with factory-applied color finishes.

D. Samples for Verification: Provide 12-inch-long samples for each type of exposed finish required.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Qualification Data: For Installer.

G. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

H. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

I. Field quality-control reports.

J. Sample Warranties: For special warranties.

K. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.4 WARRANTY

A. Manufacturer’s Material Warranty: Manufacturer and/or Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration created by wind and thermal and structural movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.
      a. Installer: One year from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   2. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Noise or vibration created by wind and thermal and structural movements.
      d. Loosening or weakening of fasteners, attachments, and other components.
      e. Failure of operating units.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
      a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

D. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      a. Per NFRC 400, maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
   2. Swinging Entrance Doors:
      a. Single Doors: Maximum air leakage of 0.20 cfm/sq. ft. per NFRC 400 or 0.30 cfm/sq. ft. of fenestration or door area when tested in accordance with AAMA/WDMA/CSA 101/I.S. A440 at 6.24 psf.
   3. Venting Windows: Whole window air leakage of not more than 0.3 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
   2. Maximum Water Leakage: According to AAMA 501.1 No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

I. Energy Performance: See Drawing Sheet A10.10 for energy performance requirements.

J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.
   1. Outdoor-Indoor Transmission Class - Minimum 26

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
   2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
      a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
      b. Low Exterior Ambient-Air Temperature: 0 deg F.
      c. Interior Ambient-Air Temperature: 75 deg F.

2.2 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Basis of Design:
      a. Exterior Storefront Framing: Trifab VG-451UT manufactured by Kawneer.
      b. Interior Storefront Framing: VG450 manufactured by Kawneer.
   2. Construction:
      a. Exterior Framing Construction: Thermally broken.
      b. Interior Framing Construction: Nonthermal.
   3. Glazing System: Retained mechanically with gaskets on four sides.
   4. Glazing Plane: Center
   5. Finish: Dark Bronze.
   6. Fabrication Method: Field-fabricated stick system.
   7. Steel Reinforcement: As required by manufacturer.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Venting Windows:
   1. Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/I.S.2/A440, with self-flashing mounting fins, and as follows:
      a. Basis of Design: Dual action AA4325 Series manufactured by Kawneer.
      b. Window Type: Awning project-in.
      c. Minimum Performance Class: AW.
      d. Minimum Performance Grade: 80.
      e. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
         1) Cam handle locking system.
         2) Multi-point locking system.
         3) Steel or bronze operating arms.
         4) Limit Devices: Concealed friction adjustor and adjustable stay bar limit devices designed to restrict sash opening.
            a) Limit clear opening to 4 inches (100 mm) for ventilation; with custodial key release.
      f. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
      g. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit, complying with SMA 1004 or SMA 1201, and as follows:

1) Glass-Fiber Mesh Fabric: 18-by-16 0.0445-inch-by-0.0515-inch (1.1-by-1.3-mm) or 18-by-14 0.0445-inch-by-0.0624-inch (1.1-by-1.5-mm) mesh of PVC-coated, glass-fiber threads, woven and fused to form a fabric mesh; complying with ASTM D3656/D3656M.

h. Glazing: Same as aluminum-framed entrances and storefront glazing.

i. Finish: Match aluminum-framed entrances and storefront finish.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Medium Stile, Thermal Storefront Doors AA-424 by Kawneer for manual swing operation, or approved comparable.

1. Door Construction: 1 3/4 inch overall thickness with minimum 3/16-inch (4.76-mm) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
   a. Stiles: 5”; unless otherwise specified.
   b. Bottom Rail: 10”; unless otherwise specified.
      1) Exterior Doors:
         a) Thermally Broken.
         b) Glass at exterior door vision lights to be 1” clear insulated tempered glass.
      2) Interior Doors:
         a) Non-thermal.
         b) Glass at interior doors to be clear tempered single light.
2. Door Design: Medium stile.
   a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and performed gaskets.
   a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 – Door Hardware.

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:
   a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion.
   b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

2.6 GLAZING

A. Glazing: Comply with Section 088000 - Glazing.
   1. Storefront Glazing Coating: As specified in Section 088000 – Glazing.

B. Glazing Gaskets: Manufacturer's standard, replaceable, sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
   1. Color: As selected by Architect from manufacturer’s full line.

2.7 MATERIALS:

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   3. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   4. Structural Profiles: ASTM B 308/B 308M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.8 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior for vision glass.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing per manufacturers instructions.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 - Glazing.

G. Install weatherseal sealant according to Section 079200 - Joint Sealants, and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of three tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
   2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
      a. Perform a minimum of three tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.
   3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 084113

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SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Fire resistive framing system.

B. Related Sections:
1. Section 013300 – Submittal Requirements for Shope Drawings, Product Data and Samples.
2. Section 081113 – Hollow Metal Doors and Frames.
3. Section 087100 – Door Hardware.
4. Section 088000 – Glazing.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
2. ASTM E152 Methods of Fire Tests of Door Assemblies.
3. ASTM E163 Methods for Fire Tests of Window Assemblies.
4. ASTM E2074 Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
5. ASTM E2110-1 Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
6. ASTM E283-04 Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
7. ASTM 547-00 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference.
8. ASTM E331-00 Standard Test Method for Metal Curtain Walls and Doors by Uniform Static Air Pressure Difference.
9. ASTM E330-02 Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
10. ASTM F588-04: Test Method for Resistance of Window Assemblies to Forced Entry Excluding Glazing.

B. National Fire Protection Association (NFPA):
1. NFPA 80 Fire Doors and Windows.
2. NFPA 251 Fire Tests of Building Construction and Materials.
3. NFPA 252 Fore Tests of Door Assemblies.
4. NFPA 257 Fire Tests of Window Assemblies.

C. Underwriters Laboratories, Inc. (UL):
1. UL 9 Standard for Safety of Fire Tests of Window Assemblies.

2. UL 10B Standard for Safety of Fire Tests of Door Assemblies.
3. UL 10C Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.
4. UL 263 Fire Tests of Building Construction and Materials.
5. UL 752-2005 Standard for Safety for Bullet-Resisting Equipment.

D. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.

E. American National Standards Institute (ANSI):
1. ANSI Z97.1 Safety Glazing materials Used in Buildings – Safety Performance Specifications and Methods of Test.

F. Glass Association of North America (GANA):
1. GANA – Glazing Manual.
2. FGMA – Sealant Manual.

G. National Fenestration Rating Council (NFRC):
1. NFRC 100 Procedure for Determining Fenestration Product U-Factors.
2. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s written product data for each component.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components.

C. Samples: Submit samples for finishes, colors and textures.

D. Technical Information: Submit latest edition of manufacturer’s product data providing product descriptions, technical data and installation instructions.

1.4 DELIVERY STORAGE AND HANDLING

A. Ordering: Comply with manufacturer’s ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials to specified destinations in manufacturer’s or distributors packaging undamaged, compete with installation instructions.

C. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.5 WARRANTY

A. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document. Manufacturer’s warranty is not intended to limit other rights that the Owner may have under the Contract Documents.
1. Warranty Period: 5-year limited warranty from date of shipping.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Rating: 45 minutes, as specified.

B. Fire Protective Window Assembly Certifications: 20-45 minute fire protective window assemblies shall be tested in accordance with NFPA 80, NFPA 257, ASTM E163, ASTM E2010, UL 9 and CAN4-S106.

C. Air Infiltration: <0.01 cfm/ft2.

D. Water Resistance Test Pressure: up to 20.0 psf.

E. Uniform Load Deflection Test Pressure: Up to +/- 50.0 psf.

F. Uniform Load Structural Test Pressure: Up to +/- 75.0 psf.

G. NFRC 100 & 200: Provide a finite element computer thermal modeling and calculations through NFRC CMAST. NFRC CMAST Bid Reports must be submitted at time of bid, time of product submission, and assemblies are installed per the project documents and actual designed exterior applications for the project. Refer to manufacturer's NFRC CMAST Document for examples of simulations based on available glazing materials in the NFRC CMAST database.

H. Testing Laboratory: Fire test must be conducted by a nationally recognized independent testing laboratory.

I. Glazing: Fire protective glazing in 20-45 minute fire protective doors and opening sup tot the maximum size tested.

2.2 FIRE RATED ASSEMBLIES

A. Assemblies shall be glazed with glazing material specified.
   1. Listing and Labels: Fire resistive, temperature rise framing system shall be under current follow-up service by a nationally recognized independent laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

B. Appearance: Fire rated wall/door assembly shall have a neat finished appearance with minimum joints at decorative cover intersections.

2.3 MANUFACTURERS

A. Manufacturer of Framing System Basis of Design: GPX Architectural Series Framing as manufactured and distributed by SAFTI FIRST Fire Rated Glazing Solutions, or approved equal.

B. Manufacturer of Glazing Material Basis of Design: SuperLite II-XL as manufactured and distributed by SAFTI FIRST Fire Rated Glazing Solutions, or approved equal.

C. Fire-Rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers. Materials for the project should be shipped together in the same shipment on the same truck.

2.4 MATERIALS – FRAMING

A. Fire resistive, temperature rise framing system rated for 20 to 120 minutes.

B. Window/Wall Frame Thickness: 2 1/2 inch Standard.

C. Door Profile Thickness: 5 inch Standard.

D. Fire resistive aluminum door capable of accommodating concealed hardware.

E. Internal Framing: Internal Tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.

F. Insulation: The framing system shall insulate against the effects of fire, smoke and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation or appropriately rated intumescent sealant.

G. Fasteners: Type recommended by manufacturer. No exposed fasteners allowed.

H. Glazing Accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape. The glazing panel shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone. Silicone setting blocks recommended.

2.5 MATERIALS – GLAZING

A. Listing and Logo:
   1. Individual Lites shall be permanently identified with a listing mark.
   2. Each piece of fire rated glazing shall be labeled with a permanent logo.

B. Glazing material installed in “Hazardous Locations” (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used in Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.

C. Temperature rise on the unexposed side of glazing material shall be limited to 250 degrees F when required.

D. Visible Transmittance: 0.789

E. Pressure glazing is acceptable.

2.6 FABRICATION

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Assemblies shall be furnished [knocked down for field assembly and will be glazed in the field] [assembled (should configurations and job site conditions allow)] [unitized (should configurations and job site conditions allow)].

C. Door assemblies shall be factory prepared for field mounting of hardware.

D. Fabrication Dimensions: Fabricate to approved dimensions. Verify dimensions are within required tolerance. Obtain approved shop drawings prior to fabrications.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for apply and designing finishes.

B. Clean and pretreat in accordance with manufacturer's recommendations.

C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
1. Color: Dark bronze

D. Protect finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

E. Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions have been previously installed under other sections and are acceptable for product installation in accordance with manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. Notify the Architect of any conditions that jeopardize the integrity of the proposed fire wall/door framing system. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written product data including product technical bulletins and installation instructions.

B. Fire wall/door installation shall be by a licensed contractor and in strict accordance with the approved shop drawings.

3.3 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 084113.13

SECTION 085313 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vinyl windows in the following configurations:
   1. Awning windows.
   2. Fixed windows.
   3. Vinyl Patio Doors.
   4. Vinyl Sliding Doors.

1.2 DESIGN REQUIREMENTS

A. Manufactured Sizes: Provide products capable of being manufactured as a single unit in the size range scheduled. Units must be available at least as small as the minimum size, and at least as large as the maximum size.

B. Operable Windows: Provide units that can tilt-in or can be removed from inside for cleaning.

C. Align meeting rails of primary and secondary sash to the maximum practical extent that permits sash to be removed.

1.3 PERFORMANCE REQUIREMENTS

A. Applicable AAMA Standards: Provide products that have been tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440

B. AAMA Performance Requirements: Provide vinyl windows that meet the applicable AAMA standard for the designation, performance class and performance grade listed for each type of vinyl window scheduled. Provide vinyl windows that meet general requirements, specific product performance requirements, material and component requirements, and optional performance requirements.
   1. Enhanced Performance: Comply with indicated performance requirements where they exceed the minimum established by the applicable AAMA standard for the scheduled performance class and grade.
   2. Optional Performance Standard: Meet AAMA “optional” performance standards when indicated.
   3. Minimum Test Size: Same size as required for “gateway” performance standards, unless smaller test size is indicated.
   4. Minimum Performance Class and Grade: CW-30.
   5. Structural Performance: Provide vinyl windows capable of withstanding the following, including wind loads based on passing the Uniform Load Structural Test of the applicable AAMA standard:
      a. Maximum Rate: 0.1 cfm/sq.ft. of area at an inward test pressure of 1.57 lbf/sq.ft.
   6. Water Resistance: No water leakage as defined and tested in the Water Resistance Test of the applicable AAMA standard at a water test pressure equaling that indicated:

a. Test Pressure: 15 percent of positive design pressure, but not less than 2.9 lbf/sq. ft.

C. Thermal Movements: Provide windows and anchorage that accommodate thermal movements from a maximum change (range) in ambient temperature of 120 deg F and material surface temperature of 180 deg F without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

D. Thermal Transmittance: NRFC 100 maximum whole-window u-factor:
1. Fixed: 0.18.
2. Operable: 0.19.

E. Solar Heat Gain: NFRC 200 maximum whole-window: 0.35.

F. Sound Transmission Class (STC): Rated for not less than indicated STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
1. Coordinate with Acoustical Report.

1.4 SUBMITTALS

A. Include submittal of Product Data and Samples for glazing of windows as specified in Section 088000 - Glazing as part of the submittal packages of this Section.

B. Product Data for each type of window required, including the following:
1. Standard construction details including:
a. Joinery.
b. Sections.
c. Hardware.
d. Weatherstripping.
e. Glazing.
f. Flashing and drainage.
g. Other details of construction.
2. Profiles and dimensions of individual components.
3. Descriptions of materials.
4. Data on hardware, screens, accessories, and finishes.

C. Shop Drawings: Show details for each window including information not fully shown in manufacturer’s standard Product Data. Include details of attachment, flashing, and clearances.
1. Indicate actual dimensions of existing openings.
2. Indicate proposed Work based upon existing conditions for each opening.

D. Window and Door Schedule: Include data for each vinyl window on window and door schedule required in Section 013300 - Submittal Procedures.

E. Samples: For units with factory-applied color finishes.
1. Include similar Samples of hardware and accessories involving color selection.

2. Corner Sample: Corner of window approximately 12 inches square with frame, sash, glazing, and screen.

F. AAMA Test Reports: Submit complete test reports for each type, grade, and size of vinyl windows.
1. Test results based on units smaller than that required by the applicable standard will not be accepted.

G. Manufacturer's Qualifications: Submit description of experience demonstrating compliance with requirements of Section 014000 - Quality Requirements.

H. Certification: Provide certification from manufacturer stating that each size vinyl window complies with specified requirements, including those of referenced standards.
1. Certify product meets the specifications for general requirements, specific product performance requirements, material and component requirements, and optional performance requirements of the applicable AAMA standard.
2. Energy Performance Certificates: NFRC-certified energy performance values for each vinyl window.

I. Maintenance Data: For operable sash, operating hardware, weatherstripping, finishes, and cleaning.

J. Installation Instructions: Manufacturer's installation instructions for specified products.

K. Sample Warranty: Sample of manufacturer's warranty with text applicable to this Project. Submit in accordance with warranty package specified in Section 017700 - Closeout Procedures.

1.5 QUALITY ASSURANCE

A. Fenestration Standard: Comply with the applicable AAMA standard for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

B. Source Limitations: For each Parcel, provide vinyl windows from a single manufacturer. Do not mix manufacturers on an individual Parcel, although other manufacturers may be used on other Parcels. When manufacturer is unable to provide unusual shapes, or other features needed for existing conditions, obtain Architect's approval for use of alternative manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store windows in compliance with manufacturer's recommendations. Store in manner such that manufacturer's identification marks are readily visible.

B. Do not slide windows against one another. Do not roll windows onto corners when handling, to avoid damage to integrity of window.

C. Transport, handle and store windows right-side-up at all times to avoid damage to operating mechanisms.

1.7 WARRANTY

A. Warranty: Manufacturer's non-prorated warranty in which manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Failure to meet performance requirements.
   2. Structural failures including excessive deflection.
   3. Water leakage or excessive air infiltration.
   4. Faulty operation of movable sash and hardware.
   5. Deterioration of vinyl, metals, metal finishes, and other materials beyond normal weathering.
   6. Insulating Glass Units: Failure of hermetic seal resulting in obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   7. Laminated Glass: Edge separation, delamination that materially obstructs vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

B. Warranty Period: Ten years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers.
   1. VPI.
   2. ECO

B. Basis of Design: VPI
   1. Windows: Endurance Series.
   2. Patio Doors: Envision Series.
   3. Sliding Doors: Endurance Series.

2.2 VINYL WINDOWS

A. Styles and Sizes: As indicated on Drawings.
   1. Casement Windows: Provide units with the following;
      a. Operating Hardware: Gear-actuated rotary operator and handle. Single lever mechanism mounted a maximum of 48 inches above the floor with multiple locking points.
      b. Locks: Single-lever actuated, with multiple locking points at casements, meeting forced entry resistance requirements of CAWM 301.
      c. Weatherstripping: Double-row low-compression set bulb gaskets.
      d. Screens: Frame color matching frame and sash interior color.
   2. Fixed: Sizes as indicated on Drawings.

2.3 VINYL PATIO DOORS

A. Styles and Sizes: As indicated on Drawings.

1. Hardware:
    a. Door Type:
        1) Sliding Door: Stainless Steel Rollers.
        2) Patio Swinging Door: Manufacturer's standard hinges.
    b. Locks: Single-point adjustable locking.
    c. Weatherstripping: Factory Standard
    d. Screens: Frame color matching frame and sash interior color.

2.4 MATERIALS, GENERAL

A. General: Provide materials and components meeting the applicable requirements of the applicable AAMA standard.

B. Frame and Sash Members: Fusion-welded construction, mitered corners, impact resistant, exterior grade polyvinyl chloride extrusions complying with AAMA 303 and ASTM D 4726.
    1. Ignition temperature, when tested in accordance with ASTM D 1929: Minimum of 824 degrees F.
    2. Flammability, when tested in accordance with ASTM D 635: Burn time of less than 5 seconds and burn distance of less than 10 mm.
    3. Non-corroding, non-flaking, non-chipping, non-rotting; no electrical conductance; low thermal conductance.
    4. Minimum external wall thickness: 2.0 mm nominal.
    5. Finish of sight-exposed surfaces: Smooth gloss finish with uniform consistent white color. All window frames to match in color.

C. Fasteners, Anchors, Clips, and Accessories: Aluminum or Austenitic (nonmagnetic) stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure.
    1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened.
    2. Reinforcement: Where fasteners anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure for AAMA Optional Performance Grade indicated.

E. Compression-Type Weatherstripping: Manufacturer's standard system and materials complying with the applicable AAMA standard. Provide compressible weatherstripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when window is closed.
    1. Replaceable Weather Seals: Comply with AAMA 702.

F. Aluminum: Alloy and temper recommended by window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength.

G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.5 GLAZING

A. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
   1. Insulating-Glass Units: ASTM E 2190. As specified in Section 088000 – Glazing.
      a. U-Value: As specified on Drawings.
      b. Tint: Clear.
      c. Kind: Fully tempered per code required locations.
      d. Lites: Three.

B. Performance: Provide glass and insulated glass units of thickness and composition necessary to meet the specified performance requirements.

C. Safety Glass: Where indicated and where required by applicable codes, provide safety glazing.

2.6 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with vinyl; designed to smoothly operate, tightly close, and securely lock vinyl windows, and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.

B. Locks and Latches: Single lever, multi-point locking mechanism.

C. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.
   1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.

2.7 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners, limiter, and latches. Locate screens on outside of window and provide for each operable exterior sash or ventilator; except locate screens on inside of casement windows. Provide full-size screens on horizontal sliding windows with two operable sashes.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll-formed from aluminum sheet with minimum wall thickness as required for screen size.
2. Finish: Baked-on organic coating in manufacturer's standard color matching color of frame.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration; charcoal gray color. Comply with ASTM D 3656.

D. Screens: Comply with minimum applicable standards of the Screen Manufacturers Association (SMA). Provide screen fabric complying with requirements of FS L-S-125.

2.8 FABRICATION

A. General: Fabricate windows in sizes indicated that comply with AAMA/NWWDA 101/I.S.2 for performance class and performance grade indicated. Include complete system for assembling components and anchoring windows.

B. Frame: Fabricate frames with multiple chambers and minimum nominal wall thickness of .065 inch. Fabricate sill of minimum nominal wall thickness of 0.078 inch.
1. Frame corners: Miter cut and fusion welded or butt-joined and mechanically fastened, per manufacturer’s standard. Provide sealant or gaskets at corners per manufacturer’s standard.
2. Reinforce frame with aluminum bars where required by size of window.
3. Weeps: fabricate window units with weeps to direct infiltrating water to exterior.

C. Accessory Trim: Provide frame designed to accept accessories as job conditions require.
1. Provide factory-installed nailing fin.

D. Weatherstripping: Provide full-perimeter weatherstripping for each operable sash and ventilator. Provide single or double row of sliding-type weatherstripping in components that slide against each other. Provide compression-type weatherstripping on other components.

E. Factory-Mulled Units: Where a combination of units are called for in one opening provide factory-mulled units. Provide assembly capable of withstanding design loads of window units, including head and sill anchor clips to prevent movement of installed window perpendicular to face of wall. Configure mullions with jambs back-to-back to minimize mullion sight-line obstruction. Provide factory-installed cover plates. Provide for movement of window units due to thermal expansion and building deflection.

2.9 FINISHES

A. Finish and Colors: Manufacturer’s standard finish; Adobe color.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Prior to commencing preparation of Shop Drawings, measure each existing opening designated to receive new windows.

B. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; and other conditions affecting performance of work. Verify that window unit is sized correctly for the opening.

C. Coordinate with requirements for flashing and painting indicated on Drawings and specified in Section 072500 - Weather Barriers, Section 076500 – Flexible Flashing and Section 099100 - Painting.

D. Be fully prepared to install new window with related items into the designated existing openings as soon as each existing window is removed.

E. After removing each existing window unit and related items, thoroughly clean existing surfaces before installing new window unit or window sash.

3.2 INSTALLATION

A. Comply with manufacturer’s specifications and recommendations for installation; and approved Shop Drawings.

B. Install windows plumb, level, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place. Adjust and reinforce substrates as necessary for proper installation and operation.
   1. Adjust frame expanders to adapt to out-of-square openings. Do not use head expander to install a smaller size window within opening.

C. Provide shims, blocking, anchors, and clips for a complete installation.

D. Provide continuous aluminum retaining angle at jambs and head where existing window frame provides inadequate bearing at exterior casing or blind stop. Set angle in continuous bed of sealant and fasten 12 inches o.c.

E. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

F. Embed perimeter of window in concealed sealant to provide acoustically tight and weatherproof joint.

G. Mullions: Anchor mullions, and mulled units, at sill and jamb to prevent movement of jamb where windows abut. Comply with manufacturers recommendations.

3.3 FIELD QUALITY CONTROL

A. Testing Extent: One group of three windows of each major type.

3.4 ADJUSTING

A. Adjust operating sash and hardware to provide a tight fit at contact points and at weatherstripping for smooth operation and a weather tight closure. Clean sash tracks of dirt. Lubricate hardware and other moving parts.

B. Verify that weep holes have not been covered during installation and remove obstructions.

3.5 PROTECTION AND CLEANING

A. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

B. Clean exposed surfaces immediately after installing window. Comply with manufacturer's written recommendations for final cleaning and maintenance. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Remove nonpermanent labels and clean surfaces.

END OF SECTION 085313

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors and Windows.
   2. Glazed aluminum storefront entrances and framing.
   3. Glazed entrances.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.3 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.
   1. Weatherproofing system, including printed statement of VOC content.

B. Sustainable Design Submittals: Section 018113 - Sustainable Building Requirements.
   1. Product Data: For sealants, indicating VOC content.

C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Coated glass.
   2. Insulating glass.

D. Glazing Accessory Samples: For gaskets, in 12-inch lengths.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Qualification Data: For installers and manufacturers of insulating-glass units with sputter-coated, low-e coatings.

G. Product Certificates: For glass and glazing products, from manufacturer.
   1. NFRC Certified Product Rating Certificates.

H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

D. Mockups: Provide as specified in Section 014000 – Quality Requirements.

E. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed

from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 5 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Engage a qualified engineer to design glazing, including comprehensive engineering analysis, to withstand the following design loads within the limits and under conditions indicated determined according to the IBC and ASTM E 1300:

1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    a. Wind Design Data: As indicated on the Structural Drawings.
    b. Interior Conditions: Design glass at interior locations to comply with the following:
        1) Lites at Level Floor Conditions Each Side: Uniform load of 10 psf.
        2) Lites at 30 Inches or Greater Offset Floor Condition: Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
   1. Provide safety glazing at all locations noted below:
      a. Within 36 inches of finished floor.
      b. Immediately adjacent to any swinging door opening.
      c. At a lite within a door.
      d. Any location specifically indicated in this section or on the Drawings to be safety glazing.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
   2. For laminated-glass lites, properties are based on products of construction indicated.
   3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
   4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
   5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
   6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
   3. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
   4. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."

B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
   1. Provide heat-strengthened laminated safety glass where required for compliance with CPSC 16CFR 1201 and where otherwise indicated on the Drawings.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

E. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article.

2.3 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Clear Fully Tempered Float Glass Thickness:
1. Interior Doors: Minimum 6mm.
2. Interior Borrowed Lites: Minimum 6mm.

C. Heat-Strengthened Float Glass: ASTM C 1048; Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated; Type I, Class I (clear) unless otherwise indicated; Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.4 INSULATING GLASS

A. Insulating-glass units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing system: Dual seal, with manufacturer's standard primary and secondary.
2. Perimeter spacer: Polypropylene-covered stainless steel in color selected by Architect.
a. Basis-of-Design Product: “TGI-Spacer M” warm edge spacer as manufactured by Technoform Glass Insulation Holding GmbH.
3. Desiccant: Molecular sieve or silica gel, or blend of both.
4. Tint: Clear.
5. Kind: Fully tempered per code required locations.
6. Lites: Three.
7. Filling: Argon.
8. Low-E Coating: Sputtered on second or third surface.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.
1. Storefront framing: Clear 1-inch insulating glass, low-e coated.
2. Glazed entrances: Clear 1-inch insulating glass, low-e coated.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. Neoprene complying with ASTM C 864.

2. EPDM complying with ASTM C 864.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Glass Stops: Provide glass stops with integral, neoprene, bulb-type weather-stripping glazing gaskets.

2.6 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L.
   4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT, G, and A.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. May National Associates, Inc.; Bondaflex Sil 290.
      d. Sika Corporation U.S.; Sikasil WS-290.
      e. Tremco Incorporated; Spectrem 1.
   2. Applications: Wet glazing for other than structural-sealant-glazed curtainwall systems.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT, G, and A.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 795.
      b. GE Advanced Materials - Silicones**;** SilPruf SCS2000.
      c. May National Associates, Inc.; Bondaflex Sil 295.
      d. Sika Corporation U.S.; Sikasil WS-295.
      e. Tremco Incorporated; Spectrem 2.
   2. Applications: Structural-sealant-glazed currtainwall systems.

D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, and A.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 799.
   2. Applications: Two-sided butt-glazed glazing in interior conditions.
   3. Joint Sealant Color: Clear.

E. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.8 ACCESSORIES

A. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

B. Anchors and Inserts: Provide devices as required for hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide stainless-steel anchors and inserts for applications on inside face of exterior walls and where indicated.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Grind smooth and polish exposed glass edges and corners.

2.10 INSULATING-GLASS (IGU) TYPES

A. Basis-of-Design Products: Subject to compliance with requirements, provide specific products listed by manufacturer‘s product or products by one of the following manufacturers:
1. Guardian Industries.
2. Vitro Americas, Inc.
3. Viracon, Inc.

B. Glass Types: Low-e-coated, clear insulating glass: As shown on Drawings.
1. Basis-of-Design Products: Subject to compliance with requirements, provide “Solarban 60” and “Solarban 60 + IS20” as fabricated by Vitro Americas, Inc. or comparable approved product.
2. Overall Unit Thickness: 1 inch.
3. Outboard Lite: 1/4 inch (clear) float, Kind HS (heat-strengthened) safety glazing.
4. Low-E Coating: Sputtered on No. 2 or No. 3 surface.
5. Interspace Content: Argon.
6. Indoor Lite: 1/4 inch, Class 1 (clear) float, Kind HS (heat-strengthened) safety glazing.
7. Performance Requirements: As specified on Drawings, meeting energy code requirements.
   a. NFRC certified U-value of 0.29 or better.
8. Label as safety glazing complying with CPSC 16CFR 1201.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape. Keep tape at 1/8 inch to 3/16 inch below the sight line. A bead of clear silicone sealant shall be applied to the outer face.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 SHELF STANDARD AND BRACKET INSTALLATION

A. Install 2-x-4 fire-treated wood blocking full height in stud wall cavity centered on each standard.

B. Cut or groove substrate as required for recessed standard installation.

C. Anchor standards in each pre-drilled location to achieve full load capacity required.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Where sealant of butt-glazed joints are indicated on the Drawings, force sealants between glass-to-glass joints to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants smooth.

3.7 BUTT-GLAZED PARTITION INSTALLATION

A. General: Install glazing vertical, plumb, and square.

B. Install wall-to-glass and glass-to-glass butt-glazed joints as indicated in Section “SEALANT GLAZING (WET).”

3.8 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Silvered flat glass mirrors.

1.2 PERFORMANCE REQUIREMENTS

A. Provide mirrored glass that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.3 SUBMITTALS

A. Product Data: Submit physical and environmental characteristics, size limitations, special handling or installation requirements for each product indicated.
   1. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Samples: Provide the following for each type of glass indicated to be used:
   1. Mirrored Glass: 12 inches square, including edge treatment on 2 adjoining edges.
   2. Mirror Clips: Full size.
   3. Mirror Trim: 12 inches long.

D. Product certificates: Signed by manufacturers of mirrored glass and mirror mastic certifying that products furnished comply with requirements.

E. Product Test Report: For mirror mastic compatibility.

F. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

G. Maintenance Data: For mirrors to include in maintenance manuals.

H. Warranty: Sample of warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed mirrored glass installations similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Mirrored Glass: Obtain mirrored glass from one source for each type of mirrored glass indicated.

C. Glazing Publications: Comply with published recommendations in GABA's "Glazing Manual," unless more stringent requirements are indicated.

D. Glazing Publications: Comply with the following published recommendations:
   1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
   2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

E. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors when ambient temperature is less than 50 degrees F. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver materials to site in Manufacturer’s original unopened packaging with labels intact.

B. Comply with mirrored glass manufacturer's written instructions for shipping, storing, and handling mirrored glass as needed to prevent deterioration of shivering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrored glass units that deteriorate, within warranty period.
   1. Deterioration of Silvered Mirrored Glass: Defects developed from normal use not caused by maintaining and cleaning mirrored glass contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
   2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MIRRORED GLASS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:

1. Arch Aluminum & Glass Co., Inc.
2. Avalon Glass and Mirror Company.
3. Binswanger Mirror; a division of Vitro America, Inc.
4. D & W Incorporated
5. Donisi Mirror Company.
6. Gardner Glass, Inc.
7. Gilded Mirrors, Inc.
8. Guardian Industries.
9. Head West.
10. Independent Mirror Industries, Inc.
11. National Glass Industries.
12. Virginia Mirror Company, Inc.
13. Walker Glass Co., Ltd.

B. Mirrored Glass: ASTM C 1503; 1/4 inch annealed float glass manufactured using copper-free, low-lead mirror coating process.

C. Nominal Thickness: 6mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B.

C. Edge Sealer: Coating compatible with glass coating and approved by mirrored glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.

D. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed. Mastic shall be resistant to water, shock, cracking, vibration and thermal expansion.
   1. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Franklin International; Titebond Division.
      b. Laurence, C. R. Co., Inc.
      c. Macco Adhesives; Liquid Nails Division.
      d. OSI Sealants, Inc.
      e. Palmer Products Corporation.
      f. Pecora Corporation.
      g. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
      h. Sommer & Maca Industries, Inc.

E. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
   1. Aluminum J Channel Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch.
   2. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Shop fabricate mirrors to greatest extent possible.

B. Cutouts: Fabricate cutouts for notches and holes in mirrored glass without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrored glass.

C. Mirrored Glass Edge Treatment: Flat polished.
   1. Silvered Mirror Glass: Seal edges after edge treatment to prevent chemical or atmospheric penetration of glass coating.
   2. Factory Fabricate: Perform edge treatment and sealing in factory immediately after cutting to final sizes.

D. Sizes: 42 inches wide by 36 inches high.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.

B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

C. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

3.2 INSTALLATION

A. Install mirrored glass units to comply with written instructions of mirrored glass manufacturer and with referenced GABA and NAAMM publications. Mount mirrored glass accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

D. Install mastic as follows:
   1. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
   2. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
   3. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.3 ADJUSTING

A. Remove and replace mirrors which are broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 089119 – FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fixed, extruded-aluminum louvers.
   2. Blank-off panels for louvers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.
   1. Wind Loads: As indicated on Drawings for local conditions and codes.
   2. Other Design Loads: As indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
1. Airolite Company (The).
2. Architectural Louvers.
3. Construction Specialties, Inc.
4. Ruskin.

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Use types and sizes to suit unit installation conditions.
1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
2. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
3. For fastening stainless steel, use 300 series stainless-steel fasteners.
4. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION, GENERAL

A. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.5 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Fixed, Extruded-Aluminum Louvers:
1. Horizontal, Drainable-Blade Louver: 4 inches deep with exposed mullions. 45 degree blade angle.

B. Louver Screens: Provided at each exterior louver.
1. Screening Type: Bird screening except where insect screening is required.

2.6 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening except where insect screening is indicated.

B. Secure screen frames to louver frames, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Mill finish unless otherwise indicated.
   3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch thick.
   2. Insect Screening: Aluminum, 18-by-16 mesh, 0.012 inch wire.

2.7 BLANK-OFF PANELS

A. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.
   1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.
   2. Galvanized-steel sheet for galvanized-steel louvers, not less than 0.040-inch nominal thickness.
   3. Panel Finish: Same finish applied to louvers.
   4. Attach blank-off panels with sheet metal screws.

B. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
   1. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
   2. Metal Facing Sheets: Galvanized-steel sheet, not less than 0.028-inch nominal thickness.
   3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
   4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer’s standard channel frames, with corners mitered and with same finish as panels.
   5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
   6. Panel Finish: Same finish applied to louvers.
   7. Attach blank-off panels with sheet metal screws.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
   1. Color: Dark bronze.

B.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 089119

SECTION 092116.23 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Fire rated gypsum board and steel stud shaft wall assemblies as indicated on Drawings.

1.2 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.3 REFERENCES

A. ASTM C-840 AND GA-216, insofar as any portions are applicable, are hereby made a direct part of this specification as though repeated herein. In case of conflicts, the more stringent requirements shall govern.

1.4 SUBMITTALS

A. Product Data: For each component of gypsum board shaft-wall assembly indicated.

B. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.
   1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

C. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.

D. Acoustical-Test-Response Reports: From a qualified independent testing agency substantiating required STC rating for each gypsum board shaft-wall assembly.

E. Load Tables: For shaft wall assemblies indicated to comply with performance requirements and design criteria, provide manufacturers' published load tables annotated to show compliance, for each type of framing assembly.

F. Delegated-Design Submittal: For shaft wall assemblies indicated to comply with performance requirements and design criteria not otherwise addressed in manufacturers' published load tables, provide analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Source Limitations: Provide products manufactured within the United States from materials free of sulfur, formaldehyde or other deleterious chemicals. Natural gypsum ore shall be mined in North America. Synthetic (Byproduct) gypsum shall be pure calcium sulfate from domestic sources.

C. Comply with the following:
   1. The face of the wall assemblies making up all exit enclosures and elevator hoistway enclosures that are not exposed to the interior of the exit enclosure or elevator hoistway enclosure shall be constructed in accordance with one of the following methods:
      a. The wall assembly shall incorporate not less than one layer of impact-resistant construction board each of which meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C 1629.
      b. The wall assembly shall incorporate multiple layers of any material, tested in tandem, that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C 1629.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 013100 - Project Management and Coordination. Review methods and procedures for installing work related to gypsum board shaft-wall assemblies including, but not limited to, the following:
   1. Fasteners proposed for anchoring steel framing to building structure.
   2. Sprayed fire-resistive materials applied to structural framing.
   3. Elevator equipment, including hoistway doors, elevator call buttons, and elevator floor indicators.
   4. Wiring devices in shaft-wall assemblies.
   5. Doors and other items penetrating shaft-wall assemblies.
   6. Items supported by shaft-wall-assembly framing.
   7. Mechanical work enclosed within shaft-wall assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.7 PROJECT CONDITIONS

A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Section 092900 - Gypsum Board.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. HVAC Equipment Design Loads: 5 lbf per sq. ft. uniform air-pressure differential acting perpendicular to covering material supported by metal framing.
   2. Elevator Velocity Design Loads: Uniform air-pressure differential acting perpendicular to covering material supported by metal framing, as follows based on elevator velocity:
      a. 0 to 180 ft per min: 5 lbf per sq. ft.
      b. 180 to 700 ft per min: 7.5 lbf per sq. ft.
      c. 700 to 1,600 ft per min: 10 lbf per sq. ft.
      d. 1,600 to 2,000 ft per min: 15 lbf per sq. ft.
   3. Deflection Limits: Design framing systems to withstand design loads without horizontal deflection greater than 1/240 of the wall height.
   4. Fire Resistivity: Fabricate and install gypsum board shaft-wall assemblies to have fire-resistance ratings indicated. Provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E412 by a testing and inspecting agency.

C. Delegated Design: Where design of metal framing cannot be addressed by manufacturers' published load tables, design metal framing. Including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one of the following. Provide products approved for use in UL assemblies indicated in drawings:
   1. G-P Gypsum.
   2. National Gypsum Company.
   3. USG Corporation.

2.3 ASSEMBLY MATERIALS

A. General: Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Studs: ASTM C 645, Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
1. Depth: As indicated on Drawings.
2. Minimum Base-Metal Thickness: As indicated.
3. Protective Coating:
   a. Interior Locations: ASTM A 653, G40, hot-dip galvanized coating.
   b. Exterior Walls: ASTM A 653, G60, hot-dip galvanized coating.

C. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches (51 mm) long and in depth matching studs.
1. Minimum Base-Metal Thickness: Manufacturer’s standard thicknesses that comply with structural performance requirements for stud depth indicated.

D. Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Acceptable Product: Subject to compliance with requirements, provide one of the following:
   a. Fire Trak Corp.; Fire Trak System.
   b. Dietrich: Blazeframe.
   c. Model CFS-TTS “Firestop Top Track Seal”; Hilti, Inc.

E. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches (76 mm), in depth matching studs, and not less than 0.0329 inch (0.84 mm) thick.

F. Gypsum Liner Panels (typical): Comply with ASTM C 442.
1. Moisture- and Mold-Resistant Type X: Manufacturer's proprietary liner panels with moisture- and mold-resistant core and surfaces; comply with ASTM D 3273.
   a. Core: 1 inch (25.4 mm) thick.
   b. Long Edges: Double bevel.

G. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X (exterior walls): ASTM C 1658/C 1658M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Gypsum; "DensGlass Shaftliner" or a comparable product by one of the following:
   a. CertainTeed Corp.
   b. National Gypsum Company.
   c. USG Corporation.
   d. Thickness: 1 inch.
   e. Long Edges: Double bevel.
   f. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

H. Abuse-Resistant Gypsum Board: ASTM C 1629, Level 2 minimum.
1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Locations: As indicated on Drawings.
5. Acceptable Product: Subject to compliance with requirement, provide DensArmor Plus Impact Resistant Shaftliner as manufactured by Georgia Pacific or a comparable product by one of the following:
a. CertainTeed Corp.
b. National Gypsum Company.
c. USG Corporation

I. Acoustical Materials:
1. Gypsum Board at sound-rated construction: 5/8 inch thick; Type X, having a minimum mass of 2.1 PSF.

J. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Section 092900 - Gypsum Board that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

K. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Section 092900 - Gypsum Board.

L. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 - Gypsum Board.

M. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

N. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

O. Cementitious Sealant: Spray applied; 40 pcf.
1. Monokote Z-146.
2. Pyrok; Acoustement 40.

P. Acoustical Sealant: As specified in Section 079200 –Joint Sealants.

2.4 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Gypsum Board Shaft Wall Assemblies:
1. Fire-Resistance Rating: 1 hour.
2. Gypsum Shaftliner Board: 1 inch, Type X.

3. Framing: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated
    a. Depth: 4 inches, unless otherwise indicated.
    b. Minimum Base-Metal Thickness: 0.033 inch.
    c. Runner Tracks: J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth and base-metal thickness.
    d. Firestop Tracks: Provide firestop track at head of shaft wall on each floor or roof level.
    e. Elevator Hoistway Entrances: J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.
4. Finish Surfaces:
    a. Room-Side Finish: Gypsum board, Type X.
    b. Shaft-Side Finish: Gypsum shaftliner board, Type X.
5. Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
    1. ASTM C 754 for installing steel framing.
    2. Section 092900 - Gypsum Board for applying panels.

B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
    1. At elevator hoistway entrance door frames, provide jamb struts on each side of door frame.

2. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip with 0.0312-inch minimum thickness of base (uncoated) metal, accurately positioned and secured behind at least 1 face-layer panel.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Sound Rated Construction:
1. Double Layer Gypsum Board Application:
   a. Joints: Stagger 24 inches between layers
   b. Sound-Rated Construction: Tape face layer.
2. Sound-rated edge condition: Stagger (ship-lap) gypsum board layers at vertical intersections. Provide a 1/4 inch nominal gap around the gypsum board face layer at floor and ceiling intersections. Fill the 1/4 inch gap with acoustical sealant to form an airtight seal.
3. Penetrations (through sound-rated construction):
   a. Cut-outs are to be regular and not fracture core or tear covering of gypsum board and meet the following requirements.
   b. Minimize penetrations of insulated wall and ceiling constructions. Penetrate only where necessary and fully seal airtight at the perimeter using acoustical sealant.
   c. Where ducts and piping greater than 3 inches diameter penetrate insulated wall or ceiling construction, provide a clearance of 1 inch +/- 1/4 inch at the perimeter of the penetration.
   d. Where conduit piping 3 inches diameter and less (including mechanical, hydraulic, plumbing, etc.) pass through insulated wall or ceiling construction, provide a clearance of 1/4 inch +/- 1/8 inch between the conduit or piping and the structure, unless otherwise shown.
   e. After the ductwork, conduit or piping has been installed, repair the gypsum board perimeter clearance to the specified tolerance as required. Where the clearance exceeds 3/4 inch, provide a sheet metal sleeve within the partition packed with safing insulation batts and caulk both sides airtight with an acoustical sealant. Where the perimeter clearance exceeds 3/8 inch, use a flexible backing rod to caulk against.
   f. Where penetration clearances are 3/8 inch or less, caulk airtight with acoustical sealant at gypsum board.
   g. All gypsum board penetrations (including those resulting from wiring, cables, and electrical junction boxes) are to be sealed airtight with acoustical sealant.
   h. The back and sides of junction boxes in sound-rated construction must be sealed airtight with sheet caulking. Caulk perimeter face at gypsum board with acoustical sealant.

i. Recessed panel boards, equipment, boxes, etc. with penetration area greater than 25 sq. in. at sound-rated partitions are to be fully enclosed and sealed with 5/8 inch thick gypsum board or fire rated putty pads.
j. Seal multiple conduit penetrations airtight with expanding fire foam sealant.
k. Seal other sound-rated conditions with spray applied (40 pcf) cementitious sealant.

4. At sound-rated construction provide fire-rated access doors, as specified in Section 083113 – Access Doors and Frames. Seal door flanges with Pemko S-88 smoke seal at perimeter. Seal entire assembly to gypsum board with acoustical sealant.
5. Shaft Wall: At all elevators provide a minimum 1 inch clearance between shaft wall liner board and steel supports for elevators.

H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

I. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 4 inches of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch-thick, gypsum board cants covering tops of projections. No recesses allowed.
1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft-wall framing.
2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft-wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Gypsum board panels for ceilings and walls.
2. Tile Backer Board.
3. Exterior Gypsum Sheathing.
4. Resilient Isolation Clips.
5. Texture Finishes.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer’s standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockups for the following:
a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.
2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
   1. STC Rating:
      a. Acoustical Rated Assemblies: Minimum 50, or per assembly.
      b. Shafts or Service Areas: Minimum 40, or per assembly.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corp.
   2. National Gypsum Company.
   3. USG Corporation.
   4. Or approved equal.

B. Gypsum Board, Type X: ASTM C 1396.
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396.
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

D. Moisture and Mold-Resistant Gypsum Board: Abuse-resistant, with moisture and mold resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

2.4 EXTERIOR GYPSUM SHEATHING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corp.
   2. National Gypsum Company.
   3. USG Corporation.
   4. Or approved equal.

B. Gypsum Board, Type X: ASTM C 1177.
   1. Thickness: 5/8 inch.
   2. Long Edges: Square.

2.5 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178, 5/8 inch, Type X.
   1. Product: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corp.; GlasRoc Tile Backer.
      b. Georgia Pacific; Dens-Shield Tile Backer.
      c. National Gypsum Company, Gold Bond eXP Tile Backer.
      d. USG Corporation; DUROCK Glass-Mat.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corp.; FiberCement BackerBoard.
      b. Custom Building Products; Wonderboard.
      c. National Gypsum Company, Permabase Cement Board.
      d. USG Corporation; DUROCK Cement Board.
   2. Thickness (Walls): 5/8-inch.
   3. Mold Resistance: ASTM D 3273, score of 10.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead: Bullnose use at outside corners.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      e. Expansion (control) joint: One piece formed with V shaped slot, with removable strip covering slot opening, use where indicated.
      f. Curved-Edge Cornerbead: With notched or flexible flanges.
   3. Tear Away L Bead:

a. Basis of Design Product: Subject to the requirements provide Trim-Tex Tear Away L Bead or a comparable product of an approved manufacturer.
b. Application: Gypsum board walls to ceilings requiring independent movement.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated; ASTM B 221, Alloy 6063-T5.
1. Basis of Specification Manufacturer: Provide the following products as manufactured by the listed manufacturer, as identified by their model number and description. Trim of the following manufacturers matching the style, size, and construction of the specified product, as determined by the Architect, is acceptable:
a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.
2. U-shaped expansion (control) non-vented reveal joint where indicated:
a. Product: Fry Reglet, Series “DRM.” Refer to drawings for size.
3. F-shaped perimeter control non-vented reveal joint where indicated:
a. Product: Fry Reglet, Series “DRMF.” Refer to drawings for size.
4. X-shaped corner trim where indicated:
a. Product: Fry Reglet, Series “XDM.” Refer to drawings for size.
5. Z-shaped reveal where indicated:
a. Product: Fry Reglet, Series “DRMZ-625-375.” Refer to drawings for size.
6. Provide partition L-shaped trim at both outside corners of vertical edges of walls that terminate at exterior window framing system:
a. Product: Fry Reglet, Series “DRML.” Provide two such at each wall termination, using trim depths that extend across face of end of wall from each corner, leaving no more than 1-inch gap centered behind the window frame.
7. Finish: Clear anodized aluminum, unless otherwise indicated above.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Board: Paper.
2. Cementitious Ceiling Board: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Resilient Sound Isolation Clips:
1. Rubber Isolator:
a. Natural organic or man-made rubber compounds.
b. Molded to isolate ferrule from clip.
c. Minimum of 12 micro-vibration controlling pedestals at point of contact with framing member.
d. Manufactured to ASTM D2000, M2 AA 510 A13, which includes:
1) Hardness, ASTM D2240, Shore A:45.
2) Modulus 300 Percent, ASTM D412, Die C: 5.3 MPa.
3) Tensile Strength, ASTM D412, Die C: 11.2 MPa.
4) Elongation at Break, ASTM D573: 454 percent.
e. Clip: Galvanized or aluminum-zinc coated steel, 18 gauge.
f. Ferrule: Zinc-electroplated steel.
g. Projection: 1 5/8 inches form supporting structure, when 7/8 inch drywall furring channels are used.
2. Sound Clip Accessories:
a. Fasteners: As recommended by the manufacturer.
b. Acoustical Sealant: As recommended by the manufacturer.
c. Tie Wire: 18 gauge, annealed, galvanized steel.
d. Fire/Smoke Sealant: Flexible, non-hardening.

D. Sound Attenuation Blankets: As specified in Section 098100 – Acoustical Insulation.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: As specified in Section 079200 –Joint Sealants.

2.9 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
1. Products: Subject to compliance with requirements, provide one of the following:
a. CertainTeed; ProRoc Easi-Tex Spray Texture.
b. National Gypsum; ProForm Wall & Ceiling Spray.
c. USG Corporation; BEADEX FasTex Wall and ceiling Spray Texture.
2. Texture: Medium Orange Peel as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

K. Resilient Sound Isolation Clips: Install in accordance with manufacturer’s written instructions.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces unless otherwise indicated.
2. Ceiling Type: Ceiling surfaces.
3. Abuse-Resistant Type: At all corridors, stairways, and where otherwise indicated.
4. Mold-Resistant (Abuse-Resistant) Type: All toilet room surfaces not covered by tile and tile backing panels to receive paint or other finishes, janitor closets, and all similar areas subject to wetting, steam, or high humidity, and as indicated on Drawings.

B. Single-Layer Application:
1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) except horizontally (perpendicular to framing) where required for abuse resistant wainscot application unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and as indicated on the Drawings. If not indicated, do not exceed the following spacing limitations:
1. Walls: Not greater than 30 feet on center.
2. Ceilings (Restrained at Edges): Not greater than 30 feet in either direction, and not greater than 900 square feet in total area.
3. Ceilings (Unrestrained at Edges): Not greater than 50 feet in either direction, and not greater than 2,500 square feet in total area.
4. Review locations of all control joints not indicated on the Drawings with the Architect prior to installation.

C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. U-Bead: Use where indicated.
4. Curved-Edge Cornerbead: Use at curved openings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction, and where indicated.
2. Level 2: Utility areas, behind cabinetry and panels that are substrate for tile.
3. Level 3: All units, corridors, and back of house spaces.
4. Level 4: At panel surfaces that will be exposed to view, unless other finish level is specifically indicated. Surfaces to receive Level 4 finish include the following:
   a. Lobby, Leasing, Fitness, Mail and other open amenity spaces.
   b. Toilet room walls, ceilings and soffits.
   c. Primer and its application to surfaces are specified in Section 099100 – Painting.
5. Level 5: Where indicated on Drawings, including surfaces designated to receive special wall graphics. Provide smooth finish over GA level 5 finish.

E. Tile Backer Units: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Porcelain tile.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
1. Shop Drawings shall include the following:
a. Floor plans and other plan drawings at not less than 1/8"=1'-0".
b. Elevations and sections at no less than 1/4"=1'-0".
c. Details drawings at no less than 1-1/2"=1'-0".
2. Verify field dimensions and document field conditions including cracks in substrate.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:
1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12

inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.

3. Full-size units of each type of trim and accessory.
4. Stone thresholds in 6-inch lengths.
5. Metal edge strips in 6-inch lengths.

E. Qualification Data: For Installer. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

G. Product Certificates: For each type of product.

H. Product Test Reports: For tile-setting and -grouting products.

I. Field Test Reports: Submit test data and reports evidencing compliance with requirements for subfloor moisture conditions, subfloor alkalinity conditions and adhesion and dryness characteristics.

J. Installer's Certification: Submit certificate signed by Installer that certifies the following.

1. Mixing: Setting and grouting products have been mixed and installed in accordance with manufacturer's instructions, reference standards, and specified requirements.
2. Additives: Setting and grouting material additives have been added to the setting and grouting materials in accordance with manufacturer's instructions, and in manufacturer's recommended quantities and ratios for type of installation material specified.

K. Acceptance of Substrate: Provide letter of substrate acceptance, signed by Contractor, material manufacturer, and installer as required in Part 3 - Execution.

L. Tile Test Reports: Indicate and interpret test results for compliance of special-purpose tile with specified requirements.

M. Setting Material Test Reports: Material test reports from independent testing laboratory indicating test results for compliance of tile-setting and -grouting products with specified requirements.

N. Pre-Installation Job Meeting Report: Submit pre-installation job meeting report. Refer to Division 01, Project Meetings, for requirements. Include copy of manufacturer's inspection report, manufacturer's recommendations, and any statement of non-compliance as applicable.

O. Maintenance Manual: Submit tile and grout manufacturers' instructions for daily and periodic maintenance of the Tile Work. Include cleaning and stain removal processes; recommended surface treatment or sealer, and related application and maintenance instructions.

P. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.4 QUALITY ASSURANCE

A. Installers' Qualifications: Firm with at least 10 years of successful installation experience on projects with work in material, design and extent similar to that required for this project with a record of successful in-service performance.
   1. Installer is a Trowel of Excellence member of the Tile Contractors' Association of America.
   2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
   3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

B. Subfloor Moisture Conditions: Do not install tile over concrete slabs until slabs have cured and are sufficiently dry.

C. Subfloor Alkalinity Conditions: A pH reading acceptable to materials manufacturers of setting materials, including but not limited to, grout, crack suppression membrane and/or waterproofing membrane, but in case not higher than pH9, when tested in accordance with ASTM F710.

D. Mockups: Provide as specified in Section 014000 – Quality Requirements.

E. Verification of Extent of Installation Systems: After pouring of new slab, the Setting Material Manufacturer's authorized Representative shall examine the tile flooring substrate. Setting Materials Manufacturer's Representative shall meet with the Contractor, Architect and Owner's Representative to verify installation systems as specified in Part 2.

1.5 PREINSTALLATION CONFERENCE

A. Conduct conference at Project Site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.
   2. Prior to installation of work, conduct conference with Contractor's Project Manager, Superintendent and Foreman, Primary Materials Installer, Installer of each component of associated work, Representative(s) of Materials Fabricator and Proprietary Product Manufacturer(s), Installer of other work requiring coordination for the purpose of reviewing job conditions, project requirements and procedures to be followed in performing work.
   3. Examination: At pre-installation job meeting, examine areas and conditions under which work is to be performed. Report in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance by the tile installer of substrate conditions and installation conditions.

4. Fabricator's Inspection: At pre-installation job meeting, Manufacturers and Fabricator's authorized Representative shall inspect storage of job site materials, establish scheduling of initial and final installation of products, and method of preparing written progress reports to Contractor of job conditions installation.
5. Recommendations: At pre-installation job meeting, review Manufacturer's product data publication and other published instructions for material installation compliance.
    a. Where Manufacturer's Representative offers recommendations (either oral or written) on material use, such recommendations shall be in writing and substantiated by dated, printed, published product data or material use statement which is complete, definite, and clear, and signed by authorized company official. Manufacturer's proposed warranties for all setting and grouting materials must be approved by Architect before proceeding with work.
6. Statement of Non-Compliance:
    a. Prepare and submit a written statement indicating nature of non-compliance, including Contractor’s plan to address and/or remediate non-conforming conditions. Proceeding under this condition of non-compliance does not relieve Contractor’s responsibility for compliance of requirements specified herein or as may be indicated on the Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
    1. Provide lighting conditions during installation which will be of the same intensity as the building completed lighting system.

1.8 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under provisions of the Contract Documents and shall be in addition to, and non-concurrent with, other warranties under requirements of the Contract Documents.

B. Special Warranty: Setting materials manufacturer to provide to the Owner a Special Warranty for this project as described below:
    1. Where setting and grouting materials are bonded directly to slab:

a. Warranty will cover all materials including tile, mortar, grouts and labor for demolition and labor for reinstallation of floor system.

2. Where setting and grouting materials are installed over crack suppression membrane:
   a. Warranty will cover setting and grouting material's ability to adhere to and be compatible with crack suppression membrane.
3. Where crack suppression membrane is used, manufacturer's supplemental warranty will cover all materials (including tile, mortar, and grouts).
4. Duration of Warranty: The manufacturers of setting and grouting materials to provide to the Owner a (5) year warranty on all materials and labor as described above. The manufacturer of the crack suppression membrane to provide to the Owner a (5) year warranty on all materials as described above.
5. Included in the warranty procedure, provide the following:
   a. Periodic site visits by the manufacturer's technical representative during each phase of the tile installation process to observe, take photographs and produce written progress reports to the tile Subcontractor, Contractor, Owner and Architect. Quantity of site visits to be determined by manufacturer at their discretion to ensure work is being installed in compliance with manufacturer's instructions.
   b. Manufacturer's technical representative to notify Architect in writing if work is not being installed in compliance with manufacturer's instructions, or concerning job site conditions and practices that are in violation of accepted stone industry standards.
   c. Continuing consultation to stone installation subcontractor, general contractor, and Architect as required.
   d. Final Inspection: Manufacturer's technical representative shall make a final inspection of the work and shall submit a written report of any work not in compliance with the manufacturer's installation requirements. The final inspection report shall be certified by the manufacturer, indicating that the warranty is in effect

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.

D. Wet Dynamic Coefficient of Friction (DCOF): For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM A137.1, Section 9.6.1:

1. For materials installed on walkway surfaces, provide products with the following values as determined by testing identical products per ANSI B101.3:
   a. Level Surface: Minimum, wet DCOF of 0.42.
   b. Ramp Surfaces: Minimum, wet DCOF of 0.45.

E. Break Strength: ASTM C 648. 250 lbs. minimum.

F. Bond Strength: ASTM C 482. 50 psi minimum.

G. Scratch Resistance (Moh's Hardness):
   1. For Porcelain (dry pressed): 0.5% maximum.

H. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
   1. Extra Heavy: Passes cycles 1 through 14.
   2. Heavy: Passes cycles 1 through 12.

2.2 TILING, GENERAL

A. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

B. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

C. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

D. Jobsite Blending: Provide additional blending at jobsite to ensure matching of color, pattern, and texture. Verify that tile is within approved range and matches approved samples prior to installing.

E. Tile Size Tolerance: Factory rectify all tiles and trim pieces. When tile products are the same nominal size, variances in actual size to be no more than 1 mm± maximum between tiles of the same color, between tiles of different colors, or between tile and trim pieces. Size variations greater than 1mm are not acceptable.

2.3 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide specific products listed by manufacturer and product on the Finish Legend.

B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or submit a comparable product by another manufacturer prior to Bid for written approval of the Architect.

C. Source Limitations for Tile: Obtain tile of each color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
   2. Installation Systems: Acceptable manufacturers are indicated for each type of setting and grouting indicated. Do not mix manufacturers for setting and grouting materials within an installation system product. Provide a single manufacturer's system of setting and grouting materials for each installation system.
   3. Provide tile complying with Standard grade requirements only unless otherwise indicated. Second grade tile will not be acceptable.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
   2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
   1. Metal edge strips.

2.4 TILE PRODUCTS (T-1)

A. General: All products provided for installation shall be the products specified by the Interior Designer and/or Architect, unless noted otherwise. If product is no longer available or if a substitution is required, refer to Section 012500 – Substitution Procedures.

B. Floor and Wall Tile:
   1. Basis of Design: Linear Color Wheel by DalTile, or approved comparable.
   2. Size: 4 inches by 16 inches.
   3. Composition: Glazed ceramic tile.
   4. Finish: Semi-gloss.
   5. Color: To be selected by Architect.
   6. Grout Joint: 1/16 inch.
   7. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile unless otherwise indicated. Provide shapes as indicated, selected from manufacturer's standard shapes.
      a. Cove Base.
      b. Base Cap.
      c. Wainscot Cap.

d. Inside Corners.
e. Outside Corners.
f. Quarter Round.

2.5 SETTING MATERIALS

A. Available Manufacturers:
1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.
4. Summitville Tiles, Inc.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

C. Medium Thin-set Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for thin-set application.
1. Basis of Design Product: Subject to compliance with requirements, provide Custom Building Products MegaLite Non-Sag Rapid Set Mortar or a comparable product from one of the following:
a. Laticrete International Inc.; 255 MultiMax.
b. MAPEI Corporation; Ultracontact RS.
c. Summitville Tiles, Inc.; S-1200 MP Premium Medium Bed Mortar.
2. Application: Large format tile installations. Refer to the Drawing Finish Legend and Materials Key for tile sizes.

D. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

A. Available Manufacturers:
1. Custom Building Products.
2. LATICRETE International Inc.
3. MAPEI Corporation.
4. Summitville Tiles, Inc.

B. Water-Cleanable Epoxy Grout: ANSI A118.3.
1. Acceptable Products: Subject to compliance with requirements, provide on of the following:
a. CEG Lite; Custom Building Products.
b. SpecraLock Pro; Laticrete.
c. Kerapoxy; MAPEI.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F (60 and 100 deg C), respectively, and certified by manufacturer for intended use.
3. Color: As shown on Finish Legend.

C. Cementitious Grout: ANSI A118.7.
   1. Acceptable Products: Subject to compliance with requirements, provide on of the following:
      a. Prism; Custom Building Products.
      b. PermaColor or PermaColor SELECT; Laticrete.
      c. Ultra Color Plus FA; MAPEI
   2. Color: As shown on Finish Legend.

D. Premixed polymer resin grout: ANSI A118.7 and A118.3
   1. Acceptable Products: Subject to compliance with requirements, provide on of the following:
      a. Fusion Pro Single Component Grout; Custom Building Products.
   2. Color: As shown on Finish Legend.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Building Products; Surfaceguard Sealer.
      b. Jamo Inc.; Penetrating Sealer.
      c. MAPEI Corporation; KER 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.
      d. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.

D. Metal Edge Strips (Where Indicated): Angle, radius or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
   1. Basis of Design Product: Schluter Systems; Aluminum Decorative Border Profile; as shown on Finish Legend.
      a. Finish: Brushed Finish.

E. Sealant: As specified in Section 079200 –Joint Sealants.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile installations consisting of tiles 8 by 8 inches or larger.
      b. Tiles installed with epoxy grout.

2. Verification: The Architect reserves the right to pull up and examine tiles, up to a maximum of five (5) tiles per 100 s. f. of installed work, to verify that required coverage is being achieved and the work is in compliance with requirements indicated. If required coverage is not being achieved, the contractor is responsible for removing non-compliant work, and replacing the work to be in compliance with requirements.

B. Material Cleaning: Clean tile surfaces, including faces and backs, as recommended by manufacturer, prior to setting. Remove soil, dust, stains, and foreign materials.
Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

F. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

G. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

H. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
1. Porcelain Tile: 1/8 inch.
2. Ceramic Tile: 1/8 inch.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated or if not indicated reference Tile Council of North America’s Guidelines EJ-171 and the American National Standard Specifications for the Installation of Ceramic Tile A108.01 – 3.7 requirements for movement joints. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. In premium areas including clubs, suites and suite concourses, locate joints as follows:
a. Provide joints in tile surfaces where tile work abuts restraining surfaces such as walls, curbs, columns, thresholds, etc. Provide continuous joints around columns.

b. Control joints may be located a maximum of 6" from substrate control joints or cracks in the slab. Span the staggered control joint or crack with a continuous crack suppression membrane per manufacturer's recommendation. Lap membrane on each side of crack or control joint in substrate to assure it is wider than any tile spanning the control joint or crack.
c. Formation: Extend joint completely through tile system, including setting material, reinforcing, membranes, and leveling materials.
d. Width: Where sealant-filled joints occur over substrate joints, form joints in the tile work to be not less in width than the substrate below, unless otherwise indicated. Where sealant-filled joints do not occur over substrate joints, form joints to be the same width as grout joints in the tile work, unless otherwise indicated.
e. Keep joints open and free of setting and grouting materials and contaminants.
f. Jobsite Conditions Coordination: Notify Architect if jobsite conditions require additional joints other than those indicated on the drawings, or if joint locations must be adjusted to meet spacing and location recommendations in the TCNA "Handbook for Ceramic Tile Installation," or if conditions differ from those shown on drawings.

2. In all other areas where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
3. Prepare joints and apply sealants to comply with requirements in Section 079200 - Joint Sealants.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces. Clean tile surfaces in accordance with manufacturer's recommendation. Polish bright-glazed and polished-surface tiles.

3.6 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior wall installation over backer board; thin-set mortar; TCNA W244C (wet conditions) with cementitious backer board and waterproof membrane; W243 (dry conditions) with Type X gypsum board; ANSI A108.5.
   1. Tile Type: As indicated On Finish Legend.
   2. Thin-Set Mortar: Latex-Portland cement mortar.
   3. Medium Thin-set Latex-Portland Cement Mortar for Large Format Tiles: Mortar indicated or manufacturer's recommended mortar.
   4. Grout: Water-Cleanable Epoxy Grout

B. Tile Installation: Interior wall installation over concrete or concrete masonry; TCNA W202 thin-set mortar on bonded waterproof membrane over solid wall backing with reinforced portland cement mortar bed:
   1. Tile Type: As indicated on Finish Legend.
   2. Thin-Set Mortar: Latex-portland cement mortar.
   3. Medium Thin-set Latex-Portland Cement Mortar for Large Format Tiles: Mortar indicated or manufacturer's recommended mortar.
   4. Grout: Water-Cleanable Epoxy Grout

3.7 FLOOR TILE INSTALLATION SCHEDULE

A. Interior slab-on-grade or above grade tile installation; Thin-set mortar on crack isolation membrane; TCNA F125-Partial over in-plane floor cracks and Continuous at all elevated slabs.
   1. Tile Type: As indicated on Finish Legend.
   2. Thin-Set Mortar: Latex- portland cement mortar.
   3. Location: Use partial crack isolation membrane in conjunction with other concrete substrate installation methods where thin-set or medium set methods are required and crack isolation is required to treat control joints and in-plane cracks.
   4. Location: Use full continuous crack isolation membrane at all elevated slab conditions.
   5. Grout: Water-Cleanable Epoxy Grout. 1/8-inch grout joint width.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which suspension systems will be attached.
   3. Size and location of initial access modules for acoustical panels.
   4. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
   5. Perimeter moldings.

D. Qualification Data: For testing agency.

E. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

F. Maintenance Data: For finishes to include in maintenance manuals.

G. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:
1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

2.3 ACOUSTICAL PANELS

A. Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corp.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Acoustical Panel Ceilings (ACP-1): Provide panels complying with ASTM E 1264 for type, form, and pattern as selected by Interior Designer from manufacturer’s full range. See Interior Design Drawings and Finish Schedule.
   1. Basis of Design: Optima Tegular, fine texture by Armstrong.
   2. Description: Wet formed mineral fiber.
   3. Size: 24 inches by 48 inches.
   4. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.
   5. Sag resistant.
   6. Color: Pre-finished white.
   7. Installation: Exposed tee system.
   8. Recycled Content: 71 percent maximum.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer’s standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273 and evaluated according to ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, “Direct Hung,” unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
   1. Basis of Design Product: Prelude 15/16 inch suspension system by Armstrong, or approved comparable. Subject to compliance with requirements, provide products by one of the following:
      a. Armstrong World Industries, Inc.
      b. CertainTeed Corp.
      c. USG Interiors, Inc.; Subsidiary of USG Corporation.
   2. Finish: White.
   3. Structural Classification: Heavy-duty system.
   4. End Condition of Cross Runners: Override (stepped) type.
   5. Face Design: Flat, Flush.
   6. Cap Material: Steel cold-rolled sheet.
   7. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corp.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide edge moldings that match profile of face of suspension grid.
   3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
   2. Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 SUSPENDED PANEL INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and

that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with

installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
    a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
    b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095426 – LINEAR WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes linear wood ceiling panels and concealed suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 RELATED SECTION

A. Section 098100 – Linear Wood Ceilings.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Panel: 12” x 18” samples of each panel type, pattern and color.
   2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which suspension systems will be attached.
   3. Size and location of initial access modules for acoustical panels.
   4. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
   5. Perimeter conditions.

D. Qualification Data: For testing agency.

E. Delegated Design Submittal: For seismic restraints for ceiling systems.
   1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

H. Field quality control reports.

I. Maintenance Data: For finishes to include in maintenance manuals.

J. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Panels: Full-size panels equal to 2 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturers other than those listed in paragraph 2.1 are required to submit for approval prior to bidding.

B. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with record of successful in-service performance.

C. Inspection: All work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.

D. Single Source Responsibility for Wood Ceiling System: Obtain each type of Linear Wood Ceiling Panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.

E. Single Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver linear wood panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Acclimatization: Before installing wood panel ceilings, permit them to reach room temperature and stabilized moisture content (at least 72 hours) per AWI standards.

C. Handling: Handle Linear Wood Ceiling Panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install linear wood panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
   2. Suspension System: Obtain each type from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

2.3 LINEAR WOOD CEILING PANELS

A. Basis-of-Design Product: 9100-C hybrd panel wood lay-in grilles by 9-Wood, or approved comparable. Subject to compliance with requirements.
   1. Linear Wood Ceiling Panel Manufacturers offering products that may be included in the work:
      a. 9-Wood.
      b. Armstrong World Industries, Inc.
      c. Geometrik.

B. Solid Wood Planks: Hybrid panel.
   1. Species: Western hemlock, solid core, mixed grain.
   2. Member Size: 1 3/8 inch and 2 ¼ inch depth by 5/8 inch wide at 2 inch o.c.
   3. Edge Profile: Square, matching edge banding.
   4. Reveal: 3/4 inch.
   5. Assembly Style: Direct attach to 15/16 inch heavy duty T-bar main runners, typ 2 inch on center.
   6. Fire Rating: Class A Fire Rating.
   7. Finish: Prefinished clear matte.
   8. Reveal Scrim: Black fabric reveal scrim, floating reveal at perimeter edge conditions.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16” 9/16”, 1 ½” suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.

B. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

A. Metal Suspension System Standard: Provide manufacturer’s standard, direct hung, metal heavy duty 15/16” suspension system and accessories according to ASTM C635 and designated by type, structural classification, and finish indicated. T-Grid system using main runners, cross-tees, wall angle or shadow moldings of types, structural classifications, and black finishes indicated.
   1. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.6 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Wire Hangers, Braces, and Ties: Unless otherwise specified by manufacturer, provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch diameter bolts.

F. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Exposed and Concealed Joints: Non-sag, paintable, non-staining latex sealant.
   2. Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which linear wood panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wood panel ceilings according to ASTM C 636/C 636M, seismic design requirements, CISCA “Ceiling Systems Handbook,” and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or comparable devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   8. Do not attach hangers to steel deck tabs.
   9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install wood panels with undamaged edges and fit accurately into suspension-system runners. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. Arrange directionally patterned wood panels as indicated on reflected ceiling plans.

2. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.3 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbfof tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Wood panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of linear wood ceilings and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095426

SECTION 096500 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Luxury vinyl tile.
2. Heterogeneous sheet vinyl.
3. Resilient sheet linoleum.
4. Resilient base.
5. Resilient stair flooring.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.3 QUALITY ASSURANCE

A. Flooring products shall comply with the requirements of the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.”

B. Adhesives:
1. Aerosol adhesives shall not exceed the VOC limits specified in the Green Seal Standard GS-36.
2. Non-aerosol adhesives and primers shall not exceed the VOC limits specified in the South Coast Air Quality District Rule 1168.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Final Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILE (RF-1; RF-3)

A. Luxury Vinyl Tile (RF-1): ASTM F1700, Class III Printed Film Vinyl Plank – Type B (embossed).
   1. Basis of Design: Shaw Contract Reside 20 Mil., or approved comparable.
      a. Size: 6 inches by 47 inches.
      b. Thickness: 2.5mm thick, 0.51mm wear layer.
      c. Color: As shown on Finish Legend.
      d. Warranty: 15-year commercial warranty.

B. Acoustic Floor Underlayment (RF-3) per finish plans.
   1. Basis of Design: Regupol Sonus Core 2 mm.
   2. Size: 4 foot by 75 foot roll.
   3. Material: PUR-bonded SBR tire rubber.

2.3 HETEROGENEOUS SHEET VINYL (RF-2; RF-5)

A. Heterogeneous Sheet Vinyl (RF-2): ASTM F1303, Class B, Type I, Grade I, commercial heterogeneous sheet with fiberglass:
   1. Basis of Design: Shaw Contract Innate Linen, or approved comparable.
      a. Size: 6.56 feet wide by 68.58 feet long roll.
      b. Thickness: 20 mil wear layer.
      c. Color: As shown on Finish Legend.
      d. Warranty: 15 year commercial warranty.

B. Heterogeneous Sheet Vinyl (RF-5): ASTM F1303, Class B, Type I, Grade I, commercial heterogeneous sheet with fiberglass:
   1. Basis of Design: Shaw Contract Tatami, or approved comparable.
   2. Thickness: 20 mil wear layer.
   3. Color: As shown on Finish Legend.
   4. Warranty: 15 year commercial warranty.

2.4 RESILIENT BASE (RB-1; RB-2)

A. Basis of Design Product: Subject to compliance with requirements, provide the product listed in the Finish Legend; or approved comparable, by one of the following:
   1. Johnsonite; A Tarkett Company.
   2. Nora Systems, Inc.

B. Resilient Base: ASTM F 1861.
   1. Material Requirement: Type TV.
   2. Manufacturing Method: Group I (solid, homogeneous).
   3. Style: Cove, unless otherwise indicated on the Finish Legend.
   4. Minimum Thickness: 0.125 inch.
   5. Height:
      a. 4” high.
   6. Lengths: Coils in manufacturer's standard length.
   7. Outside Corners: Preformed.
   8. Inside Corners: Preformed.
   9. Colors and Patterns: As indicated on the Finish Legend.

2.5 RESILIENT STAIR FLOORING (RF-4)

A. Basis of Design Product:
   1. Roppe Corporation, USA.
   2. Johnsonite; A Tarkett Company.
   3. Nora Systems, Inc.

B. Rubber Stair Treads, Risers and Stringers: One-piece rubber stair tread and riser, hammered finish. Cork infused rubber flooring, free of Red List chemicals, PVC, phthalates and halogens. Provide contrasting color tactile rubber insert at nosing for visually impaired aid. Contains 13% bio-based content.,
   1. Basis of Design: ReNew #95 one-piece rubber stair tread and riser by Roppe. Type TS, Class 1, Grade 1, or approved comparable.
      a. Material: Rubber.
      b. Style: #95 Hammered design with riser.
      c. Dimensions: TBD.
      d. Color: Selected by Architect from full range of Manufacturer’s options.
      e. Warranty: 10 year commercial warranty.

2.6 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 LVT FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:
   1. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 SHEET FLOOR COVERING INSTALLATION

A. Comply with manufacturer's written instructions for installing floor coverings.

B. Unroll floor coverings and allow them to stabilize before cutting and fitting.

C. Lay out floor coverings as follows:
   1. Maintain uniformity of floor covering direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
   3. Match edges of floor coverings for color shading at seams.
   4. Avoid cross seams.

D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

H. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:
   1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
   2. Chemically-Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly-fitted seams without gaps, overlays, or excess bonding compound on floor covering surfaces.

3.5 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Final Completion.

END OF SECTION 096500

SECTION 096800 – CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Broadloom Carpet.
   2. Carpet Tile.
   3. Carpet Pad.

1.2 SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations.

B. Shop Drawings: For carpet installation, plans showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Seaming Diagrams.
   9. Type, color, and location of insets and borders.
   10. Type, color, and location of edge, transition, and other accessory strips.
   11. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Manufacturer’s Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.

F. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II or Master II certification level.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard; CRI 104-2015, Section 4, Storage and Handling."

1.5 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet and carpet cushion until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet and carpet cushion over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, the following:
      a. More than 10 percent edge raveling, snags, and runs.
      b. Dimensional instability.
      c. Excess static discharge.
      d. Loss of tuft-bind strength.
      e. Loss of face fiber.
      f. Delamination.
   3. Warranty Period:
      a. Broadloom: 10 years from date of Substantial Completion.
      b. Tile Carpet: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET CARPET (CPT-2)

A. Basis of Design: Simply by Nature Accord broadloom by Shaw Contract, or approved comparable.
   1. Patterns: As indicated on Finish Legend.
   2. Colors: As selected by Architect from Manufacturer's full range.
   3. Width: 12 feet.
   4. Tufted Weight: 16 ounces per yard.
   5. 100% solution dyed.

B. Alternate CPT-2:
   1. Remastered Essential Elements BC441 broadloom, by Mohawk Group.
   2. Harmony broadloom by Mannington Commercial.

2.2 CARPET TILE (CPT-1)

A. Basis of Design: Simply by Nature Offset Tile by Shaw Contract, or approved comparable.
   1. Patterns: As indicated on Finish Legend.
   2. Colors: As selected by Architect from Manufacturer's full range.
   3. Size: 24 inch by 24 inch.
   4. Tufted Weight: 15 ounces per yard.
   5. 100% solution dyed.

B. Alternate CPT-1:
   1. Natural Networks BT597 by Mohawk Group.
   2. Dark Skies Haze by Mannington Commercial.

2.3 CARPET CUSHION

A. Products: Polyurethane-foam cushion, bonded.
   1. Traffic Classification: CCC Class I, moderate traffic.
   2. Thickness and Density: As specified on the Finish Schedule.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the Carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Metal Edge/Transition Strips: Extruded aluminum with finish, profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. As shown on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
   2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Wood subfloors: Verify the following:
   1. Underlayment over subfloor complies with requirements specified in Section 06 10 00-Rough Carpentry.
   2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Examine carpet tile for type, color, pattern, and potential defects.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104-2015, Section 7.0 Site Conditions and Section 8.0 Substrate Preparation and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the Carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE CARPET INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Direct glue.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 SHEET CARPET INSTALLATION

A. General:
1. Lay carpet materials tight and free of irregularities. Cut and fit carpeting accurately and smoothly on wall and floor surfaces, around projections and into trim strips or binding bars with a minimum number of seams. Install no lengths or fillers which are less than 2'-0" in length. Make installation continuous under removable portable and/or accordion partitions.
2. Carpet Seams:
   a. Locate seams in accordance with approved seam diagram.
   b. Seam layout shall provide a minimum total seam length with minimum head seams.
   c. Do not locate head seams in areas of heavy traffic.
   d. Butt match seams in carpeting material with no cut yard ends allowed and with carpet tufting running in same direction throughout Project installation.
   e. Stagger carpet cross cuts or seams by a minimum of 10 feet.
   f. Required tapes or adhesives used shall be in strict accordance with carpet and product Manufacturer's recommendations for type of seam, material and use intended.
3. Edge Strips:

a. Install where floor carpeting terminates and where carpeting abuts a dissimilar floor material.
b. Securely fasten edge strips with concealed fasteners.

4. Do not bridge building expansion joints with carpet.
5. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
6. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.4`
7. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
8. Install pattern parallel to walls and borders.
9. Center under doors at doorways.

B. Direct-Glue-Down Installation: Comply with CRI 104, Section 13.0, "Direct Glue-Down Installation."

C. Stretch-In Installation: Comply with CRI 104, and carpet and carpet cushion manufacturer’s written installation instructions.

3.5 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet cushion and adhesive manufacturers.

END OF SECTION 096800

SECTION 098000 – ACOUSTICAL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Acoustical Insulation Materials
   2. Resilient Channel
   3. Resilient Acoustical Sealant Material
   4. Acoustical Floor Underlayment
   5. Acoustical Door Seals
   6. Acoustical Requirement for Windows
   7. Plumbing Isolation for water supply, waste and rain drain lines
   8. Sound Rated Partition

B. Related Sections include the following:
   1. Division 7 Section “Building Insulation.”
   2. Division 7 Section “Though Penetration Firestop System.”
   3. Division 8 Section “Finish Hardware.”
   4. Division 9 Section “Gypsum Board Assemblies.”

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).
   1. C665-91 Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
   2. C919-98 Standard Practice for Use of Sealants in Acoustical Applications.
   3. E84-00 Test Method for Surface Burning Characteristics of Building Materials
   4. E497-99 Standard Practice for Installing Sound-Isolating Lightweight Partitions

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include fabrication and installation details, and attachments to other Work.

C. Product certificates and test reports.

1.4 COORDINATION

A. Contractor shall coordinate fabrication and installation schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ACOUSTICAL INSULATION MATERIALS

A. Acoustical Insulation: As specified in Division 7 Section “Building Insulation, and as indicated below:
   1. Fiberglass batt insulation
      a. R-11 fiberglass batts shall meet the following requirements:
         (1) Low density unfaced fiberglass.
         (2) 3-1/2" thick.
      b. R-19 fiberglass batts shall meet the following requirements:
         (1) Low density unfaced fiberglass.
         (2) 5-1/2" thick.

   2. Mineral Fiber
      a. 2" or 3" thick mineral fiber insulation batts. Acceptable Products: "Thermafiber" by U.S. Gypsum Company, or equal.
      b. Fire Safing Insulation. Acceptable Products: "Thermafiber" by U.S. Gypsum Company, or equal.

B. Resilient Channel: hole pattern: 3/8” wide slots, 3” long, spaced 4” on center
   a. Dietrich RCSD Deluxe

C. Resilient Acoustical Sealant: Non-hardening, non-bleeding, non-drying, resilient caulk. Acceptable Products:
   1. Acoustical Sealant by U.S. Gypsum Company
   2. Acoustical Sealant BA-98 by Pecora Corporation
   3. SpecSeal ES105 Sealant by STI - fire rated
   4. “Fire Stop 2000" by 3M Vibration Control Systems - fire rated
   5. Non Sag Firestop Caulk (Part # AA-529) by Nelson - fire rated

D. Acoustical Floor Underlayment:
   1. Floor Underlayment below Gyp-crete (at hard surface areas only)
      a. Sleeping Areas, and Bedrooms with vinyl plank flooring
         1) Quiet Qurl 025 MT by Keene Building Products
         2) Acousti-Mat 1/4 Premium by Maxxon
         3) Acousti-Mat 3/8 by Maxxon
      b. All units (alternate)
         1) Quiet Qurl 025 MT; Keene Building Products
         2) Acousti-Mat 1/4 Premium by Maxxon
         3) Acousti-MAT 3/8 by Maxxon
      c. Other than Sleeping Areas / Bedrooms:
         1) Quiet Qurl 025 by Keene Building Products, or
         2) Acousti-Mat 1/4 by Maxxon
   2. Underlayment at concrete slab (apartments over TI)
      a. Vinyl with a pad underlayment attached:
         1) Evoke
         2) TAS; Tandem

3. b. Vinyl without pad underlayment attached:
    1) 2mm Regupol Sonus LV
    2) Silencer LVT
    b. Sheet Vinyl at concrete slab
    1) CorkPlus 250, or
    2) Approved equal

E. Acoustical Door Seals: As specified in Division 8 Section “Finish Hardware” and as follow:
1. Unit Entry Doors:
    a. Pemko S88, or Zero 488 SBK gasketing
    b. Pemko 171
    c. Pemko 2113_V UNCUT, or Pemko 211_V, or Zero 111A door sweep

F. Acoustical requirements for windows: Refer to Architectural Drawings and A3’s Environmental Noise Analysis Report dated 8/7/2024 for more information.
1. STC 35 Windows
2. All other windows should have a min. STC 30.

G. Acoustical Insulation for plumbing pipes:
1. Piping attachment:
    a. Plumbing isolation material:
        1) Closed cell sponge neoprene tape.
        2) Holdrite Silencer System; Mechanical Solutions Northwest Company (206) 575-9001. (Pexpipe does not require isolation material).

H. Acoustical Insulation for mechanical equipment:
1. As specified in Division 23 Section “Vibration Control For HVAC Piping and Equipment”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence.

B. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved. Beginning work constitutes acceptance of the site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Verify that adjacent materials are secured, properly spaced, dry, and ready to receive installation.

B. Verify that mechanical and electrical services within spaces to be insulated have been installed and tested.

3.3 INSTALLATION

A. Acoustical Batt Insulations: Install in accordance with manufacturer's instructions. See Section 09260 for installation.

B. Acoustical Resilient Channel
1. Resilient channel shall be installed perpendicular to framing members.
2. Spacing for resilient channels mounted on walls shall be 24" on center.
3. On the wall, install the channel so that the bottom part of the channel is attached to the studs. The gypsum wallboard should be attached to the top side, so the weight of the gypsum board pulls the channel away from the studs.
4. Position channels 6" maximum distance from the wall-ceiling angle.
5. Cantilever channel ends no more than 6".
6. Install gypsum with 1/8" to ¼" gap around perimeter of each room for acoustical sealant application. Seal the gap using resilient caulk.
7. Mount electrical boxes and other junction boxes to the framing.
8. On the ceiling, install gypsum board with 1/8" to ¼" gap around perimeter for acoustical sealant application. Seal the gap using resilient caulk.
9. Use 1" screw on the first layer of 5/8" gypsum board and 1-5/8" screw of the 2nd layer of 5/8" gypsum board. Do not allow gypsum wallboard fasteners to touch the wall studs.
10. Use 1.5" laminating screws to attach the soffit's framing to the gypsum board ceiling. Do not attach soffit's framing to TJI.

C. Acoustical Isolation for Plumbing pipes: Install in accordance with manufacturer's instructions.

D. Acoustical Sealant Materials: See Section 09520 for installation.

E. Acoustical Floor Underlayment: Install in accordance with manufacturers directions and the following:
1. Acousti-Mat 1/4, or Quiet Qurl 025 underlayment:
a. Subfloor shall be structurally sound, level and clean
b. Install perimeter isolation strip (2" wide, ¼" thick foam) at the perimeter of the entire subfloor (including door frames), and transitions between hard surface flooring and carpet. The perimeter isolation strip could be stapled, or taped temporary with duct tape.
c. Place the Acousti-Mat 1/4, or Quiet Qurl 025 over subfloor and tape joints. Acousti-Mat 1/4, or Quiet Qurl 025 should be free floating. Do not attach it to the subfloor with staples.
d. Pour the overlay (gyp-crete) on top of the Acousti-Mat 1/4, or Quiet Qurl 025

F. Sound Rated Partition
1. Coordinate with Division 9 Section "Gypsum Board Assemblies." Most stringent requirements govern.
2. Sound-rated partition shall extend to structure and be sealed to it, unless noted otherwise.

3. Acoustical rated partitions on concrete slab: The first layer of gypsum board on each side of the stud shall be sealed, top, and bottom with acoustic sealant. Where partitions seal to a rough, textured or corrugated surface, special closure strips may be required in addition to sealing.
4. Where sealing is indicated, use silicone-base, non-hardening compounds.
5. Electrical and other outlets on a party wall between units
    a. For back to back installation, outlets should be spaced at least 24 inches from each other. Back side of both outlets should be fitted with putty pad if the distance is within 24 inches of each other. In any case, the junction boxes located on one side of the wall should have putty pad.
6. Penetration of sound rated partitions (i.e. ductwork, conduit, or plumbing) must be sealed with resilient calk.
7. Pipe conduit or ductwork runs within, or penetration through a double-studded partition, must not rigidly tie to the two sets together. Any interconnecting elements must be vibration isolated, either, by means of a flexible connection, or by packing around the penetration on one side with sponge neoprene or glass fiber so no contact is made with the wall surface before caulking.
8. Where two or more layers of gypsum board are used, do not cement gypsum board layers to bottom layer. Use nails or screws. Stagger board joints.
9. Batt insulation shall be full height of studs. Secure insulation to prevent sagging.
10. Conform to reference ASTM E497 and C919.

G. Plumbing Piping:
1. Supply Pipes:

    a. Use flow velocities of 5ft/second inside units.
    b. Use Wirsbo PEX pipe and manifold system inside the units for domestic supply water pipes. No need for additional acoustical isolation when using PEX pipe.

2. Waste Pipes & Rain Drain Lines

    a. Use cast-iron or wrap completely all plastic waste pipes and plastic rain drain lines running in the ceiling or in the wall adjacent to bedroom. The wrap should consist of carpet pad covered with Foil Tech Pipe Acoustic Lagging.
    b. Use cast-iron for waste pipes and rain drain lines running in the common spaces such as Lobby, Leasing, Offices, etc., and TI.
    c. Isolate waste pipes and rain drain lines from the structure by an insert of neoprene sleeve between the framing and the pipe. Do not allow the piping, pipe connectors, pipe hangers, or valves to directly touch the structure, studs, or gypsum board.
    d. Floor penetrations should be packed with rock wool or fiberglass insulation and sealed with fire resilient caulk. Do not allow piping to make direct contact with the framing elements.
    e. Fill plumbing wall cavity & ceiling cavity (where plumbing occurs) with fiberglass batt insulation.
    f. Use plastic piping for waste vents.
    g. Use plastic piping for waste from bathroom and kitchen sinks running inside the bathroom or kitchen cabinet.

END OF SECTION 098000

SECTION 098100 - ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Acoustical insulation as shown on Drawings and as specified.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s data sheets on each product to be used, including:
   1. Test data showing compliance of products with specified requirements.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Surface Burning Characteristics:
      a. Maximum flame spread: 25
      b. Maximum smoke developed: 50.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - Label insulation packages to include material name, production date and/or product code.PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products as manufactured by one of the following:
   1. Manville Building Products Group
   2. Owens Corning Fiberglas
   3. U.S. Gypsum Company

2.2 MATERIALS

A. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Product Description: Glass fibers bonded with an acrylic thermosetting binder.
   2. Thickness: As indicated on Drawings or as required by wall thickness.
   3. Products shall be formaldehyde free.

B. Acoustic Blanket Insulation: Mineral fiber thermal insulation, complying with ASTM C553.
   1. Basis of Design: Select Sound Black acoustic blanket by Owens Corning, or approved comparable.
   2. Material: Inorganic glass fibers with thermosetting resin binder in a dimensionally stable blanket. Minimum 22% post-consumer and balance 31% pre-consumer recycled glass content.
   3. Thickness: 2 inches.
   4. Acoustic Performance: NRC 1.0.
   5. Surface burning characteristics: Flame spread index 25; Smoke developed index 50.
   6. Color: Black, with black veil facing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified.

B. Obtain installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

C. Clean substrates of substances harmful to insulation.

3.2 INSTALLATION

A. General: Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Batts:
   1. Install acoustical insulation batts in sound-rated stud partition walls where indicated on Drawings. Size batts for a friction fit and install in accordance with Manufacturer's recommendations.
   2. Install acoustical insulation batts above lay-in ceilings, and other locations as shown on Drawings, in strict accordance with Manufacturer's printed instructions.
   3. Butt ends of batts closely together and fill all voids.

4. Where insulation must extend higher than 8 feet, temporary support can be provided to hold product in place until the finish material is applied.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 098100

SECTION 098433 - SOUND-ABSORBING WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sound-Absorbing Acoustical Wall Panels.

1.2 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.3 SUBMITTALS

A. Product Data: Manufacturer's printed data sheets for products specified.

B. Verification Samples: Fabricated samples of each type of panel specified; 6 x 6 inch, showing construction, edge details, and textures to be expected in completed work.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Panels: Quantity equal to 5 percent of total installed, but not less than one carton of each type.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than five years of experience in manufacturing acoustical products similar to those specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.

B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.

C. Protect panel edges from damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acoustical Wall Units:
   1. Basis of Design: F-Sorb Acoustical Ceiling Panels.
   2. Acceptable Manufacturers:
      a. PolySorb Polyester Acoustic Panels.
      b. Kieri Acoustics.

2.2 ACOUSTICAL PANELS

A. Acoustical Wall Units:
1. Material: Extruded, recycled content polyester, shaped and formed with heat.
2. Thickness: 2 inch.
3. Size: 48 inch x 96 inch panel.
4. Class A Rated.
5. Edge Profile: Square.
6. Finish: To be selected by Architect form manufacturer’s full range.
7. Minimum NRC of not less than 0.70 according to ASTM C423.
8. Reveals: A indicated on Drawings.
9. Installation: Fasten with concealed fastening system per manufacturer’s recommendation.

2.3 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

2.4 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal.

B. Furring Strips: 1 inch deep, metal hat channel.

C. Manufacturer’s recommended ceiling accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level.

B. Wall Panels: Install furring channels at location shown on Drawings to create 1 inch air space behind wall panels. Mount panels in accordance with manufacturer’s written instructions.

C. Install panels to construction tolerances of plus or minus 1/16 inch for the following:
1. Plumb and level.
2. Flatness.
3. Width of joints.

3.3 CLEANING

A. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.4 PROTECTION

A. Provide protection of installed acoustical panels until completion of the work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099100 – PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and field painting of exposed exterior and interior items and surfaces.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 , Standard Terminology for Paint, Related Coatings, Materials, and Applications and ASTM D523 Standard Test Method for Specular Gloss apply to this Section.
   1. Flat: Lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
   3. Semigloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
   4. Full gloss: High-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

B. PDCA: Painting and Decorating Contractors of America.

1.3 SUBMITTALS

A. General: Submittals to be provided as Directed by the Project Manager and/or Architect.

B. Product Data: Submit manufacturer’s data for each paint system indicated, including primers. Data shall include label analysis and instructions for handling, storing, and applying each coating material.

C. Material List: Submit an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

D. Samples:
   1. Architect will furnish Contractor a color schedule, color chips or selected colors prior to commencing work.
   2. Submit samples a minimum of 30 days prior to commencing painting work.
   3. Label and identify each sample as to location and application.
   4. Resubmit as requested by Architect until required sheen, color, and texture are achieved.
   5. Samples shall define each separate coat, including primer.
   6. Submit two 8 inch x 10 inch samples of each color and material specified, including the correct sheen and texture. Samples shall be on heavy cardboard.

E. Coating Maintenance Manual: Submit a coating maintenance manual including an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:
1. ASTM Standards listed in paint manufacturer’s technical literature.
2. Local and Federal regulations regarding toxicity and air quality regulations.

B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

C. Applicator Qualifications: A firm or individual with a minimum 5 years experience in applying paints and coatings similar in material, design, and scope to this project.

D. Mockups: Provide as specified in Section 014000 – Quality Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.
2. Store materials in manner and quantities that are in strict accordance with local ordinances, state laws, or fire underwriter regulations.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
1. Apply paints when ambient and surface temperature conforms to manufacturer’s recommendations. Do not apply paint in the following conditions:
a. Snow, rain, fog, or mist
b. When relative humidity exceeds 85 percent
c. At temperatures less than 5 deg F above the dew point
d. To damp or wet surfaces.
e. In direct sunlight.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to location as instructed by Owner.

1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal., of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following manufacturers:
   1. BEHR
   2. Benjamin Moore
   3. Kelly-Moore
   4. PPG Paints
   5. Sherwin-Williams Co.
   6. Tnemec

2.2 PAINT MATERIALS

A. All materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the MPI Architectural Painting Specification Manual “Approved Product” listing and shall be from a single manufacturer for each system used.

B. Other paint materials such as linseed oil, shellac, etc. shall be the highest quality product of an approved manufacturer listed in the MPI Architectural Painting Specification Manual and shall be compatible with other coating materials as required.

C. All materials and paints shall be lead and mercury free and shall have low VOC content where possible.

D. Material Compatibility: Provide primers, and finish-coat materials that are compatible with one another, and with the substrates indicated, under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

E. Material Quality: Provide manufacturer's best-quality paint materials, factory formulated and recommended by manufacturer for application indicated.
   1. Materials selected for coating systems for each type surface shall be the product of a single manufacturer.

F. Colors:
   1. Manufacturer supplying paint shall match colors.
   2. Obtain clarification of intended color at locations where color is not indicated on schedule or drawings.
   3. Approval of final colors: Do not apply final coat of paint until colors have been approved by Architect.

G. Schedule of Finishes: Refer to the "Finish Schedule" on the Drawing for designated finishes of areas.

H. Paint Products: As indicated in Schedule of Paint Products at end of section.

I. Chemical Components of Interior Paints and Coatings: Provide products that comply with the limits for VOC content contained in 2010 California Green Building Standards Code as indicated on the drawings. Note: VOC limits contained in California Code comply with, or are more restrictive than, LEED 2009 VOC requirements.

2.3 ACCESSORIES

A. Concrete Floor Sealing Compound: Clear, chemically reactive, waterborne solution of inorganic silicate or silconate materials and proprietary components; odorless; that penetrates, hardens and densifies concrete surfaces. Subject to compliance with requirements, provide products as manufactured by one of the following:
   1. Ashford Formula by Curecrete Distribution Inc.
   2. Seal Hard by L&M Construction Chemicals.

B. Application Materials:
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Commencement of painting will be construed as Applicator's acceptance of surfaces and conditions.

B. Test shop applied primer to verify compatibility with cover materials.

C. Verify moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents are at range acceptable to paint manufacturer.

3.2 PREPARATION

A. General:
   1. Prior to commencing painting work, remove and protect hardware, accessories, electrical plates, lighting fixtures and similar items.
   2. Mask permanent labels.
   3. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers,

efflorescence and other foreign matter detrimental to the coating's adhesion and performance.

4. Repair voids, cracks, nicks, and other surface defects, with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.
5. Determine moisture content of plaster, stucco, cementitious materials, wood, and other moisture-holding materials by use of a reliable electronic moisture meter.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. WOOD: Sand smooth and remove dust. Fill open joints, cracks, nail holes and other pits or depressions flush and smooth with putty or wood dough after priming. Use wood dough to match finish paint coat. Touch up knots or sap streaks with a stain-blocking sealer before priming.
2. CONCRETE: Remove bond breaker and release agent residue, loose particles, efflorescence and encrustations from cured concrete substrates. Fill depressions and remove fins and projections not inherent in base material. Prime with an alkali-resistant primer.
3. PRIMED FERROUS METAL: Remove contaminants and foreign matter. Touch up abrasions with a suitable ferrous metal primer.
4. UNPRIMED FERROUS METAL: Remove rust, mill scale and foreign matter. Touch up abrasions with a suitable ferrous metal primer.
5. GALVANIZED METAL: Remove oils, passivators and clean entire surface with an appropriate solvent. Pre-treat with a phosphoric acid etching solution. Apply primer same day as pretreatment is applied.
6. PHOSPHATIZED METAL (shall not be chemically etched): Clean and apply suitable metal primer.
7. GYPSUM BOARD: Remove dust and foreign matter. Fill pits flush and smooth with joint compound and where required skim coat to provide the specified level of finish before application of decoration.
8. Surfaces, which cannot be prepared or painted as specified, shall be immediately brought to attention of Architect.
    a. Starting of work without such notification will be considered acceptance of surfaces involved.
    b. Replace unsatisfactory work caused by improper or defective surfaces as direct by Architect.

C. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

D. Tinting: Manufacturer shall shop tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color

of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions.
   1. Paint colors, surface treatments, and finishes as indicated in the paint schedules.
   2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   3. Sand lightly between each succeeding enamel or varnish coat.
   4. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   5. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
   6. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   7. Leave parts of molding and ornaments clean and true to details with no undue amount of paint in corners and depressions.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practical after preparation and before subsequent surface deterioration.
   1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified. Touch up prime coats applied by others as required to ensure an even primed surface before applying finish coat
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
   5. Number of coats scheduled is minimum. Apply additional coats at no additional cost if necessary to completely hide base materials, produce uniform color and provide satisfactory finish result.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

D. Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Exposed Surfaces: Paint exposed surfaces, except where indicated that the surface or material is not to be painted or is to remain natural. If a finish is not indicated, verify with Architect prior to painting that surface. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
   1. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
   2. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

F. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

G. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

H. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces. Items without factory finish such as conduits, pipes, access panels and items of similar nature shall be finished to match adjacent wall and ceiling surfaces unless otherwise directed.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Touch Up for Previously Coated Surfaces:
   1. Touch up marred, scraped, and blemished areas of surfaces which were factory primed or previously coated.
   2. Properly prepare and touch up scratched, abrasions, and blemishes and remove foreign matter before proceeding with succeeding coats.
   3. Feather touch up coating overlapping minimum 2 inches onto adjacent unblemished areas producing smooth, uniform surface.
   4. Touch up fasteners, welded surfaces and surrounding, field connections and areas on which shop coat has been abraded or damaged with specified primer before corrosion or other damage occurs from exposure.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
   1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
   2. Testing agency will perform a generic ID test to verify type of product and manufacturer.
   3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup:
   1. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site. Take precautions to prevent fires.
   2. During the course of the Work, remove misplaced paint and stain spots or spills. Leave Work in clean condition acceptable to Architect.
   3. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

B. Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
   1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1-Touch-Up Painting And Damage Repair: Financial Responsibility..

3.7 SCHEDULE OF PAINT PRODUCTS

A. The following schedule of paint products is intended to identify manufacturer’s highest quality recommended systems. Recommended systems for substrates or applications that are not identified in the schedule shall be submitted by paint manufacturer for approval.

B. Provide paint finishes of even uniform color, free from cloudy or mottled appearance. Properly correct non-complying work to satisfaction of Owner or Owner’s Representative.

C. Some Colors, especially accent colors may require multiple finish coats for adequate coverage and opacity.

D. The specified number of primer and finish coats is minimum acceptable. If full coverage and opacity is not obtained with specified number of coats, apply additional coats as necessary to produce required finish.

3.8 EXTERIOR PAINT SCHEDULE

A. Vertical Concrete:
1. System: 2 coats self-priming elastomeric coats.
2. Paint Type: TBD

B. Fiber Cement Panels and Siding:
1. System: 1 coat factory primer and 2 finish coats.
2. Paint Type: 100 percent Acrylic latex system.
3. First Coat Primer: Factory primer.
4. Second and Third Coats:
   a. Flat acrylic house paint:
      1) BEHR: Behr Pro e600 Exterior Flat 610
      2) Benjamin Moore: Super Spec Flat K180
      3) Kelly-Moore: 1200 Color Shield Exterior Flat
      4) PPG Paints: Speedhide Exterior Flat 6-652XI
      5) Sherwin-Williams Co.: A-100 Exterior Flat A6-100 Series

C. Galvanized Metals:
1. System: 1 coat primer with 2 coats finish.
2. Paint Type: 100 percent Acrylic latex system.
3. First Coat (Primer): TBD
4. Second and Third Coats:
   a. Semi-gloss:
      1) BEHR: Behr Pro e600 Exterior Semi-Gloss 670
      2) Benjamin Moore: Super Spec Semi-Gloss 170
      3) Kelly-Moore: 1215 Color Shield Semi-Gloss
      4) PPG Paints: Speedhide Exterior Semi-Gloss 6-900XI
      5) Sherwin-Williams Co.: Solo Semi-Gloss 76 Series

D. Exterior Ferrous Metals:
1. System: 1 coat shop-primed with 2-coats finish.
2. Paint Type: TBD
3. First Coat (Primer): Shop-primed, Zincrich MIO Urethane.
4. Second and Third Coats:
   a. Polyaspartic Semi-Gloss:
      1) BEHR: Behr Pro e600 Exterior Semi-Gloss 670
      2) Benjamin Moore: Super Spec Semi-Gloss 170
      3) Kelly-Moore: 1215 Color Shield Semi-Gloss
      4) PPG Paints: Speedhide Exterior Semi-Gloss 6-900XI
      5) Sherwin-Williams Co.: Solo Semi-Gloss 76 Series

3.9 INTERIOR PAINT PRODUCTS – LOW/ZERO VOC

A. Gypsum Board – Walls and Ceilings:
1. System: 2 coat finish over 1-coat primer. 2 coats primer required at exterior walls.
2. Paint: Latex paint.
3. First Coat (Primer)
a. BEHR: Kilz PVA Interior Primer 10
b. Benjamin Moore: Ultra Spec Latex Primer 534
c. Kelly-Moore: 970 Acry-Plex PVA Wall Sealer
d. PPG Paints: Speedhide Zero Interior Latex Sealer 6-4900XI
e. Sherwin-Williams Co.: ProMar 200 Zero VOC Primer B28W02600
4. Second and Third Coats:
a. Low-Luster/Eggshell:
1) BEHR: Behr Pro i300 Interior Eggshell 370
2) Benjamin Moore: Ultra Spec 500 Eggshell 539
3) Kelly-Moore: 1050 KM Professional Eggshell
4) PPG Paints: Speedhide Zero Interior Eggshell 6-4510XI
5) Sherwin-Williams Co.: ProMar 200 Zero VOC Eggshell B31-2600
b. Wet locations: Semi-gloss finish.

B. Interior Ferrous Metals: Hollow Metal Doors and Frames (excludes prefinished items)
1. System: 1 coat primer (not required on shop-primed items in sound condition) with 1 coat finish.
2. Paint Type: 100 percent Acrylic. (latex system)
3. First Coat (Primer): Not Used.
4. Second Coat:
a. Semi-Gloss:
1) BEHR: Behr Pro i300 Interior Semi-Gloss 370
2) Benjamin Moore: Ultra Spec 500 Semi-Gloss 539
3) Kelly-Moore: 1050 KM Professional Semi-Gloss
4) PPG Paints: Speedhide Zero Interior Semi-Gloss 6-4510XI
5) Sherwin-Williams Co.: ProMar 200 Zero VOC Semi-Gloss B31-2600

C. Interior Wood Finishes – Painted:
1. System: 1 coat finish over one coat primer
2. Paint: Acrylic
3. First Coat (Primer): Enamel undercoater as recommended by paint manufacturer. Primer not required for pre-primed items.
a. BEHR: Premium All-In-One Primer Sealer 75
b. Benjamin Moore: Fresh Start Primer K023
c. Kelly-Moore: 973 AcryPlex Interior Undercoat
d. PPG Paints: Pure Performance Primer 9-900
e. Sherwin-Williams Co.: PrepRite Primer B28W101
4. Second Coat:
a. Semi-Gloss:
1) BEHR: Behr Pro i300 Interior Semi-Gloss 370
2) Benjamin Moore: Ultra Spec 500 Semi-Gloss 539
3) Kelly-Moore: 1050 KM Professional Semi-Gloss

4) PPG Paints: Speedhide Zero Interior Semi-Gloss 6-4510XI
5) Sherwin-Williams Co.: Harmony Semi-Gloss B10-1000

END OF SECTION 099100

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Entry signs.
2. Exit signs.
3. Stairs and stairway landings.
4. Elevator signs.
5. Accessibility signs.
6. Egress doors with locks.
7. Posting occupancy.
8. Manual fire alarm stations.
9. Evacuation signs.
10. Building signs:
a. Way-finding.
b. Exterior building name identification.
c. Unit numbering signs.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

1.3 SUBMITTALS

A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room name, other text to be applied, sign and letter sizes, fonts, and colors.
1. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
2. Submit for approval by Owner through Architect prior to fabrication.

C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

D. Closeout Submittals: Provide Maintenance Data for each type of sign in maintenance manuals.

E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Flat Signs:
1. Basis of Design: 100 Series; Vomar Products, www.vomarproducts.com, or as selected by Owner/Architect.
2. Best Sign Systems, Inc: www.bestsigns.com.
3. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com.
4. Art Source Inc.: www.artsource-inc.com.

2.2 SIGNAGE APPLICATIONS

A. All graphics shall be computer-generated and machine-manufactured with precise edges and form to meet requirements of Schedule and Design Intent Drawings.

B. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

C. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
1. Sign Type: Flat signs with raised lettering panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.

3. Size/Shape/Pattern: As indicated on design intent drawings.
4. Colors to be selected by Architect from full range of colors or to match custom color sample.

2.3 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: TBD
   2. Character Case: Upper case only.
   3. Background Color: Architect to choose from manufacturer's full range of colors.
   4. Character Color: Contrasting color.

2.4 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

2.5 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door, centered 60 inches above finish floor to baseline of characters, unless noted otherwise.
   2. If no location is indicated obtain Owner's instructions.
   3. Accessible Signage: Install in locations on walls according to the accessibility standard.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION 101400

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Corner guards.
2. Wall protection.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each impact-resistant wall protection unit. Include sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepare on Samples of size indicated below.
1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each impact-resistant vinyl material, from manufacturer.

B. Material Test Reports: For each impact-resistant vinyl material.

C. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data. For each impact-resistant wall protection unit to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

C. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

D. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated areas protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period materials are stored.
   2. Keep sheet material out of direct sunlight.
   3. Store wall protection components for a minimum of 72 hours, or until material attains a minimum room temperature of 70 deg F.
      a. Store corner-guard covers in a vertical position.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Deterioration of vinyl and other materials beyond normal use.
   2. Warranty Period: Five years from date of Final Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE DATA

A. Flammability Characteristics: High Impact vinyl components.
   1. Class A Interior wall finish (NFPA 101 Life Safety) when tested in accordance with ASTM E84.
      a. Flame Spread: 25 or less.
      b. Smoke Developed: 450 or less.
   2. Classification of HB when tested in accordance with ASTM D635.

B. Stain Resistance: High impact vinyl components.
   1. Material to be tested for stain resistance to various chemical reagents in accordance with ASTM D543.

C. Bacterial and Fungal Growth: High impact vinyl components.
   1. Material must not support bacteria or fungal growth when tested in accordance with ASTM G21 and ASTM G22.

D. Impact Resistance: High impact vinyl components.
   1. Extruded profiles shall resist damage from impact at apex of 90-degree corner when tested in accordance with applicable sections of ASTM F476.
   2. Izod impact strength ASTM D256 method A notched, 23.8 ft-lbs/in average with no break.

3. Charpy impact strength ASTM D6110 notched, 26.1 ft-lbs/in average with no break.

2.2 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

B. Material: 16 gauge stainless-steel sheet, Type 430.

C. Thickness: Minimum 0.0500 inch (1.3 mm).

D. Finish: Directional satin, No. 4.

E. Wing Size: Nominal 1-1/4 inch wing width by 46 inches high.

F. Corner Radius: 1/8 inch.

G. Mounting: Adhesive.

2.3 Wall Protection

A. Wall Covering: 0.40 inch PVC free, rigid, high impact sheet. Chemical and stain resistant per ASTM D543 standards. Include all trim accessories as recommended by manufacturer.
1. Basis of Design: CS Acrovyn
2. Size: 4 feet by 8 feet by 0.40 inch thick.
3. Texture: Irish tweed.
4. Color: As selected by Architect from Manufacturer’s full range.

2.4 FABRICATION

A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
   2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
      a. Provide anchoring devices to withstand imposed loads.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

3.4 CLEANING

A. Immediately after completion of installation, clean vinyl covers and accessories using a standard, ammonia-based, household cleaning agent.

END OF SECTION 102600

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Unit bathroom accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Basis-of-Design Product: The design for accessories is based on products indicated on the Drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Bobrick Washroom Equipment, Inc.
      a. Surface mounted waste receptacles: Bobrick B-279.
      b. Surface mounted dual toilet paper dispenser: Bobrick B-2840.
      c. Surface mounted seat cover dispenser: Bobrick B-4221.
      d. Waste receptacle: Bobrick B-3699.
      e. Surface mounted soap dispenser: Bobrick B-155.
      f. Surface mounted warm air hand dryer: Bobrick B-7120 115v.

C. Grab Bars:
   1. Product: B-5806 as manufactured by Bobrick Washroom Equipment, Inc., no substitutions.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
   4. Outside Diameter: 1-1/2 inches.
   5. Length:
      a. Side: B-5806 by 36 inch.
      b. Rear: B-5806 by 42 inch.

D. Mirrors: As indicated in Section 088300 Mirrors.
   1. 6mm plate with polished edges and silver J-channel mounted at bottom. Provide on lavatory wall above vanity, height 42 inch, width to match countertop.

2.3 UNIT BATHROOM ACCESSORIES

A. The design for accessories is based on products indicated on the Drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. Basis of Design: Mason line in chrome by Moen.
      a. Toilet Tissue Dispenser: YB8000CH Mason mounting posts with YB8099CH toilet paper holder by Moen.
      b. Towel Bars: YB8000CH Mason mounting posts with YB8094CH 24 inch towel bar by Moen.
      c. Robe Hooks: YB8003CH double robe hooks by Moen.
      d. Shower Curtain Rod: DN2160CH curved Inspirations shower rod by Moen.
      e. Grab Bars (Type A units): Home Care LR87##D3G0BN, brushed nickel finish, 24 inch and 42 inch long.
      f. Mirrors: As indicated in Section 088300 - Mirrors.
         1) 6mm plate with polished edges and silver j-channel mounted at bottom. Provide on lavatory wall above vanity , height 36 inch, width to match countertop.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Portable fire extinguishers.
2. Fire extinguisher cabinets.

1.2 REFERENCES

A. National Fire Protection Association:
1. NFPA 10 - Standard for Portable Fire Extinguishers.

B. Underwriters Laboratories Inc.:
1. UL - Fire Protection Equipment Directory.

1.3 SUBMITTALS

A. Product Data: Submit extinguisher operational features, color and finish, anchorage details.

B. Manufacturer's Installation Instructions: Submit special criteria and wall opening coordination requirements.

C. Maintenance and Operating Manuals: Submit test, refill or recharge schedules and re-certification requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature is capable of freezing extinguisher components.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
b. Larsen's Manufacturing Company.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10,

B. Dry Chemical Type Fire Extinguisher (General): Carbon steel heavy-duty DOT tank, with pressure gage. Multi-purpose UL rated 2A-10B:C, 5 pound capacity..

2.2 CABINETS

A. Fire-Protection Cabinets: Surface Mounted, Recessed or Semi-Recessed (depending on wall assembly) Mounted Cabinet.
   1. Manufacturers:
      a. J.L. Industries, Inc.
      b. Larsen's Manufacturing Company.
   2. Basis of Design:
      a. Surface Mounted Cabinets: Ambassador 1013G10 by JL Industries; or approved equal.
      b. Semi-Recessed Cabinets: Ambassador 1017G10 by JL Industries; or approved equal.

B. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
   1. Cabinet Metal: Steel.
   2. Shelf: Same metal and finish as cabinet.

C. Cabinet Type: Suitable for the following:
   1. Fire extinguisher.

D. Cabinet Mounting: Suitable for the following mounting conditions:
   1. Surface Mounted, Recessed or Semi-Recessed Mounted: Cabinet box mounted within walls, as shown on Drawings.

E. Cabinet Trim Style: Fabricate cabinet trim in one piece with rolled edges.
   1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      a. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Cabinet Trim Material: Manufacturer's standard, as follows: Steel.

G. Door Material: Manufacturer's standard, as follows: Steel

H. Door Glazing: Manufacturer’s standard, as follows:
   1. Polycarbonate Acrylic Sheet: ASTM D4802, Category A-1, 6 mm thick, with Finish 1 (smooth or polished). Clear.

I. Door Style: Manufacturer's standard design, as follows:
   1. Vertical duo panel with frame.

J. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.

1. Provide minimum 1/2-inch thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
2. Provide inside latch and lock for break-glass panels.

K. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.3 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.
1. Typical Locations: Equipment or Storage rooms where shown on plans or directed by local Authority.

B. Door Locks: Provide emergency release cam-lock based design.

C. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
1. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
a. Application Process: Silk-screened.
b. Lettering Color: Red.
c. Orientation: Vertical.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

B. Install fire extinguisher cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
   1. Fasten cabinets to structure, square and plumb.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 104400

SECTION 105500 - POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Mailboxes.
2. Parcel boxes.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, identification sequence for compartments, and attachments to other work.

C. Samples: For each exposed finish.

D. Other Informational Submittals: Final USPS local postmaster approval for installed postal specialties to be served by USPS.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver lock keys to Owner by registered mail or overnight package service with a record of each corresponding lock and key number.

1.4 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of postal specialties that fails in materials or workmanship within 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, and as follows:
1. Sheet and Plate: ASTM B 209.
2. Extruded Shapes: ASTM B 221.

B. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

C. Custom millwork enclosure with wood veneer and solid surface facings.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as manufactured by one of the following:
   1. Basis of Design: 4C series Suite D Mailboxes & Parcel Lockers by Florencemailboxes.com.
   2. Grainger.
   3. Salsbury Industries.

2.3 EQUIPMENT

A. Mailboxes: USPS-Approved, Front-Loading, consisting of multiple compartments with fixed, solid compartment backs, enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS STD-4C.
   1. Number of units: As indicated on Drawings. Provide 1 for each unit in 10 box/2 package configuration.
   2. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; with master door lock and concealed, full-length, stainless-steel piano hinge on one side. Fabricate master door to remain open while mail is deposited.
      a. Master Door Lock: Prepare master door to receive lock furnished by local postmaster.
   3. Compartment Doors: Fabricated from aluminum sheet reinforced with vertical stiffeners. Equip each compartment door with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide one compartment with outgoing mail slot and prepared for master door lock.
      a. Tenant Identification: Numbers engraved on door surface. Architect and Owner will provide numbering system.
      b. Compartment Door Locks: 5-pin tumbler, cylinder cam locks capable of at least 1000 key changes; with 2 keys for each compartment door. Key each compartment to buildings.
   4. Concealed Components and Mounting Frames: Aluminum or steel sheet.
   5. Finish: Clear anodized finish.
   6. Letter drop:
      a. 11 inch wide by 3-1/2 inch high, top-hinged, spring-loaded flap that pivots inward, held in place by 1-inch wide face frame.
      b. Frame: Fabricated from ¼ inch thick aluminum or steel.
      c. Finish: Match mail receptacles.
      d. Identification: Engrave face of swinging flap with 1 inch high letters “RENT DROP.”
      e. Finish: Satin aluminum, clear anodized.

B. USPS-Approved, Front-Loading, Lobby Parcel Lockers: Consisting of multiple compartments. Provide access to compartments for distributing incoming parcels from front of unit. Provide access to each compartment for removing parcels by swinging compartment door.
   1. Quantity: As indicated on Drawings.

2.4 FABRICATION

A. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs, and safe to touch.

B. Form joints exposed to weather to exclude water penetration.

C. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Metal Protection: Where aluminum and copper alloys will contact grout, concrete, masonry, wood, or dissimilar metals, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation.

B. Final acceptance depends on compliance with USPS requirements.

C. Horizontal Apartment Mailboxes: Install horizontal apartment mailboxes with center of tenant-door lock cylinder not more than 67 inches above finished floor and bottom of lowest compartment not less than 28 inches above finished floor.
   1. Arrange compartments in groups, with not more than 35 and not less than 4 compartments operated by 1 master lock.

D. Vertical Apartment Mailboxes: Install vertical apartment mailboxes with center of master lock cylinder not more than 58 inches and not less than 30 inches above finished floor.
   1. Arrange compartments in groups, with not more than seven and not less than three compartments operated by one master lock.

E. Collection Boxes: Install collection boxes with bottom of mail slots not more than 60 inches above finished floor.

F. Adjust doors to operate easily without binding. Verify that integral locking devices operate properly.

3.2 FIELD QUALITY CONTROL

A. Arrange for USPS personnel to test collection boxes after installation according to USPS regulations.

B. Obtain written final approval from USPS postmaster that authorizes mail collection.

END OF SECTION 105500

SECTION 105723.14 - FIXED WIRE SHELVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fixed mount wire shelving.

1.2 SUBMITTALS

A. Submit under provisions of Section 013300 – Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations, Storage and handling requirements and recommendations, and Installation methods.

C. Shop Drawings: Prepared specifically for this project; show dimensions of shelving and interface with other products.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience of the same type and scope as specified.

B. Installer Qualifications: Company specializing in the installation of the products specified in this section with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.4 WARRANTY

A. At project closeout, provide to Owner or Owner's Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

A. MANUFACTURERS

B. Basis of Design: Shelf Tech Wire Shelving.

C. Acceptable Manufacturers:
1. ClosetMaid Corp.

D. Provide all storage shelving and accessories from a single manufacturer.

2.2 MATERIALS GENERAL

A. Steel Wire: Basic cold drawn, Grade C-1006; average tensile strength over 100,000 psi (690 MPa); coated.

B. Wire Coating: Proprietary heavy-duty polyvinyl chloride (PVC) formula resin, plasticizers, stabilizers, pigments, and other additives.
1. Thickness: 7 to 17 mil (0.178 to 0.432 mm).
2. Classification: No ingredients listed as hazardous per OSHA 29CFR1910.0017.

2.3 FIXED WIRE SHELVING

A. Wire Shelving:
1. Size: 12 inch wide.
2. Cross Deck Spacing: 1 inch (25 mm) 12-3/4 GA wire.
3. Color:
a. White PVC Coated Wire.
4. Mounting System: Provide the fixed mount system mounting hardware as required using hardware components recommended by the manufacturer.
5. Hardware Accessories: Provide the following hardware accessories as required.
6. Provide the fixed mount system hardware as required using hardware components recommended by the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verification of Conditions:
1. Prepared spaces are sized and located in accordance with shop drawings.
2. Framing, reinforcement, and anchoring devices are correct type and are located in accordance with shop drawings.

D. Installer's Examination:
1. Examine conditions under which installation is to be performed; submit written notification if such conditions are unacceptable.
2. Installation activities started before unacceptable conditions have been corrected is prohibited.
3. Installation indicates installer's acceptance of conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with approved shop drawings and manufacturer's printed instructions.

B. Cut shelves 1/2 inch to 1-3/8 inches (12.7 to 35 mm) shorter than actual wall measurements; cap all exposed ends.

C. Install shelving plumb and level at heights indicated in accordance with shop drawings and manufacturer's printed installation instructions.

D. Drill holes where required using sharp bit; do not punch.

E. Drywall: Drill 1/4 inch (6 mm) hole, insert No. 910 or 911 wall clip. Use No. 658 # 8 x 1 inch (25 mm) pin to expand anchor if unloaded.

F. Wood: Drill 1/4 inch (6 mm) hole into wood, secure wall clip with No. 8 x 1 inch (25 mm) screw or secure pole clip No. 978 directly to wood with No. 8 x 1-1/4 inch (31 mm) screws.

G. Concrete: Drill 1/4 inch (6 mm) hole with masonry bit, insert wall clip No. 911 or 978 with 250 anchor, secure with No. 8 x 1 inch (25 mm) screws.

3.4 CLEANING

A. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris related to this work.

B. Upon completion of installation, clean all surfaces that have become soiled during installation.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 111750 - TRASH CHUTES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal, vertical, gravity-type waste chutes.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature for each product indicated.

B. Shop Drawings: Detail chute assemblies and indicate installation details, dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

C. Qualification Data: For installer and manufacturer.

D. Manufacturer's Installation Instructions: Indicate special preparation of substrate, attachment methods, and perimeter conditions requiring special attention.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Data: For user's operation and maintenance of the system.
   1. Methods for operation.
   2. Methods for maintaining system's materials, finishes, and performance.
   3. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Provide chutes complying with NFPA 82.

1.4 PREINSTALLATION MEETING

A. Convene one week before starting of work on this section, in accordance with Section 01 31 00 – Project Management and Coordination.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Chutes International
   2. U.S. Chutes Corp.

3. Wilkinson Hi-Rise
4. Valiant Products.

2.2 SYSTEM COMPONENTS

A. Chute Metal: Aluminum-coated, cold-rolled, commercial steel sheet; ASTM A 463, Type 1 with not less than T1-40 coating.
   1. Specified (Nominal) Thickness: 0.060 inch.
   2. Chute size: As shown on Drawings.

B. Intake Doors: Bottom hinged for trash chutes; stainless steel doors, 15 x 18 inch size for trash chute; 1-1/2 hour rated, UL Class B label. Provide door interlocks. Provide barrier free doors where required by inspector.

C. Trash Discharge Door: Manufacturer's standard horizontal slide type discharge door; galvanized steel construction; UL Class B label; spring loaded hold open with 165 degree F fusible link.

D. Sprinkler Heads: 1/2 inch IPS sprinkler head with 165 degree F fusible link.

E. Cleansing System: Two-cycle automatic flushing system to clean and disinfect using high pressure jets.

F. Access Doors: Bearing Underwriter's Laboratories class B label; 1 1/2 hr B temperature rise 30 min 650 degree max; 24 x 24 inch size; fabricated to be compatible with the shaft construction indicated.

2.3 FABRICATION

A. General: Factory assemble chutes to greatest extent practical with continuously welded or lock-seamed joints without bolts, rivets, or clips projecting on chute interior. Include intake-door assemblies and chute-support frames at each floor, and chute expansion joints between each support point.

B. Fire Sprinklers: Comply with NFPA 13. Locate fire sprinklers at or above the top service opening of chutes, within the chute at alternate floor levels in buildings more than two stories tall, and at the lowest service level.

C. Equipment Access: Fabricate chutes with access for maintaining equipment located within the chute, such as flushing and sanitizing units, fire sprinklers, and plumbing and electrical connections.

2.4 ACCESSORIES

A. All accessory material required by the manufacturer for a warrant-able installation of the installed products in a manner that meets the Performance and Design Criteria.

B. All adhesives, sealants, paints & coatings, including accessories, applied on site must comply with the VOC limits as specified in ESDS v4.01(1) Section 6.01a Healthier Material Selection/SCAQMD Rule 1168 (dated 10/6/2017).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NFPA 82 requirements and with chute manufacturer's written instructions. Assemble components with tight, nonleaking joints. Anchor securely to supporting structure to withstand impact and stresses on vent units. Install chute and components to maintain fire-resistive construction of chute and enclosing chase.

B. Install chutes plumb, without offsets or obstructions that might prevent materials from free falling within chutes.

C. Coordination with Roofing: Anchor roof flanges of chute vents before installing roofing and flashing. Install counterflashing after roofing and flashing are installed.

D. Intake and Discharge Doors: Interface door units with throat sections of chutes for safe, snag-resistant, sanitary depositing of materials in chutes by users.
   1. Interconnect sanitizer control with door interlock system.

E. Interlock System: Comply with applicable NECA recommendations.

F. Test chute components after installation. Complete test operations before installing chase enclosures.

END OF SECTION 111750

SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Ranges.
2. Range Hoods.
3. Microwave ovens.
4. Refrigerator/freezers.
5. Dishwashers.
6. Garbage Disposals
7. Washers/Dryers.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's literature for each product indicated.

B. Appliance Schedule: Use same room designations shown on Drawings.

C. ESDS Measure 5.03 Submittals:
1. Product Data: for indicated products, show compliance with requirements for ENERGY STAR product labelling.

D. Closeout Submittals:
1. Operation and Maintenance Data: for each residential appliance, include operation and maintenance manuals.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

C. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.

D. AHAM Standards:
1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver appliances only after utility rough-in is complete and construction in spaces to receive appliances is substantially complete and ready for installation.

B. Storage: Adequately protect against damage while stored at the site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard warranty in which manufacturer agrees to repair or replace appliance that fails in materials and workmanship within specified warranty period.
   1. Electric Range: Lifetime limited warranty for in-home service on surface-burner elements.
   2. Microwave Oven: One-year limited warranty for in-home service on defects in magnetron tube.
   3. Refrigerator/Freezer: One-year limited warranty on sealed refrigeration system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain residential appliances from single source and each type of residential appliance from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design, the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

C. Provide Energy Star Rated Appliances.

2.3 APPLIANCES

A. Refrigerators:
   1. Type A units: Frost-free, 28 inch wide, 19.2 cu. Ft. top freezer. No liquid or ice dispensers in door.
      a. Basis of Design: Model #GTS19KYNRFS by GE, or approved comparable.
      b. Dimensions: 66 3/8 inches high by 29 3/4 inches wide by 34 1/2 inches deep.
      c. Capacity:
         1) Freezer: 5.57 cu.ft.
         2) Refrigerator: 13.59 cu.ft.
      d. Finish: Stainless steel.
   2. Studio units, 1 bedroom and 2 bedroom units: Frost-free, 34 inch wide, 21.9 cu. Ft. top freezer. No liquid or ice dispensers in door.

a. Basis of Design: Model #GTS22KYNRFS by GE, or approved comparable.
b. Dimensions: 66 3/8 inches high by 32 3/4 inches wide by 34 1/2 inches deep.
c. Capacity:
1) Freezer: 6.68 cu.ft.
2) Refrigerator: 15.25 cu.ft.
d. Finish: Stainless steel.

3. 3 bedroom units: Frost-free, 31" wide, 17.7 cu. f.t, accessible bottom-freezer, ADA compliant. No liquid or ice dispensers in door.
a. Basis of Design: Model #GBE17HYRFS by GE, or approved comparable.
b. Dimensions: 66 inches high by 31 1/8 inches wide by 27 inches deep.
c. Capacity:
1) Freezer: 4.74 cu.ft.
2) Refrigerator: 12.99 cu.ft.
d. Finish: Stainless steel.

4. Community room: Frost-free, 34 inch wide, 21.9 cu.ft. top freezer. No liquid or ice dispensers in door.
a. Basis of Design: Model #GTS22KYNRFS by GE, or approved comparable.
b. Dimensions: 66 3/8 inches high by 32 3/4 inches wide by 34 1/2 inches deep.
c. Capacity:
1) Freezer: 6.68 cu.ft.
2) Refrigerator: 15.25 cu.ft.
d. Finish: Stainless steel.

B. Microwave: Countertop microwave.
1. Basis of Design: Model #PES7227SLSS by GE, or approved comparable.
2. Dimensions: 14 inches high by 24 1/8 inches wide by 19 3/4 inches deep.
3. Capacity: 2.2 cu.ft.
4. Finish: Stainless steel.

C. Vent Hood: Over the range hood with integral light and separate on/off switch within reach range.
1. Basis of Design: Model #JVX5305SJSS by GE, or approved comparable.
2. Dimensions: 5 1/2 inches wide by 29 7/8 inches wide by 20 inches deep.
3. Fan Power: 270 cfm.
4. Finish: Stainless steel.

D. Range:
1. Type A units: Slide-in, 30 inch wide, 4 burner, self-cleaning, electric range.
a. Basis of Design: Model #GRS500PVSS by GE, or approved comparable.
b. Dimensions: 37 1/8 inches high by 30 inches wide by 28 5/8 inches deep.
c. Finish: Stainless steel.
2. All other units: Free-standing, 30 inch wide, 4 burner, self-cleaning, electric range.
a. Basis of Design: Model #GRF500PVSS by GE, or approved comparable.
b. Dimensions: 47 1/4 inches high by 30 inches wide by 27 7/8 inches deep.
c. Finish: Stainless Steel.

E. Dishwasher: 24 inch, top control dishwasher.
1. Basis of Design: Model #GDT670SYVFS by GE, or approved comparable.

2. Dimensions: 34 inches high by 23 3/4 inches wide by 24 inches deep.
3. Finish: Stainless steel.

F. Residential Washer and Dryers in central laundry rooms and in-unit equipment: Provided by owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine subsurface to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurface.

B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work. Verify utility rough-ins are present and correctly located.

3.2 INSTALLATION

A. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

B. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 CLEANING

A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition, wash and clean equipment.

END OF SECTION 113100

SECTION - FALL PROTECTION DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Permanent fall protection anchor.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. American National Standard Institute (ANSI)
   1. ANSI Z359.1- Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
   2. ANSI Z359.6 – Specifications and Design Requirements for Active Fall Protection Systems.

C. Occupational Health and Safety Administration (OSHA)
   1. OSHA 1926.502 – Fall Prevention Systems Criteria and Practices

1.3 SUBMITTALS

A. Product Data: For each type of device specified, including manufacturer's standard fabrication details and installation instructions.

B. Shop Drawings: Show layout, profiles, and anchorage details. Submit engineering calculations demonstrating compliance with the references of Section 1.02.

C. Maintenance Data: Written instructions for maintenance of fall prevention safety devices to be included in the operation and maintenance manual.

D. In-house Test Reports: Indicate anchor fabrication compliance with performance requirements.

E. Delegated Design: Provide design and location for placement of anchors on roof.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm having at least 10 years continuous experience in manufacturing fall safety equipment similar to systems specified and exhibiting records of successful in-service acceptability and performance. Firm must employ personnel dedicated to provide regularly scheduled Authorized and Competent Person Training courses as mandated by OSHA 1926 and 1910 for owner's authorized safety personnel.

B. OSHA Standards: Comply with Occupational Safety and Health Administration Standards for the Construction Industry 29 CFR § 1926.500 Subpart M (Fall Protection), and with applicable State Administrative Code safety standards for Fall Restraint and Fall Arrest.

C. Source Limitations: Obtain all roof anchors through one source from a single manufacturer.

1.5 COORDINATION

A. Contractor to coordinate installation of structural deck to meet requirements of roof anchor manufacturer.
   1. Wood Deck: Minimum 5/8" CDX plywood or provided with additional deck reinforcing per manufacturer's instructions.
   2. Other structural decks not listed above shall be approved by a Qualified Person.

B. Contractor to coordinate installation of structural deck reinforcements and anchorages to receive fall protection anchors.

C. Contractor to coordinate placement of roofing system, insulation and flashing to ensure water-tight integrity to roof.

1.6 WARRANTY

A. Provide manufacturer’s standard warranty to guarantee products will be free from defects for a period of 12 months. Warranty period shall become effective on date of substantial completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide structural fall restraint and fall arrest system capable of withstanding loads and stresses within limits and under conditions specified in OSHA and other applicable safety codes and designed to allow free movement of persons for purposes of window maintenance while attached by full body harness in accordance with ASME 120.1 and OSHA 1910.66 app C for structural connections and components. Provide fall protection anchors permanently attached to roof structure.

B. Delegated Design: Comply with applicable OSHA and ANSI regulations. Design and supply roof mounted fall restraint and safety system components.

C. Design Requirements: Anchors and accessories comprising system of following types:
   1. Plate Anchors, spaced as indicated by manufacturer, for safety snap connection by individual workers capable of withstanding a 5,000 pound load or safety factor of 2 meeting the requirements of OSHA 1926.502(d)(8).

D. Performance Requirements: System and components tested for the resistance of the following loads:

1. Fall Arrest:
    a. Maximum 1 personal fall arrest system.
    b. Structure must withstand loads applied in the directions permitted by the system of at least 5,000 lbs.
    c. Maximum allowable free fall is 6 feet, unless used in combination with equipment explicitly certified for extended free fall of up to 12 feet.
    d. Applicable D-rings: Dorsal.
2. Restraint:
    a. Prevent workers from reaching the leading edge of a fall hazard.
    b. Structure must withstand loads applied in the directions permitted by the system of at least 1,000 lbs.
    c. No free fall is permitted.
    d. May only be used on surfaces with slopes up to 4/12 (vertical/horizontal)
    e. Applicable D-rings: Dorsal, Chest, Side, and Shoulder
3. Work Positioning:
    a. Work positioning systems allow a worker to be supported while in suspension and work freely with both hands.
    b. Structure must withstand loads applied in the directions permitted by the system of at least 3,000 lbs.
    c. Maximum allowable free fall is 2 feet.
    d. Applicable D-rings: Side and Shoulder.
4. Rescue/Confined Space:
    a. Rescue systems function to safely recover a worker from a confined location or after exposed to a fall.
    b. Structure must withstand loads applied in the directions permitted by the system of at least 3,000 lbs.
    c. No free fall is permitted.
    d. Applicable D-rings: Dorsal, Chest, and shoulder.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing and substrate and verify conditions comply with structural requirements for proper system performance.

B. Proceed with installation of roof anchors only after verifying conditions are satisfactory.

3.2 INSTALLATION

A. General: Installation of anchors to be performed by contractor according to manufacturer’s instructions and recommendations.

END OF SECTION 118129

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Horizontal louver blinds with aluminum slats.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For horizontal louver blinds, include fabrication and installation details.

C. Samples: For each exposed product and for each color and texture specified, 12 inches long.

D. Product Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

E. Maintenance Data: For horizontal louver blinds to include in maintenance manuals.

F. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Horizontal Louver Blinds: Full-size units equal to 5 percent of quantity installed for each size, color, and gloss indicated, but no fewer than five units.

1.3 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver horizontal louver blinds in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet-work and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 EXTRA MATERIALS

A. Window Shades: 5% of full-size units installed. Package all with protective covering for storage and identified with labels clearly describing contents and site location. Store on site in designated, secured area.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain horizontal louver blinds from single source from single manufacturer.

2.2 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS

A. Manufacturers:
1. Basis of Design: Riviera Aluminum Blinds by Hunter Douglas Architectural.
2. Springs Window Fashions Division, Inc.

B. Flame-Resistance Rating: Comply with NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Slats: Polymers that are lead free, UV stabilized, integrally colored, opaque, and will not crack or yellow; antistatic, dust-repellent treated.

1. Formulation: Manufacturer's standard.
2. Width: 1 inch.
3. Thickness: 0.006 inch.
4. Spacing: Manufacturer's standard.
5. Profile: Manufacturer's standard.

a. Lift-Cord Rout Holes: Minimum size required for lift cord and located near back (outside) edge of slat to maximize slat overlap and minimize light gaps between slats.

D. Headrail: Formed steel; long edges returned or rolled. Headrails fully enclose operating mechanisms on three sides.
1. Capacity: One blind per headrail unless otherwise indicated.
2. Ends: Capped or plugged.
3. Manual Lift Mechanism:

a. Lift-Cord Lock: Variable; stops lift cord at user-selected position within blind full operating range.
b. Operator: Extension of lift cord(s) through lift-cord lock mechanism to form cord pull.

4. Manual Tilt Mechanism: Enclosed worm-gear mechanism and linkage rod that adjusts ladders.
   a. Tilt: Full.
   b. Operator: Clear-plastic wand.
   c. Over-Rotation Protection: Manufacturer's detachable operator or slip clutch to prevent over rotation of gear.
5. Manual Lift-Operator and Tilt-Operator Lengths: Manufacturer's standard.
6. Manual Lift-Operator and Tilt-Operator Locations: Manufacturer's standard, unless otherwise indicated.
7. Integrated Headrail/Valance: Curved face.

E. Bottom Rail: Formed-steel or extruded-aluminum tube that secures and protects ends of ladders and lift cords and has plastic- or metal-capped ends.
1. Type: Manufacturer's standard.

F. Lift Cords: Manufacturer's standard braided cord.

G. Ladders: Evenly spaced across headrail at spacing that prevents long-term slat sag.

H. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
1. Type: As indicated on drawings.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

I. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

J. Side Channels and Perimeter Light Gap Seals: Manufacturer's standard.

K. Colors, Textures, Patterns, and Gloss:
1. Slats: As selected by Architect from manufacturer's full range.
2. Components: Provide rails, cords, ladders, and materials exposed to view matching or coordinating with slat color unless otherwise indicated.

2.3 HORIZONTAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch.

Length equal to head-to-sill dimension of opening in which blind is installed less 1/4 inch, plus or minus 1/8 inch.

2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
   1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.

D. Mounting and Intermediate Brackets: Designed for removal and reinstallation of blind without damaging blind and adjacent surfaces, for supporting blind components, and for bracket positions and blind placement indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
   1. Locate so exterior slat edges are not closer than 2 inches from interior faces of glass and not closer than 1-1/2 inches from interior faces of glazing frames through full operating ranges of blinds.
   2. Install mounting and intermediate brackets to prevent deflection of headrails.
   3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

A. Adjust horizontal louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

A. Clean horizontal louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that horizontal louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Manually operated roller shades with single rollers.

1.2 SUBMITTALS

A. Product Data: For each type of product.
1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

C. Samples for Verification: For each type of roller shade.
1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
2. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.

E. Qualification Data: For Installer.

F. Product Certificates: For each type of shadeband material, signed by product manufacturer.

G. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

H. Maintenance Data: For roller shades to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hunter Douglas Architectural.
2. SkyCo.
3. Draper Inc.
4. Lutron Electronics Co., Inc.
5. MechoShade Systems, Inc.
6. Nysan Solar Control Inc.; Hunter Douglas Company.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED, SINGLE-ROLLER SHADES

A. Basis of Design: RB 500 manual roller shades by Hunter Douglas Architectural.

B. Chain-and-Clutch Operating Mechanism: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
1. Bead Chains: Manufacturer’s standard.
a. Loop Length: Full length of roller shade unless otherwise specified on drawings.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Clip, jamb mount.
d. Finish: Stainless.
2. Spring Lift-Assist Mechanisms: Manufacturer’s standard for balancing roller shade weight and for lifting heavy roller shades.

a. Provide for shadebands that weight more than 10 lbs or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
1. Roller Drive-End Location: As indicated on Drawings.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-To-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:
1. Shadeband Material: Light-filtering fabric; as specified below.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
a. Type: Enclosed in sealed pocket of shadeband material.

2.3 SHADEBAND MATERIALS

A. Basis of Design: E Screen with Koolblack by Mermet.

B. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller-shade manufacturer, as shown on Finish List.
2. Type: 36% fiberglass, 64% vinyl.
3. Weave: As selected by Architect.
4. Roll Width: Maximum available by manufacturer, but not less than 84 inches.
5. Openness Factor: 3 percent.
6. Colors: As selected by Architect.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2.5 INSTALLATION ACCESSORIES

A. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   1. Height: Manufacturer’s standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.
   2. Color and Finish: As selected from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Manufactured cabinets.

B. Related Requirements:
1. Section 061001 – Miscellaneous Rough Carpentry for wood blocking for anchoring casework.
2. Section 064000 – Architectural Woodwork.
3. Section 123540 – Solid Surface Countertops.

1.2 DEFINITIONS

A. Concealed Surfaces of Casework: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of casework installed directly against and completely concealed by walls or other casework, and tops of wall cabinets and utility cabinets.

B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.

C. Semi-exposed Surfaces of Casework: Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.

1.3 COORDINATION

A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

1.4 SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components, and profiles and finishes for casework.
2. Include rated capacities, operating characteristics, profiles, and finishes for hardware.

B. Sustainable Design Requirements:
1. ESDS 6.01a: Healthier Material Selection: See Section 018113 – Sustainable Building Requirements.

C. Shop Drawings: For residential casework.
1. Include plans, elevations, details, and attachments to other work.
2. Show materials, finishes, filler panels, and hardware.

3. Indicate manufacturer's catalog numbers for casework.

D. Samples: For casework and hardware finishes.

E. Samples for Initial Selection: For casework and hardware finishes.

F. Samples for Verification: For the following:
1. Casework Finishes: 8-by-10-inch Samples for each type of casework finish.
2. Hardware: One full-size Sample of each type of exposed hardware in each finish required.

G. Qualification Data: For manufacturer.

H. Product Certificates: For casework.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations for Cabinets: Obtain cabinets through one source from a single manufacturer.

C. Product Options: Drawings indicate size, configurations, and finish material of cabinets by referencing designated manufacturer's catalog numbers. Other manufacturers' cabinets of similar sizes and door and drawer configurations, same finish material, and complying with the Specifications may be considered.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

D. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 STRUCTURAL REQUIREMENTS

A. Structural Performance: Countertop fabricator shall design countertops, countertop support brackets, and concealed blocking as required to accommodate the following loads:
   1. Dead Loads: Material loads as determined by manufacturer.
   2. Live Loads: Uniform load of 50 lbs/ft; concentrated load of 250 lbs at any location.
      a. Uniform and concentrated loads need not be assumed to act concurrently.

2.2 CABINETS

A. Grade: Custom Grade.

B. Basis of Design:
   1. Cabinet Style: Frameless construction, as shown on Drawings.
   2. Door Style: As shown on Finish Schedule.
   3. Wood Species: NAUF TFL plywood substrates with wood texture finish.
   4. Edge Profile: Eased, unless otherwise specified.
   5. Finish: Thermofoil.
      a. Color: As shown on Finish Schedule.

C. Cabinet Construction:
   1. Cabinet Box: 3/4 inch thick; particle board. Frameless construction; composite wood panels and rails, doweled and glued.
      a. Side Panels: Particle board.
      b. Back Panel: Thermoset Overlay on MDF.
      c. Bottom (and Top) Panel: Particle board.
      d. Interior Cabinet Finish: Thermo-set overlay.
         1) Color: As selected by the Architect.
      e. Exposed Panel Edges: Finish with manufacturer’s standard edge banding, color coordinated with other exposed finishes.
   2. Cabinet Doors/Drawer Configuration: Flush overlay, or approved alternates:
      a. Beech stile and rail cabinet doors and drawers.
      b. Solid maple stile and rail cabinet doors and drawers.
   3. Drawers: Double-wall metal drawer box with integrated; full extension slides with integrated soft-close feature.
      a. Thermoset overlay particle board bottom and back; 5/8 inch thick.
      b. Drawer Slide Performance:
         1) Capacity: 100 pound dynamic load.
         2) Fully adjustable, vertical and horizontal adjustment.
         3) KCMA Certified.
      c. Drawer Front: To match cabinet doors in style, material and finish.
      d. Interior Finish: Manufacturer’s standard.
   4. Shelf: Manufacturer’s standard adjustable shelves and shelf supports.
      a. Shelf Supports: Line-bored application with self-locking shelf pins.
   5. Hardware: As selected from manufacturer’s standard types, styles and finishes. Comply with BHMA A156.9.

a. Drawer and Door Pulls: Wire pulls as shown on Finish Schedule. Doors and drawers pre-drilled for pulls.
b. Drawer Guides: Full extension guides with quiet-close.
c. Hinge: European style 110, 180 degree wall, clip on hinge with 6 way adjustable soft close. Fully concealed.
d. Adjustable shelf clip: Manufacturer's standard.

D. Accessories:
1. Fasteners: Use manufacturer's recommended fasteners for installing casework.
2. Valence: 2 inch at bottom.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install casework with no variations in adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework.

C. Install casework without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

D. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.

E. Fasten casework to adjacent units and to backing.
1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.

3.3 ADJUSTING AND CLEANING

A. Adjust hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Clean casework on exposed and semiexposed surfaces. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 123530

SECTION 123540 – SOLID SURFACE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Interior acrylic solid surfaces for the following:
   1. Countertops.
   2. Side and Back splashes.

1.2 SUBMITTALS

A. Product Data: For each solid surface counter type, and other manufactured products indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Samples:
   1. For each solid surface counter type. Contractor to identify quantity required for project.
   2. Submit 2 samples, 6 inches in length, for each color of grout required.

D. Maintenance data: Submit supplier's literature or instructions for preventive care and maintenance measures pertinent to the specific finishes for normal maintenance and special cleaning procedures.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An installer who employs experienced acrylic solid surface fitters, who are skilled in installing interior material, design, and extent to that indicated for this Project and whose products have a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 SOLID SURFACE (SS-1)

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Corian.
   2. Wilsonart.

C. Solid Surface Countertops: 1/2 inch thick, solid surface material.
   1. MSF approved for food contact.
   2. Finish on Exposed surface: Polished.

3. Exposed Self Edge Treatment:
   a. Front: Straight, slightly eased at top, unless other profiles are indicated on Drawings.
   b. Edge: Eased, ½ inch drop edges.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inch high; 1/2 inch deep. Install at all locations abutting walls, not adjacent to cabinets, and as shown on Drawings.
   a. Backsplash Configuration: Straight, slightly eased at corner.
   b. End splash Configuration: Where indicated on the Drawings, match backsplash.
5. Product/Color: As selected by Interior Designer from manufacturer's full range. See Interior Design Drawings and Finish Legend.

2.2 ACCESSORIES

A. Adhesives:
   1. General: Use only adhesives formulated for stone and recommended by their manufacturer for the application indicated.
   2. Bonding Stone to plywood subtop: Epoxy Adhesive: ANSI A118.3.
      a. Manufacturers: Subject to compliance with specifications, provide products as manufactured by one of the following:
         1) Custom Building Products.
         2) Laticrete International, Inc.
         3) Mapei Corporation.
   3. Stone Seam Adhesive: 2-part polyester-resin type adhesive designed for joining stone with hairline joints matching color of stone. "Akemi" stone adhesive as manufactured by Wood and Stone, Inc. Manassas, VA, or as recommended by stone manufacturer. Verify compatibility of adhesive with type of stone used.

B. Setting Shims: Resilient, non-staining plastic.

C. Cleaner: As recommended by manufacturer.

D. Sealant for Countertops: Silicone sealant complying with requirements in Section 079200 - Joint Sealants.
   1. Color: Clear, unless otherwise selected by Architect or Interior Designer.
   2. Sealant at top edges shall match wall colors.

2.3 FABRICATION

A. Solid Surface Countertops:
   1. Fabricate countertops in the shop to the largest extent possible according to manufacturer's written instructions and the AWI "Architectural Woodwork Standards."
      a. Grade: Premium
   2. Inspect material for defects prior to fabrication.
      a. Materials used throughout the project shall be from the same batch and bear labels with the same batch numbers.
      b. Visually inspect materials to be used for adjacent pieces to ensure acceptable color match.
      c. Inspect in lighting conditions similar to those existing at the job site.

3. Shop fabricate to the greatest extent possible.
4. Fabricate solid surface countertops to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
5. Joints: Fabricate countertops without joints to the greatest extent possible. If joints are unavoidable, submit to Architect a Drawing indicating proposed location of joints for approval prior to commencing fabrication.
    a. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
6. Cutouts and Holes:
    a. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
        1) Verify shape of vertical edges with Architect prior to commencing cutouts.
    b. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
7. Rout and finish component edges with clean, sharp returns.
    a. Rout cutouts, radii and contours to template.
    b. Smooth edges.
    c. Repair or reject defective and inaccurate work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect.
2. Commencement of Work will be construed as acceptance of subsurfaces.
3. Verify, before proceeding with this Work that required inspections of existing conditions have been completed.

3.2 PREPARATION

A. Coordinate erection of acrylic counter with work of other trades that adjoin or tie into work.

B. Clean surfaces which have become soiled or stained prior to setting to remove soil, stains and foreign materials. Clean by thoroughly scrubbing with fiber brushes followed by thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasive.

3.3 INSTALLATION

A. General
1. Temporarily place and fit units in position to assure accurate fit prior to final setting. Make adjustments as required for level and fit to adjacent construction.

2. Do not lay chipped, cracked, or otherwise defective units. Remove and replace units that are chipped, cracked, broken, or otherwise defective whether before or after setting.
3. Cutting: Avoid field cutting and fitting to the greatest extent possible and obtain approval prior to proceeding. When required and approved, exposed units shall be cut with a power driven Carborundum or diamond disc blade saw or other methods as approved by Architect by skilled stone fitters. When using "wet" cutting methods, clean water shall be used on exposed units.
4. Contiguous Work: Provide reveals and openings as required to accommodate contiguous work.
5. Set units to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure interior stone facing in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
6. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
7. Seal expansion and other joints as specified in Section 079200 - Joint Sealants.
8. Keep expansion joints free of plaster, mortar, grout, and other rigid materials.

B. Countertops:
1. General: Install countertops over plywood subtops with full spread of water-cleanable epoxy adhesive.
2. Bond seams with stone seam adhesive and draw seam tight and level with clamps to assure tight, level hairline seams matching stone for color and finish. Protect area adjacent to seam by masking.
3. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting.
4. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
5. Apply sealant to seams and to gap between countertops and splashes in accordance with Section 079200 - Joint Sealants.

3.4 CONSTRUCTION TOLERANCES

A. Construction Tolerances: Set stone to comply with the following tolerances:
1. Variation from level: 1/8 inch in 5 feet maximum.
2. Variation from plumb: 1/16 inch in 12 inches maximum.

3.5 ADJUSTING AND CLEANING

A. Remove and replace stonework of the following description:
1. Broken, chipped, cracked, stained or otherwise damaged stones.
2. Defective joints.
3. Stonework not matching approved samples.

B. Replace in manner which results in stonework showing no evidence of replacement.

C. Cleaning: Do not use wire brushes, acid type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods which could damage stone.

D. Clean countertop not less than 6 days after completion of grouting and pointing, using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

E. Clean up debris, refuse and surplus material and remove from premises.

3.6 PROTECTION

A. Furnish temporary protection for exposed stone corners and surfaces subject to injury.

END OF SECTION 123540

SECTION 124813 - ENTRANCE FLOOR MATS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Entrance tiles.

1.2 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show the following:
   1. Divisions between mat sections.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated.
   1. Floor Mat: 12-inch- square, assembled sections of floor mat.

E. Maintenance Data: For floor mats to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed floor mats that comply with Sections 302 and 303 in ICC A117.1.

1.4 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.5 COORDINATION

A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats.

1.6 WARRANTY

A. Warranty: Lifetime commercial limited warranty.

PART 2 - PRODUCTS

2.1 ENTRANCE TILES (WOM-1)

A. Basis-of-Design Product: ShawContract All Access, Swift Tile 5T414.

B. Carpet-Type Tiles: Entryway carpet tile, multi-level pattern loop.
   1. Total Thickness: 0.362 inch
   2. Colors: Selected by Architect from manufacturer’s full range.
   3. Tile Size: 24 inch x 24 inch.
   4. Installation: Quarter Turn.
   5. 100 percent solution dyed, Ecosolution Q100 Nylon fibers.
   6. Backing: Ecoworx Tile.

2.2 ACCESSORIES

A. Adhesive: Manufacturer’s recommended adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.

END OF SECTION 124813

SECTION 129300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Exterior Bike rack
2. Aluminum Planters
3. Bioretention Planters
4. Wood Bench

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast and installing anchor bolts cast in concrete footings.
2. Section 310000 "Earthwork" for excavation for installing concrete footings.
3. Section 321413 “Pedestal Set Unit Pavers” for installation on pedestal support system

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer’s standard catalog cut sheets.

B. Samples for Initial Selection: For units with factory-applied finishes. As required for color selection or material thickness.

C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

D. Shop Drawings:

1. Aluminum Planters and Bioretention Planters: For custom applications, showing critical sizes and dimensions for installation and integration with other work.

2. Wood Bench: For custom applications, showing critical sizes and dimensions for installation and integration with other work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Unwrap and inspect furnishings after delivery for signs of damage during transit.

B. Protect furnishings from damage during storage and handling

C. Store furnishings indoors if possible. Do not stand or walk on furnishings.

1.5 PROJECT CONDITIONS

A. Contractor to provide adequate structural support for site furnishings.

B. Protect furnishings from damage by adjacent work.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Touch up paint: No less than one quart per color and manufacturer.

B. Product Warranty Information:

1. Products will be free from defects in material and/or workmanship for a period of three years from the date of substantial completion.
2. The warranty does not apply to damage resulting from accident, alteration, misuse, tampering, negligence, or abuse.

PART 2 - PRODUCTS

2.1 MANUFACTURED SITE FURNISHINGS

A. Exterior Bike Rack
1. Manufacturer: Sportworks, 15540 Woodinville-Redmond Rd NE, A-200
Woodinville, WA 98072
2. Model: Tofino No Scratch Bike Rack
3. Size:
Height: 33.4 inches.
Length: 28.5 inches.
4. Mounting: Surface flanged for bolting to concrete. Cap anchor bolts with tamper-proof breakaway security nuts.
5. Material: Stainless Steel
6. Finish: Bead Blast Satin

B. Aluminum Planters

1. Manufacturer: Tournesol Siteworks LLC. 2930 Faber St., Union City, CA 94587 Tel: (800) 542-2282 FAX (510) 471-6243 or approved equal.
2. Model: Tournesol Siteworks Wilshire Powder-Coated Aluminum Custom Rectangle Planters
3. Material: Marine-grade aluminum
4. Finish: Powder-coat over zinc-free epoxy primer. Color to be selected by Landscape Architect from available standard colors.
5. Size: Modular units fabricated to size by manufacturer as required to fill specified areas. Custom sizes as per approved shop drawings.
6. Accessories:
    a. Planters shall be delivered with 1-5/8” drain holes.
    b. Manufacturer shall provide “Scoop” connections for all same-height abutting planters – adjacent planter walls lowered to allow multiple modular units to appear to be one continuous unit; use manufacturer’s connection kit to attach. Contact manufacturer prior to ordering.
    c. Field installed drainage/irrigation connection fitting. Thread-by-thread thermoplastic drainage adapter, ½”, ¾” and 1"NPT female thread per irrigation drawings and specs. Contractor to locate drainage hole, drill as necessary, and install fitting.
    d. Cast-in accessory for lighting.

C. Bioretention Planters
1. Manufacturer: Tournesol Siteworks LLC. 2930 Faber St., Union City, CA 94587 Tel: (800) 542-2282 FAX (510) 471-6243 or approved equal.
2. Model: Tournesol Siteworks Bioretention Planter
3. Material: Aluminum
4. Finish: Color and texture to be selected by Landscape Architect from available standard colors and textures.
5. Size: Modular units fabricated to size by manufacturer as required to fill specified areas. Custom sizes as per approved shop drawings.
6. Accessories:
    a. Planters shall be waterproofed per manufacturer specification with 4” diameter drainage plumbing.
    b. Manufacturer shall provide “Scoop” connections for all same-height abutting planters – adjacent planter walls lowered to allow multiple modular units to appear to be one continuous unit; use manufacturer’s connection kit to attach. Contact manufacturer prior to ordering.
    c. Field installed drainage/irrigation connection fitting. Thread-by-thread thermoplastic drainage adapter, ½”, ¾” and 1"NPT female thread per irrigation drawings and specs. Contractor to locate drainage hole, drill as necessary, and install fitting.

D. Wood Bench
1. Manufacturer: Anova, 1424 Talmage Ave St. Louis, MO 63110, Telephone: 800-325-3047
2. Model: Infinity 2’ Thermory Bench, Custom
3. Style: Straight backless
4. Size: Custom sizes as per approved shop drawings.
5. Material: Ash Thermory hardwood wood mounted to steel frame

6. Hardware: Stainless Steel
7. Finish on Metal: Powder-coated, color to be selected by Landscape Architect from full range.
8. Finish on Wood:
   a. Wood for Exterior Use: Unfinished.
9. Mounting: Freestanding unless directed by owner to surface mount.

2.2 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

D. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.3 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Flanged Posts on Concrete: Secure posts to concrete slabs with stainless steel drilled-in-concrete-anchors sized to the maximum diameter allowed by the manufacturer provided anchor/flange holes. Stainless steel bolts to be placed according to manufacturers' recommendations. Include manufacturers flange cover option in same finish.

E. Provide continuous basal support OR adequate pedestal support for full weight of furnishings including weight of soil, plantings, and additional live loads.

3.3 ADJUSTING

A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Landscape Architect.

B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Landscape Architect.

3.4 CLEANING

A. Clean site furnishings promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

C. Timber: clean with clear water and soft brush or cloth; do not use high pressure cleaners.

D. Steel: clean with clear water and brush

3.5 PROTECTION

A. Protect installed site furnishings to ensure that, except for normal weathering, furnishings will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 129300

SECTION 129313 – INTERIOR BICYCLE RACKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Interiormodular bicycle racks.
   2. Interior bike repair station.

1.2 DELIVERY, STORAGE AND HANDLING

A. Upon delivery, before signing for shipment, inspect for any damages and notate on the B.O.L.

B. Store bicycle racks in original undamaged packages and containers until ready for installation

C. Handle bicycle racks with sufficient care to prevent any scratches or damage to the finish.

1.3 WARRANTY

A. Provide manufacturer’s standard warranty against defects in materials and workmanship for a period of one year.

PART 2 - PRODUCTS

2.1 BIKE RACKS

A. Basis of Design: Duplex bike rack by Dero.
   1. Mounted: Surface mounted.
      a. Rack Depth: 74 inches.
      b. Ceiling Height: Minimum 102 inch.
      c. Side Wall to Rack: 14 inch minimum.
      d. Distance Between Racks: 48 inch minimum.
   2. Finish: Manufacturer’s standard powder coated finish.

2.2 BIKE REPAIR STATION

A. Basis of Design: Fixit repair stand by Dero.
   1. Access: Single sided.
   2. Pump: Air Kit Prime.

B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality. Provide as required for mounting, and secure attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BIKE RACK INSTALLATION

A. Comply with manufacturer's written installation instructions.

3.3 CLEANING

A. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129313

SECTION 142400 - MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified. Elevator work includes:
   1. Standard pre-engineered hydraulic passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Jack(s).
   5. Accessibility provisions for physically disabled persons.
   6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
   2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   4. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   6. Division 26 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
   7. Division 22 Plumbing
      a. Sump pit and oil interceptor.
   8. Division 23 Heating, Ventilation and Air Conditioning
      a. Heating and ventilating hoistways and/or control room.

C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more

stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.
2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hoistway walls require a minimum one-hour of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2'' at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2'' (4'' for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42'' minimum, (48'' minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.

22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.
24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.2 SUBMITTALS

A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.

B. Shop drawings:
1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Powder Coat paint selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

D. Plastic laminate selection: Submit manufacturer’s standard selection charts for exposed finishes and materials.

E. Metal Finishes: Upon request, standard metal samples provided.

F. Operation and maintenance data. Include the following:
1. Owner’s manuals and wiring diagrams.
2. Parts list, with recommended parts inventory.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
2. The manufacturer shall have a documented, on-going quality assurance program.
3. ISO-9001:2000 Manufacturer Certified

4. ISO-14001:2004 Environmental Management System Certified
5. LEED Gold certified elevator manufacturing facility.

B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. Building Code: National. Current edition adopted by Authorities having jurisdiction.
3. NFPA 70 National Electrical Code.
4. NFPA 80 Fire Doors and Windows.
5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
6. Section 407 in ICC A117.1, when required by local authorities

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory.

E. Inspection and testing:
1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
2. Arrange for inspections and make required tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.5 PROJECT CONDITIONS

A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.6 WARRANTY

A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.7 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
   1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
   2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
   3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Design based around TK Elevator’s Endura Machine Room-Less hydraulic elevator.

2.2 MATERIALS, GENERAL

A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the Public Health Standard and requirements of the project location.

B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

C. Steel:
   1. Shapes and bars: Carbon.
   2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
   3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture’s standard selections.

D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture’s standard selections.

E. Flooring by others.

2.3 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car platform shall

be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.

D. Guides: Slide guides shall be mounted on top and bottom of the car.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telescopic 2-stage. Two jacks piped together, mounted one on each side of the car with each having two telescopic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. Each Jack Assembly shall have a check valve built into the assembly to allow for automatically re-syncing the two plunger sections by moving the jack to its fully contracted position. The jack shall be designed to be mounted on the pit floor or in a recess in the pit floor. Each jack section shall have a bleeder valve to discharge any air trapped in the section..

G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)

I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform “flooded pit operation”, which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.4 POWER UNIT

A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
   1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
   2. An oil hydraulic pump.
   3. An electric motor.
   4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.

B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.

C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.

D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
   1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
   2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
   3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
   4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
   5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
   6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
   7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)
   8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.5 HOISTWAY ENTRANCES

A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
   1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
   2. Main landing door & frame finish: Stainless steel panels, no. 4 brushed finish with factory-applied powder coat finish entrance frame.
   3. Typical door & frame finish: Stainless steel panels, no. 4 brushed finish with factory-applied powder coat finish entrance frame.

B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.

C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details

D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.

E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
   3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.

F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.6 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
   2. Reveals and frieze: a. Reveals and frieze: Stainless steel, no. 4 brushed finish
   3. Canopy: Cold-rolled steel with hinged exit.
   4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
   5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
   6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.

a. Door Finish: Stainless steel panels: No. 4 brushed finish.
b. Cab Sills: Extruded aluminum, mill finish.

7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
9. Protection pads and buttons: Not required

B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.7 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.

1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.
5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.

6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.8 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.

B. Emergency Communications System: Integral phone system provided.

C. Auxiliary Operating Panel:

D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Special Equipment: Not Applicable

2.9 CONTROL SYSTEMS

A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.

B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
1. Access to main control board and CPU
2. Main controller diagnostics
3. Main controller fuses

4. Universal Interface Tool (UIT)
5. Remote valve adjustment
6. Electronic motor starter adjustment and diagnostics
7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
8. Operation of auxiliary pump/motor (secondary hydraulic power source)
9. Operation of electrical assisted manual lowering
10. Provide male plug to supply 110VAC into the controller
11. Run/Stop button

C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.

D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.

E. Special Operation: Not Applicable

2.10 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
2. Hall Station Key Switches: Spring return type.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.

C. Hall Position Indicator: Not Applicable

D. Hall lanterns: Not Applicable

E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.

B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.

C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of

sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

I. Lubricate operating parts of system, where recommended by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.4 ADJUSTING

A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.5 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

C. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.6 PROTECTION

A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in

normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.8 ELEVATOR SCHEDULE

A. Elevator Qty. 1
1. Elevator Model: endura MRL Twinpost above-ground 2-stage
2. Elevator Type: Hydraulic Machine Room-Less, Passenger
3. Rated Capacity: 2500 lbs.
4. Rated Speed: 110 ft./min.
5. Operation System: TAC32H
6. Travel: 15'-4''
7. Landings: 2 total
8. Openings:
9. Front: 2
10. Rear: 0
11. Clear Car Inside: 6'-8'' wide x 4'-3'' deep
12. Inside clear height: 7'-4" standard
13. Door clear height: 7'-0" standard
14. Hoistway Entrance Size: 3'-6'' wide x 7'-0" high
15. Door Type: One-speed | LH Side opening
16. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
17. Seismic Requirements: Zone B Design Category.
18. Hoistway Dimensions: 8'-4'' wide x 5'-9'' deep
19. Pit Depth: 4'-0''
20. Button & Fixture Style: Traditional Signal Fixtures
21. Special Operations: None

END OF SECTION 142400

SECTION 220001 –PLUMBING PE STAMP COVERSHEET

DIVISIONS: 220000 TO 224000

SPECIFICATIONS ARE PREPARED BY:
DELTA E CONSULTING
PO BOX 16785
SEATTLE, WA 98116
206-690-2260

MECHANICAL ENGINEER: ERIC K. VANDER MEY

DATE OF SIGNATURE: PRELIMINARY

END OF SECTION

SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION AND TEAM

A. Multifamily mid-rise apartment building Seattle, WA.
   1. Project includes commercial retail spaces that will be delivered as core and shell spaces for the initial buildout.
   2. See architectural drawings for a complete description of building areas, building height, building occupancies and uses, residential Group R-2 dwelling unit count, amenities, parking garage, and other building features.

B. See Architectural Code Basis “G” Drawing Sheets for further information on the code basis for the project, Note: Detailed “G” Drawing Sheets were not yet available for this schematic design drawing set.

C. Project Team:
   1. See architectural drawings for details on project team and contact information.
   2. Owner: SCIDpda/Friends of Little Saigon
   3. Architect: GGLO
   4. General Contractor: BNBuilders

1.2 PROJECT INTRODUCTION

A. Delta E Consulting is the Engineer of Record for the Mechanical, Electrical and Plumbing Systems. See MEP drawings and Division 22, 23, and 26 Specifications for contract document. The set will be utilized for bidding and selection of the MEP subcontractors. There will be an Issued for Construction (IFC) set that is issued after the subcontractors are selected.

B. This section aims to outline the approach for project design and delivery, upon which contractors are expected to prepare a bid for preconstruction and construction services. For additional information about the project requirements for bidding and contractor selection refer to the owner or general contractor request for proposal (RFP) document. If there are discrepancies between the RFP and the specifications/drawings please notify the owner or general contractor so that these can be resolved prior to the bid or contractor selection date.

C. All tasks covered in this section must adhere to the standards set forth in the General Conditions, Supplemental Conditions, Special Conditions, and Division 01 – General Requirements, including the fire

D. Discrepancies among drawings, this specification section, and other specification sections will not serve as a basis for determining project or cost exemptions. Decisions on exemptions due to document discrepancies will be determined based on the engineer of record's official responses to bid clarification inquiries or Requests For Information (RFIs).

1.3 DESCRIPTION OF BID DOCUMENTS

A. Specifications:
   1. Specifications, in general, describe quality and character of materials and equipment.

B. Drawings:

1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and details of installation.
2. Before proceeding with work check and verify all dimensions.
3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
4. Make adjustments that may be necessary or requested, to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
5. If any part of Specifications or Drawings appears unclear or contradictory, apply to the Owner's Representative for interpretation and decision as early as possible, including during bidding period.

1.4 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Project Commissioning: See the Division 019100 Specification and drawings for details on the project commissioning requirements to meet Energy Code, project Sustainability, and owner requirements.
C. Equipment Controls and Description of Operations: See plumbing drawings for details on the plumbing equipment controls and sequencing of equipment.

1.5 DEFINITIONS & ABBREVIATIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
F. The following are industry abbreviations for plastic materials:
   1. CPVC: Chlorinated polyvinyl chloride plastic.
   2. PE: Polyethylene plastic.
   3. PEX: Cross-lined polyethylene (PEX-a)
   4. PVC: Polyvinyl chloride plastic.
G. The following are industry abbreviations for rubber materials:
   1. EPDM: Ethylene-propylene-diene terpolymer rubber.
   2. NBR: Acrylonitrile-butadiene rubber.

1.6 CODES & STANDARDS

A. As required by the Building Code and jurisdictional requirements the Contractor is responsible for meeting all code, standard, and jurisdictional requirements not explicitly detailed in these specifications or drawings, but which may be reasonably inferred or implied from the nature of the project, must be

provided as part of the contract. Contractor is responsible for requesting further information or clarifications in regard to meeting applicable jurisdictional requirements, code and standards if they find the contract documents do not clearly describe the project scope or intended means for code compliance.

B. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.
C. All accessible plumbing work shall comply with the Americans with Disabilities Act (ADA)and local amendments.
D. Plumbing equipment, electrical devices and wiring shall conform to the latest standards of NFPA 70. All materials and equipment covered under the UL Testing Laboratory Service must be certified by the Underwriters Laboratories for their intended use and bear the UL mark. ETL or CSA marks may also be used if they are accepted by the Authorities Having Jurisdiction (AHJs).
E. Plumbing equipment and systems shall comply with Energy Code requirements. Mechanical and plumbing equipment efficiencies to comply with certification and listing requirements of Energy Code Sections C403.3.2 and C404.2.
F. Equipment Short-Circuit Current Ratings (SCCR): The SCCR on unit nameplates must equal or exceed the AIC rating of the panel serving the equipment. All small package equipment must have a listing for a minimum of 5,000 AIC. Larger packaged equipment are required to be listed for at least 64,000 AIC, unless otherwise specified. The final SCCR is determined based on the Electric Contractor coordination study.
G. Perform all tests required by governing authorities and required by the contract documents. Provide written reports on all tests.
H. The following codes and standards apply to the design of the project:

CODES & STANDARDS ABBREVIATION LEGEND	
ABBREVIATION	**PROJECT SPECIFIC CODE REFERENCE**
ENERGY CODE	2021 SEATTLE ENERGY CODE FOR COMMERCIAL BUILDINGS (SEC-C)
BUILDING CODE	2021 SEATTLE BUILDING CODE WITH WASHINGTON STATE AMENDMENTS
ACCESSIBILITY CODE	2021 SEATTLE BUILDING CODE AND ICC A117.1-2009
SEISMIC CODE	ASCE 7-2016 AS REFERENCED BY 2021 SEATTLE BUILDING CODE
FIRE CODE	2021 SEATTLE FIRE CODE
MECHANICAL CODE	2021 SEATTLE MECHANICAL CODE
FUEL GAS CODE	2021 SEATTLE FUEL GAS CODE 2021 NATIONAL FUEL GAS CODE (NFPA 54) 2020 LIQUEFIED PETROLEUM GAS CODE (NFPA 58)
PLUMBING CODE	2021 SEATTLE PLUMBING CODE
BOILER CODE	2024 SEATTLE BOILER CODE
ELECTRICAL CODE	2023 NATIONAL ELECTRICAL CODE WITH 2023 SEATTLE AMENDMENTS (NFPA 70)
ELEVATOR CODE	ASME A17.1-2019 SAFEY CODE FOR ELEVATORS AND ESCALATORS WITH WASHINGTON STATE AMENDMENTS
NFPA STANDARDS	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS AS REFERENCED BY THE CODES ABOVE
SUSTAINABILITY	ESDS V4, WITH THE FOLLOWING CREDITS UNDER V3.0.1: 5.1A, 5.2A AND 7.5.

GENERAL NOTES:

DELTA E CONSULTING: TEMPLATE REV DATE: REVISED FOR PROJECT

A. WHERE DRAWINGS AND SPECIFICATIONS REFER TO THE "BUILDING CODE" (FOR EXAMPLE) THIS REFERS TO THE PROJECT SPECIFIC CODE LISTED IN THE TABLE ABOVE. SEE CODES & STANDARDS BASIS OF DESIGN IN THE DRAWINGS FOR FURTHER DETAILS REGARDING THE APPLICABLE CODE SUCH AS EFFECTIVE DATE, ETC.

1.7 SCOPE OF WORK

A. See plumbing drawings for an outline of the specific scope of work and plumbing systems for this project.
B. Specifications may include additional typical systems that may not be utilized for this specific project. Where system types or equipment types are not utilized for this specific project the contractor is not required to submit on these components.
C. Energy Code Compliance
   1. See project drawings and specifications for details on project energy code compliance.
   2. Energy code compliance is utilizing the prescriptive path in accordance with Energy Code Section C401.2 Item 1.
D. Sustainability Protocol Compliance
   1. Project is required to comply with ESDS v4 protocol. See project drawings and specifications for details on requirements.

1.8 PROJECT PRICING ALTERNATES

A. See owner or general contractor request for proposal (RFP) for a complete list of project pricing alternates (deductive or additive) that are required to be priced as part of the project milestone budgeting or contractor selection process.
B. See Table below for a list of project pricing alternates that have been identified for this project:

Alternate #	Pricing Alternate Description	MEP Impacts
ALT-01	**Base:** None **Alternate:** None	Divisions 22, 23, 26

1.9 INTERPRETATION OF PLANS

A. In general, the Drawings are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements.
B. Drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail of construction. All work shall be constructed from field measurements taken at the site. This shall include all rises, drops and offsets necessary to avoid structural members or equipment and materials installed by other trades. The contractor shall coordinate the ductwork and piping layout before construction. No additional costs will be allowed for piping and ductwork fabrications without field verification of available space. If it is found, before installation, that a more convenient, suitable or workable arrangement of any or all phases of construction would result by altering the arrangement indicated on the Drawings, the architect/engineer may require the contractor to change the arrangement of their work without additional cost to the owner.
C. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.
D. The drawings and specifications are intended to supplement each other. Any items shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed the same as if mentioned and shown.
E. The greatest quantity or more expensive work shall govern where there is a conflict noted anywhere on the drawings and/or specifications.

1.10 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
    1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
    2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
C. Lead Free Requirements: All plumbing pipes, fittings, valves, fixtures, and other components in systems providing water for human consumption shall be ‘lead-free’ in accordance with the “Reduction of Lead in Drinking Water Act” and the “Safe Drinking Water Act”, where the term ‘lead-free’ is defined to mean – “not containing more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.”
    1. Lead-free products shall be compliant with the requirements of either NSF 61-G or NSF 372.
    2. Lead-free products shall bear a certified mark by a nationally accredited certification body.

1.11 COORDINATION

A. Coordinate equipment and materials installation with all other building components.
B. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or

servicing without impacting adjacent equipment or piping. This work shall include furnishing access doors required for install by others.

C. Joints and fittings shall not be located in inaccessible locations such as wall, floor and roof penetrations.
D. Refer to the acoustical specifications for additional installation requirements.
E. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
F. Coordinate the cutting and patching of building components to accommodate the installation of equipment and materials. Cutting, patching, and painting is by others.
G. All cutting or drilling of joists must adhere to requirements provided by the Structural Engineer.
H. Materials within plenums shall be noncombustible or shall be listed and labeled as having a flame spread index of not more than 25 and a smoke-developed index of 50 or less when tested in accordance with ASTM E84 (NFPA 255) or UL-2043.
I. All fire stopping of through penetrations and membrane penetrations is by the installing Contractor
J. Coordinate installation of floor drains and floor sinks with work of other trades. Finished floors shall slope to floor drains as shown on Architectural drawings. Floor sinks will typically be installed flush with surrounding floor. Review plans and design intent for floor sinks that may require elevated rims.
K. Pipes, pipe fittings, plumbing fittings and fixtures that come into contact with the wetted surface of a public water system or any plumbing in a facility providing water for human consumption shall be “Lead Free” and NSF 61/NSF 372 compliant.

1.12 PRODUCT SUBSTITUTIONS

A. Equipment manufacturer’s where indicated on the drawings are the basis for design. The contractor accepts responsibility for all design implications when providing approved equipment other than the design basis.
B. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics than the basis of design may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
C. Dimensional and Weight Changes: Equipment with dimensions or weight different than the basis of design may be furnished provided such proposed equipment is approved in writing. The contractor is responsible for verifying proposed equipment maintains the design intent for access and serviceability and reserves space for future equipment where required. Cost implications to other trades are the responsibility of the contractor.

1.13 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified (refer to Division 01).
   1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
   2. RFIs shall address single questions and related issues only.

3. All RFIs shall be thoroughly reviewed and approved by the General Contractor and/or Construction Manager for accuracy and need for information required before submittal to the Owner's Design Representative.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. General RFI requirements:
      a. All information required by RFI's in accordance with Division 01 specifications
      b. Project name.
      c. Date.
      d. Name of Contractor.
      e. RFI number, numbered sequentially and unique.
      f. RFI subject.
      g. Specification Section number and title and related paragraphs, as appropriate.
   2. Specific RFI detail:
      a. Drawing number and detail references, as appropriate.
      b. Field dimensions and conditions, as appropriate.
      c. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
      d. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      e. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow a minimum ten business days for Engineer's response for each RFI, plus additional time for Architect and General Contractor to review and forward. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
   1. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
   2. The following Contractor-generated RFIs will be returned without action:
      a. Incomplete RFIs or inaccurately prepared RFIs.
      b. RFIs submitted without indication of review and approval for submission by General Contractor or Construction Manager.
      c. RFIs addressing multiple unrelated issues.
      d. Requests for approval of submittals or shop drawings.
      e. Requests for approval of product substitutions.
      f. Requests for approval of Contractor's means and methods.
      g. Requests for adjustments in the Construction Cost Sum or Contract Time.
      h. Requests for interpretation of Engineer's actions on submittals unless review comments indicate an RFI is required to clarify the contract documents.

1.14 SUBMITTALS

A. Provide submittals for all materials and equipment in accordance with Division 01 specification requirements.

B. Provide a list of all required submittal and timeline for submission and approval for owner and design consultant review.

C. Submittals and Shop Drawings:

1. Submit electronic copies of manufacturer's submittal sheets in one (1) coordinated package per Specification Division. Multiple submissions will not be accepted without prior approval of the Owner's Representative. Organize submittal sheets in sequential order aligned with matching specification section numbers.
2. Submittals to include at a minimum the following information in addition to the requirements required by the drawings and specifications:
    a. General Information:
        1) Project name and location
        2) Architect company name and Engineer of Record Company Name
        3) Contractor name(s) and contact information
        4) Local vendor name and contact information
        5) Manufacturer name and contact information
        6) Applicable Energy Code Cycle project is permitted under. See "Codes and Standards" Section for details.
    b. Schedule of all materials and equipment included in the submittal:
        1) Electronic bookmarks will be provided to each product or equipment (by type or tag) listed in the Submittal Section Schedule.
        2) Where electronic bookmarks are not provided submittal will be returned rejected and will not be reviewed until electronic bookmarks are added.
    c. Energy Code and Sustainability Protocol Compliance:
        1) Include all equipment efficiency required by the Energy Code
        2) Include all information required by the project specific sustainability standard where applicable.
    d. Parts:
        1) Indicate in submittal of all equipment parts ship loose or ship separately that require assembly by the contractor.
        2) Provide a list of all spare parts that will be provided and when they will be provided.
    e. Startup: Description of responsible party for equipment startup. Where equipment startup is required by a manufacturer representative it shall be included. Provide a description of any all startup services provided by the material and equipment manufacturer.
    f. Warranty:
        1) Base warranty: Provide detailed description of material or equipment warranty including all items warranties are contingent upon.
        2) Optional warranty: Provide a detailed description of optional warranties that need owner review and approval where required by the drawings or specifications.
3. Provide electronic copies of contractor coordinated shop drawings prepared to show details of the proposed installation. Copies of contract design drawings submitted to demonstrate shop drawing compliance will not be accepted.
4. Paper submittals will only be acceptable if specifically required by Division 01.

5. The reviewed submittals shall be converted into Operations & Maintenance Manuals at the completion of the project with additional information required. Refer to Division 01 for additional requirements.

1.15 CONTRACTOR COORDINATED SHOP DRAWINGS

A. The Contractor shall prepare Coordinated Shop Drawings for fabrication and installation of the systems. Coordinated Shop Drawings shall meet the following requirements at a minimum:
   1. Record the coordinated layout and installation of all piping, fixtures, HVAC equipment, ductwork, grilles, diffusers, fire sprinklers, lighting, audio/video systems, electrical services, and related components.
   2. Include all mechanical rooms and floor plans.
   3. Be keyed to the structural column grid and numbered in sequence.
B. Coordination and Conflict Resolution: Prior to completion of the Drawings, the Contractor shall coordinate the proposed installation, structural requirements, maintenance clearances, and minimum code required clearances, with the Owner's Representative and all other trades (including HVAC, Plumbing, Fire Protection, Electrical, and Structural Systems). In the event conflicts or interferences are identified, revise the layout as needed to resolve.
C. No equipment or material shall be fabricated, ordered, or installed until the General Contractor and Owner's Representative have approved the coordinated documents.
D. Shop Drawings (or electronic coordination models) shall be submitted on a floor-by-floor basis, in alignment with the building's construction schedule.
E. Preparation: Three-Dimensional Revit / BIM-Based Documents
   1. Provide a Revit model (or equivalent BIM data) showing all equipment and piping, including valves and fittings; dimension from column lines and indicate elevations (e.g., bottom of pipe above finished floor).
   2. Obtain and integrate BIM data from other trades (architectural, structural, HVAC, plumbing, electrical, fire alarm, low voltage, etc.) to ensure full coordination with other building systems.
   3. Incorporate all approved addenda items and change orders into the Revit model / BIM data.
   4. Provide necessary maintenance access clearances per manufacturer installation instructions and minimum code requirements.
   5. Distribute the Revit model and BIM input to all affected trades and coordinate additional adjustments as needed to avoid conflicts.
F. Conflict Notification: Advise the Owner's Representative in the event a conflict occurs in the location or connection of equipment. Contractor shall bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Owner's Representative of conflict.
G. Record Drawings: Final Coordination Drawings with all appropriate information added are to be submitted as Record Drawings at completion of project.

1.16 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "Project Record Documents." In addition to the requirements specified in Division 1, refer to specific sections for additional record documentation.

B. Record documents provided by the contractor will include redlines of the design architectural engineering drawings that comply with Energy Code Section 103.6. At a minimum the contractor will provide the following redlines for the following:
   1. Record documents will convey a record of the completed work if any work is removed from the project scope then redlines will indicate this.
   2. Redlines will include building envelope, mechanical, plumbing, electrical and control drawings red-lined, or redrawn, that show all changes to size, type and locations of components, equipment and assemblies.
   3. Record documents shall include the location and model number of each piece of equipment as installed.

1.17 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "Operating, Maintenance, and Warranty Data". Submit copies for review by Architect/Engineer. In addition to the requirements specified in Division 1, include the following information:
   1. Descriptive summary of function, normal system operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.
   5. Warranty information for all mechanical items shall be included in one tabbed section.

1.18 SUMMARY OF PRODUCTS AND MATERIALS

A. This Section includes the following:
   1. Supports and anchors.
   2. Equipment and piping rails.
   3. Identification markers.
   4. Access doors and panels.
   5. Transition fittings
   6. Dielectric fittings
   7. Pipe sleeves
   8. Sleeve seals
   9. Escutcheons.
   10. Grout.
   11. Equipment and system-common requirements.
   12. Painting.

1.19 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
C. Storage of materials and equipment shall not impede the work of other contracts.
D. Handling of equipment and products shall be according to manufacturers instructions and in compliance with the articles of their warranty.
E. Protect products from weather, unless product is slated for exterior installation. If outdoor storage is necessary, support products off the ground or pavement in watertight enclosures.

1.20 FIRE SAFETY PRECAUTIONS

A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phases of work.
B. At all times, access shall be maintained for fire department trucks to the building.
C. All welding brazing, cutting and sweating operations performed in vicinity of or accessible to combustible materials shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.
D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.
E. When necessary to do cutting, welding, brazing, sweating and similar work in vicinity of wood, in shafts, or vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire resistant blankets or similar approved coverings. In addition, a helper shall be stationed nearby with proper fire extinguishers (provided by the Contractor performing the work) to guard against sparks and fire.
F. Whenever combustible materials have been exposed to sparks, molten metal, hot slag or splatter, a person shall be kept at the place of work to make sure the smoldering fires have not been started. Whenever cutting or welding operations are carried on in a vertical pipe shaft, a person to act as a fireguard shall be employed to examine all floors below the point of cutting or welding. This fireguard shall be kept on duty after completion of work to guard against fires and shall examine each level after this time, prior to leaving. There shall be no exceptions to this requirement and failure to comply will be construed as negligence.

1.21 PERSONAL SAFETY REQUIREMENTS

A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions required in connection with his work, including regulations of the Occupational Safety and Health Administration (OSHA) and other governing agencies.

1.22 PERMITS, LICENSES AND FEES

A. The Contractor shall secure all permits and licenses, both temporary and permanent required for their work. The Contractor shall pay all fees and expenses required for the permits and licenses.
   1. The Contractor shall make all arrangements with each utility company and pay all service charges associated with new services or modifications to existing services.
   2. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.

3. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.
4. Comply with requirements of Division 00.

1.23 WARRANTY

A. Refer to general terms and conditions, as well as warranties and obligations defined in Division 1 of the specifications that provide basic warranty requirements for the entire project.
B. The warranties and corrective obligations provided under this section:
   1. Are in addition to, and not in lieu of, any other warranty, representation, covenant, duty or other obligation (including any corrective obligation) of the Contractor or Manufacturer,
   2. Have no relationship to the time when any warranty, representation, duty, covenant or other obligation of Contractor or Manufacturer may be enforced or any dispute resolution proceeding commenced and
   3. Are made by the Manufacturer to both the Contractor and the Owner and by the Contrator to Owner.
C. All equipment and systems shall be provided with a minimum one-year warranty, or longer, as defined in each subsequent specification section. Warranty shall include all parts, material, labor and travel.
D. Warranty Start Date: The start date for all warranty periods shall be defined as starting from the date of Substantial Completion which shall include the Certificate of Occupancy from the Authority Having Jurisdiction.
E. Refer to individual Specification sections for additional extended warranty requirements.
F. Provide complete warranty information for each item, to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
G. Nothing in any separate warranty or other document provided by Contractor or Manufacturer, or both, will apply to limit their liability or responsibility for damages arising out of or related to a breach of any warranty or corrective obligation.
H. Service during warranty period: Contractor shall provide maintenance as specified elsewhere during the 12-month warranty period.

1.24 GUARANTEE

A. The Contractor shall guarantee and service all workmanship and materials to be as represented by him and shall repair or replace, at no additional cost to the Owner, any part thereof which may become defective within the period of one (1) year, minimum, after the Certificate of Occupancy, ordinary wear and tear excepted.
B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in this work.

PART 2 - PRODUCTS

2.1 SUPPORTS AND ANCHORS

A. General: Comply with applicable codes pertaining to product materials and installation of supports and anchors, including, but not limited to, the following:
   1. UL and FM Compliance: Provide products, which are UL listed and FM approved.

2. ASCE 7 (Latest Edition): American Society of Civil Engineers-Minimum Design Loads for Buildings and Other Structures.
3. MSS Standard Compliance: Manufacturer's Standardization Society (MSS).
4. NFPA: Pamphlet number 13 and 14 for fire protection systems.
5. Provide copper plated or plastic coated supports and attachment for copper piping systems. Field applied coatings or tape is unacceptable.

B. Horizontal Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated hangers and supports of one of the following MSS SP-58 types listed.
1. Adjustable Steel Clevis Hangers: MSS Type 1.
2. Adjustable Steel Swivel Band Hangers: MSS Type 10.
3. U-Bolts: MSS Type 24.
4. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
a. Plate: Unguided type.
b. Plate: Guided type.
c. Plate: Hold-down clamp type.
5. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast iron floor flange.
6. Pipe Saddle Supports with U-Bolt: MSS Type 37, including steel pipe base support and cast iron floor flange.
7. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast iron floor flange.
8. Upper Attachment Side Beam Bracket: MSS Type 34
9. Upper Attachment Side Beam Angle Bracket: MSS Type 34, UL listed and FM Approved.
10. Pipe Guides: Provide factory-fabricated guides of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

C. Horizontal Cushioned Pipe Clamp: Where pipe hangers are called out to absorb vibration or shock install a piping clamp with thermoplastic elastomer insert. Cush-A-Clamp type by many manufacturers.

D. Vertical Piping Clamps: Provide factory-fabricated two-bolt vertical piping riser clamps, MSS Type 8 and or four-bolt riser clamps for heavy loads, MSS Type 42. Provide with 1” thick (minimum) neoprene pad on floor with 1/4" thick steel plate to distribute riser clamp weight to pad.

E. Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments of one of the following MSS types listed.
1. Steel Turnbuckles: MSS Type 13.
2. Steel Clevises: MSS Type 14.
3. Swivel Turnbuckles: MSS Type 15.
4. Malleable Iron Eye Sockets: MSS Type 16.
5. Steel Weldless Eye Nuts: MSS Type 17.

F. Building Attachments: Except as otherwise indicated by the Structural Engineering design, provide factory-fabricated building attachments of one of the following types listed.
1. Concrete Inserts:
a. MSS Type 18.
2. Steel Brackets: One of the following for indicated loading:
a. Light Duty: MSS Type 31.

b. Medium Duty: MSS Type 32.
c. Heavy Duty: MSS Type 33.

3. Horizontal Travelers: MSS Type 58.
4. Concrete Screw Anchors: For floor mounted attachments with maximum allowable pullout and shear force of 250 lbs. (1.1 kN) per anchor regardless of size.
5. Powder-Driven Concrete Anchors:
   a. Only for existing concrete structures with minimum 4000 psi concrete compressive strength.
   b. Minimum embedment of 1” (25 mm).
   c. Maximum allowable load of 50 lbs (0.2 kN) per anchor.

G. Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping at hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with adjacent pipe insulation.
   1. Pipe Covering Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
   2. Insulation Protection Shields: MSS Type 40, 18" minimum, or of the length recommended by manufacturer to prevent crushing of insulation. High-density insulation insert lengths shall match or exceed shield length.
   3. Thermal Hanger Shields: Constructed of 360° insert of waterproofed calcium silicate (60 psi flexural strength minimum) encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation. Provide assembly of same thickness as adjoining insulation. Shield length shall match or exceed length of calcium silicate insert. Shield and insulation length shall be 4” for pipe diameters up to 2”, length shall be 6” for pipe sizes 2-1/2” to 6”, and 12” length (minimum) for sizes greater than 12” diameter. Alternate Shield: Polyisocyanurate Urethane with a minimum flexural strength of 60 psi, fully encased in SnappItz #360 PVC for pipe sizes to 6” diameter.
   4. Thermal Hanger Couplings: Constructed of high strength plastic coupling to retain tubing and joint insulation at clevis hangers and strut-mounted clamps.

H. Miscellaneous Materials:
   1. Metal Framing: Provide products complying with NEMA STD ML1.
   2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.
   3. Cement Grout: Portland Cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of one-part cement to three-parts sand by volume, with minimum amount of water required for placement and hydration.
   4. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required. Weld steel in accordance with AWS standards.
   5. Pipe Brackets: Copper plated brackets and supports for various mounting options. Insulate brackets attached to metal studs with felt.

2.2 EQUIPMENT AND PIPING RAILS

A. Where equipment/pipe rails are not provided by other sections of Specification, provide prefabricated reinforced equipment rails as required for support of equipment and piping. Field built curbs are acceptable alternatives - provide detail of construction for review.
B. Standard equipment rail, unless otherwise noted, shall be constructed as follows:
   1. Construct of heavy gauge galvanized steel with continuous welds on shell seams.

2. Provide internal reinforcing supports welded as required to meet application requirements.
3. Equipment rails to have raised 3" (minimum), 45° cant.
4. Equipment rails to have 1-1/2" x 1-1/2" wood nailer (minimum) and counterflashing.
5. Equipment rail height to be 6" (minimum) above roof deck.
6. Cant shall be raised to match roof insulation thickness.

C. Equipment rails to be constructed to meet equipment size and weight requirements. Provide tapered rails to match roof pitch where required. Coordinate with structural design and mechanical details for attachment through membrane.

2.3 IDENTIFICATION MARKERS

A. Plumbing Identification Materials: Provide products of categories and types required for each application as referenced in other Division 22 Sections. Where more than single type is specified for application, selection is installer's option, but provide single selection for each product category. Stencils, hand printed, painted, and felt pen markers are not acceptable.

B. Plastic Pipe Markers:
1. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially or fully cover the circumference of pipe, or insulated pipe, and to attach to pipe without fasteners or adhesive complying with ANSI A13.1. Minimum letter size shall be 1/2” high.
2. Pressure Sensitive Type: Provide pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers, complying with ANSI A13.1. Secure both ends of markers with color coded adhesive vinyl tape.
3. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
4. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
5. Nomenclature shall include service type and directional arrow as follows:
   a. Refrigerant: yellow background with black lettering.
   b. Other piping services: Comply with ANSI and ASME A13.1 standards.
   c. Direction of water flow.

C. Valve Tags:
1. Brass Valve Tags: Provide 1-1/2" diameter 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Fill tag engraving with black enamel.
2. Plastic Laminate Valve Tags (indoors only): Provide 3/32” thick engraved plastic laminate valve tags, with piping system abbreviations in 1/4" high letters and sequenced valve number 1/2" high, and with 5/32” hole for fasteners.
3. Valve Tag Fasteners: Provide solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

D. Access Panel Markers: Provide 1/16" thick (minimum) engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or device.

E. Plastic Equipment Signs:

1. Provide 4-1/2” x 6” (minimum) plastic laminate sign, ANSI A.13 color coded with engraved white core lettering. Minimum letter size shall be 1/2” high.
2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
3. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
   a. Tag number
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters, such as pressure drop, entering and leaving conditions, rpm, etc.
4. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2”x11” bond paper, tabulate each equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

F. Underground-Type Plastic Line Markers: Provide 6" wide x 4 mils thick multi-ply tape, consisting of solid metallic foil core between 2 layers of plastic tape. Markers to be permanent, bright colored, continuous printed, intended for direct burial service.

2.4 ACCESS DOORS AND PANELS

A. Provide all access doors and panels to service equipment under this work, including those which must be installed, in finished architectural surfaces. Refer to other specification sections for specific access doors associated with ductwork and equipment.

B. Construction:
1. Frame: 16-gauge steel (minimum).
2. Door: 16-gauge steel (minimum) or two layers of 20-gauge steel (minimum) for double wall door construction.
3. Hinge: 1" flange width, continuous piano hinge.
4. Latching System: screwdriver latch, allen key latch or T-handle latch for non-public access areas. Cylinder key lock for public access areas. Cam latch for access to fire/life safety systems.
5. Paint: white prime coated.

C. Size:
1. Access doors shall be of a size to permit access and removal of equipment for servicing. Access door shall have same rating as the wall or ceiling in which it is mounted. Provide access panel for each trap primer, concealed valve, fire and combination fire/smoke dampers, volume dampers, and other equipment requiring access. Use no panel smaller than 12" x 12" for simple manual access, or smaller than 24" x 24" where personnel must pass through.

D. Architectural Coordination:
1. Refer to Division 01 Architectural specifications and drawings for additional requirements for each surface. Contractor is to submit schedule of access panels for approval. Exact size, number and location of access panels are not shown on Plans.
2. Included under this work is the responsibility for verifying the exact location and type of each access panel or door required to service equipment under this work and in the proper sequence to coordinate with construction schedule and with prior approval of the Owner’s Representative.
3. Access doors in fire rated partitions and ceilings shall carry all label ratings as required to maintain the rating of the rated assembly.

4. Submit markup of architectural plans showing size and location of access panels required for equipment access for approval by Owner's Representative.

2.5 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
B. Plastic-to-Metal Transition Fittings: One-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
D. Plastic-to-Metal Transition Unions: MSS SP-107, four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
B. Insulating Material: Suitable for system fluid, pressure, and temperature.
C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
C. Pressure Plates: Stainless steel. Include two for each sealing element.
D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.9 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening. Provide brass material with polished chrome plated finish.

2.10 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
B. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
C. Design Mix: 5000-psi, 28-day compressive strength.
D. Packaging: Premixed and factory packaged.

2.11 ELECTRICAL

A. General:
   1. All electrical material, equipment, and apparatus specified herein shall conform to the requirements of Division 26.
   2. Provide all motors for equipment specified herein. Provide motor starters, controllers, and other electrical apparatus and wiring which are required for the operation of the equipment specified herein.
   3. Set and align all motors and drives in equipment specified herein.
   4. Provide expanded metal or solid sheet metal guards on all V-belt drives to totally enclose the drive on all sides. Provide holes for tachometer readings. Support guards separately from rotating equipment.
   5. Provide for all rotating shafts, couplings, etc., a solid sheet metal, inverted “U” cover over the entire length of the exposed shaft and support separately from rotating equipment. Cover shall extend to below the bottom of the shaft and coupling, and shall meet the requirements of the State Industrial Safety Regulations.
   6. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings.
B. Quality Assurance:
   1. Electrical components and materials shall be UL or ETL listed/labeled as suitable for location and use.
C. Motors:

1. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment Specifications.
2. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
3. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range. Unless otherwise noted on plans, all motors 3/4 HP and larger shall be rated for 3-phase operation above 200 volts. Unless otherwise noted on plans, all motors up to 1/2 HP shall be rated for 120-volt, single phase operation.
4. Temperature Rating: Motor meets class B rise with class F insulation.
5. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
6. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design “B”, except “C” where required for high starting torque.
    a. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.
    b. VFD driven motors to be provided as inverter ready and equipped with a shaft grounding device.
    c. Bearings:
        1) Ball or roller bearings with inner and outer shaft seals.
        2) Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
        3) Designed to resist thrust loading where belt drives or other drives product lateral or axial thrust in motor.
        4) For fractional horsepower, light duty motors, sleeve type bearings are permitted.
        5) Enclosure Type:
            a) Open drip-proof (ODP) motors for indoor use in clean air environments.
            b) Totally enclosed fan cooled (TEFC) motors for outdoor use and indoor application in dirty environments.
            c) Totally enclosed air over (TEAO) motors for motors in the airstream of cooling towers and fluid coolers.
            d) Guarded drip-proof motors where exposed to contact by employees or building occupants.
            e) Weather protected Type I for outdoor use, Type II where not housed.
    d. Overload Protection: Built-in thermal overload protection where external overload protection is not provided and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
    e. Noise Rating: “Quiet.”
    f. Efficiency:
        1) Motors shall have a minimum efficiency per governing State or Federal codes, whichever is higher.
    g. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

D. Starters and Electrical Devices:
    1. Motor Starter Characteristics:
        a. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs.

b. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.

2. Manual switches shall have pilot lights and all required switch positions for multi-speed motors. Overload Protection: Melting alloy or bi-metallic type thermal overload relays, sized according to actual operating current (field measured).

3. Magnetic Starters:
   a. Heavy duty, oil resistant, hand-off-auto (HOA), or as indicated, and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
   b. Trip-free thermal overload relays, each phase, sized according to actual operating current (field measured).
   c. Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division 23 Controls and HVAC Air Distribution sections.
   d. Built-in primary and secondary fused control circuit transformer, supplied from load side of equipment disconnect.
   e. Externally operated manual reset.
   f. Under-voltage release or protection for all motors over 20 hp.

4. Motor Connections: Liquid tight, flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Low Voltage Control Wiring:
   1. General: 14-gauge, Type THHN, color coded, installed in conduit.

F. Disconnect Switches:
   1. Fusible Switches: For equipment 1/2 HP or larger, provide fused, each phase; heavy duty; horsepower rated; spring loaded quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the “OPEN” position; arc quenchers; capacity and characteristics as indicated.
   2. Non-Fusible Switches: For equipment less than 1/2 horsepower, switch shall be horsepower rated; toggle switch type with thermal overload quantity of poles and voltage rating as required.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

C. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

D. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.

E. Equipment to Be Removed: Disconnect and cap services and remove equipment.

F. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

G. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
H. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
I. Lead Containing Materials: The existing building may contain lead-containing materials, including lead paint. It is the Contractor's responsibility to meet all governmental regulations when dealing with the disposing of lead containing materials.

3.2 EQUIPMENT AND SYSTEM INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
D. Install equipment to allow right of way for piping installed at required slope.
E. Install transition fittings where necessary to accommodate installed materials of construction.
F. Install dielectric fittings at all metallic joints of dissimilar metal.
G. Install chrome plated brass escutcheons for penetrations of walls ceilings, and floors that are not concealed above a ceiling.

3.3 PIPE SLEEVE INSTALLATION

A. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
B. Cut sleeves to length for mounting flush with both surfaces.
C. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
D. Install sleeves in new walls and slabs as new walls and slabs are constructed.
E. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
F. For pipes penetrating gypsum-board partitions: Schedule 40 steel pipe sleeves or steel sheet sleeves.
G. For all penetrations other than gypsum board partitions: Cast iron or schedule 40 steel sleeves.
H. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Flashing" for flashing.
I. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Sealants and Caulking" for materials and installation.
J. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
K. Install Schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.

L. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
M. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
N. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
O. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Firestopping" for materials.

3.4 PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Painting."
B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
C. Field Welding: Comply with AWS D1.1.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
    1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
    2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
    3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
    4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    5. Install anchor bolts to elevations required for proper attachment to supported equipment.
    6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
    7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

END OF SECTION

SECTION 2 0549 – SEISMIC CONTROL FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Seismic restraint and support of piping, ductwork and plumbing equipment as required by code and as designed by a registered Professional Structural Engineer for each related nonstructural equipment restraint.
   2. Plumbing component supports and the means how they are attached to the plumbing component shall be designed for the forces and displacements determined in ASCE 7 Chapter 13. Such supports include structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the plumbing component.
   3. All ductwork designed to carry toxic, highly toxic, flammable gases or used for smoke control shall be seismically braced regardless of size or location.

1.2 DEFINITIONS

A. AHJ: Authority Having Jurisdiction.
B. ASCE: American Society of Civil Engineers.
C. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.
D. IBC: International Building Code with Amendments.
E. ICC-ES: ICC-Evaluation Service.
F. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.
G. Mechanical Attachments: Means by which components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.
H. Plumbing Supports: Those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.
I. Plumbing Components: Elements, including, but not limited to, pumps, water heaters, boilers, heat pumps, pipes, and plumbing fixtures.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 230548: Vibration Control for HVAC.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.
B. Structural Performance: Restraint devices and systems shall withstand the effects of locally defined gravity loads, seismic loads, dead loads, live loads, winds loads and stresses within limits and under conditions indicated per the local Building Code and ASCE 7. Coordinate all support structures and restraint systems with project registered professional Structural Engineer.
C. Special Inspections: Provide structural design and Special Inspections as required by Chapter 17 of the IBC, the Authority Having Jurisdiction, and as defined in the manufacturer installation instructions for each anchorage system. Per IBC Section 1705 all anchors post-installed in hardened concrete members shall have periodic Special Inspections. Special inspection agencies shall be independent of the design and construction companies and shall act as agents for the AHJ but contracted directly with the Owner or Owner's Representative.
D. Codes and Standards: Provide components conforming to the seismic load requirements of the latest addition of the local building code and the following:
    1. International Building Code with State Amendments
    2. ASCE 7 (Latest Edition) - Minimum Design Loads for Buildings and Other Structures
        a. Ductwork and piping requirements defined in Chapter 13 Seismic Design Requirements for nonstructural Components.
        b. Seismic Design Categories, B through F, are defined in Chapter 12, Table 12.6-1. Seismic Design Category B and C apply to all structures. While Seismic Design Categories D, E and F may apply to Category I and II buildings not exceeding two stories, light frame construction and/or structures not exceeding 160 in height.
        c. Nonstructural components in Seismic Design Category A are exempt from seismic design requirements.
    3. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems (Latest Edition.
        a. Seismic guidelines for ductwork and piping bracing as adopted by Authority Having Jurisdiction.
    4. ASHRAE – Practical Guide to Seismic Restraint (Latest Edition).
    5. Mason West Inc. - Seismic Restraint Guidelines (Latest Edition).
        a. For all suspended piping, suspended ductwork.

1.5 APPLICABILITY

A. Seismic restraints are required for nonstructural plumbing systems, but may not be required for the following conditions related to nonstructural components per ASCE 7 Section 13.1.4:
    1. Plumbing components in Seismic Design Category B facilities.
    2. Plumbing components in Seismic Design Category C facility if the component Importance Factor, Ip, is equal to 1.0.
    3. Plumbing components in Seismic Design Categories D, E, or F facilities where all of the following apply:
        a. The component Importance Factor, Ip, is equal to 1.0;
        b. The component is positively attached to the structure;

c. Flexible connections are provided between the component and associated ductwork, piping, and conduit; and any of the following applies:
   1) The component weighs 400 lbs. (1,780 N) or less and has a center of mass located four feet (1.22 m) or less above the adjacent floor level; or
   2) The component weighs 20 lbs. (89 N) or less; or
   3) The distributed ductwork or piping system weights 5 lbs./ft. (73 N/m) or less.

B. Provide seismic bracing at the following locations per SMACNA Seismic Restraint Manual Guidelines for Plumbing Systems (Latest Edition):
   1. Piping:
      a. Transverse bracing shall be provided at 40 feet (12.2 m) maximum except where a lesser spacing is indicated in SMACNA tables.
      b. Longitudinal bracing shall be provided at 80 feet (24.4 m) maximum except where a lesser spacing is indicated in SMACNA tables. Anchor locations for thermal expansion may be used as longitudinal braces. Longitudinal braces must be capable of resisting the additional force induced by expansion and contraction.
   2. Ductwork:
      a. Transverse bracing shall be provided at 30 feet (9.2 m) maximum except where a lesser spacing is indicated in SMACNA tables.
      b. Longitudinal bracing shall be provided at 60 feet (18.4 m) maximum except where a lesser spacing is indicated in SMACNA tables.
   3. Equipment:
      a. All equipment weighing more than 400 lbs. (1,780 N) shall be seismically braced or attached directly to structure.
      b. All suspended plumbing components weighing more than 20 lbs. (89 N) shall be seismically braced, unless the following criteria applies for components up to 75 lbs.
      c. All equipment installed in-line with the duct system with a weight greater than 75 lbs. (334 N), such as fans, heat exchangers and humidifiers, must be supported and laterally braced independent of the duct system.

C. Seismic restraints may be omitted where the following conditions apply and as allowed by the local Authority Having Jurisdiction (AHJ):
   1. Ductwork supported by hangers and each hanger in the duct run is 12" (305 mm) or less in length from the duct support point to the supporting structure.
   2. Ductwork cross-sectional area is less than six (6) square feet (0.557 m2), round ductwork is 32 inches (0.8 m) in diameter or less, or weighs 17 lbs./ft. (248 N/m) or less.
   3. Pipes suspended by hangers 12" (305 mm) or less in length from the top of the pipe to the bottom of the supporting structure for the hanger. Where pipes are supported by trapeze, the trapeze shall be supported by hangers having a length of 12” (305 mm) or less.
   4. Pipe bracing is not required where the following conditions apply:
      a. For Seismic Design Category C where the Ip value is greater than 1.0 and pipe sizes are 2” (50 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).
      b. For Seismic Design Category D, E, or F where the Ip is greater than 1.0 and pipe sizes are 1” (25 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).
      c. For Seismic Design Category D, E, or F and where the Ip equals 1.0 and pipe sizes are 3” (80 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).

D. Seismically restrained systems shall not move more than 2” when pushed and shall not impact the building structure or other nonstructural components.

1.6 PERFORMANCE REQUIREMENTS

A. Component Importance Factor and Risk Category:
   1. Ip=1.0: Standard Occupancies and components associated with Risk Category I, II, and III, including offices and schools.
   2. Additions, alterations, and repairs involving nonstructural plumbing components in structures designed in accordance with pre-1973 building codes may have a Component Importance Factor of Ip=1.0. However, components required to operate for life-safety purposes after an earthquake, including emergency and standby power systems, smoke removal system, smoke control systems, fire alarm panels and egress stairways shall have an Ip=1.5.

B. Building Seismic Design Category:
   1. The directions of application of seismic forces used in the design shall be those which will produce the most critical load effects. Seismic Design Categories are classified as B, C, D, E or F. Refer to Architectural and Structural Designs for project specific classification.

C. Mechanical Seismic Coefficients for Plumbing Components:
   1. Refer to ASCE 7 Table 13.6-1 for ap factor (component amplification factor) and Rp factor (component response modification factor) as required for each unique plumbing component.

1.7 SUBMITTALS

A. Product Data:
   1. Include rated load, rated deflection, and overload capacity for each device or system.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service or agency acceptable to authorities having jurisdiction.
      b. Annotate to indicate application of each product submitted and compliance with requirements.
   3. Submit seismic brace product details from the Mason West Seismic Restraint Guidelines detailing compliance with the specifications.
   4. Where products from the Mason West Seismic Restraint Guidelines cannot be used, special details must be submitted for approval.

B. Seismic Restraint Calculations
   1. Seismic restraint calculations must be provided for all connections to the structure.
   2. Calculations must be stamped by a registered professional Structural Engineer.
   3. Where seismic restraint sizes, spacing and anchorage are included in the Mason West Seismic Guidelines no further calculations are required.

1.8 ENGINEERED PIPING SYSTEMS

A. Where the piping system design indicated on the plans utilizes Mason Industries, Inc. - Mason West, Inc. seismic restraint components, vibration isolators, guides, anchors, expansion compensators and flexible connectors the following requirements apply:

1. Mason Industries, Inc. - Mason West, Inc. products must be installed as shown.
2. If product substitutions or design changes are made the contractor must provide certified design of the piping system and meet the following conditions:
    a. Certification must be provided by a registered professional Structural Engineer.
    b. Certification shall include a statement that all systems have been checked for loads and stresses and that no excessive loads or stresses exist.
    c. Forces on all anchors, guides, supports, and restraints must not exceed those shown in the original design unless the structure is checked for the larger loads at no cost to the owner.

B. Where the piping system design is not indicated on the drawings the design is delegated to the contractor with the following requirements for piping certification and analysis:
1. The supports, anchors, guides and seismic braces for systems with significant thermal motion including steam, condensate, high temperature hot water and heating hot water systems must be designed for combined gravity, seismic, pressure and thermal loads.
2. Small diameter pipes (2” diameter and smaller) may not require analysis as determined by the project registered professional Structural Engineer.
3. The results of the analysis shall include reactions at restraints and anchors, maximum pipe displacements and a code compliant report indicating maximum pipe stresses.
4. Where required, seismic restraint components, vibration isolators, guides, anchors, expansion compensators and flexible connectors manufactured by Mason Industries, Inc. and Mason West, Inc. shall be incorporated into the design of the systems.
5. The analysis and design must be performed by a Structural Engineer with 5 years of experience in this field.

1.9 MANUFACTURER AND CONTRACTOR RESPONSIBILITIES

A. All seismic restraints shall be designed by a registered professional Structural Engineer.
B. Seismic restraint layouts for piping and ductwork shall be added to the contractor’s shop drawings and shall include:
1. The number, size and location of seismic braces.
2. Maximum support loads and seismic loads at the seismic brace locations.
3. Reference to specific details or pages from the Mason West Seismic Restraint Guidelines.
C. Submit seismic restraint layout drawings and special details for approval of the project registered professional Structural Engineer per the requirements listed in the Mason West Seismic Restraint Guidelines.
D. Seismic restraint layout drawings shall bear the stamp and signature of the registered professional Structural Engineer who designed the layout of the braces.

1.10 LOADS ON STRUCTURE

A. The responsibility of determining allowable loads on the structure is the sole responsibility of the project registered professional Structural Engineer.
B. Maximum support loads and seismic brace loads on the structure must be less than the maximum allowable loads defined by the project registered professional Structural Engineer, as shown on the plans.

C. Where maximum loads are not listed on the plans or the maximum allowable loads cannot be met, any additional support steel required to reduce support and seismic bracing loads on the structure shall be designed by the project registered professional Structural Engineer.
D. Plumbing component supports and the means how they are attached to the component shall be designed for the forces and displacements determined in ASCI 7 Section 13.3.1 and 13.3.2. Such supports include structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the plumbing component.
E. Plumbing supports are those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.
F. Mechanical attachments are the means how components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.

1.11 WARRANTY

A. Provide minimum one-year warranty from date of Substantial Completion, including all parts, material, labor and travel.
B. Refer to Section 230500 for additional warranty and Substantial Completion requirements.

PART 2 - PRODUCTS

2.1 INTENT

A. All seismic restraints described in this section shall be the product of a single manufacturer.
B. Refer to Section 230500 for additional guidelines for applicable supports and anchors.
C. Mason Industries products are the basis of these specifications; products of other manufacturers may be submitted for review provided their systems strictly comply with the specifications. Manufacturers: Mason Industries, Hilti Inc., B-Line/Tolco (Eaton), Anvil, Superstrut, or equal.

2.2 SEISMIC SWAY BRACING

A. Seismic sway braces shall consist of galvanized steel aircraft cables, steel angles or steel struts.
B. Cable braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads. Brace end connections shall be steel assemblies that swivel to the final installation angle.
C. Cable brace assemblies shall have published strength and stiffness ratings based on testing per FM-1950 standards.
D. Angle or strut bracket assemblies shall be FM Approved except as noted below.
E. Steel angles or struts, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps.
F. Cable and universal swivel sway brace bracket attachment assemblies shall be Mason Industries #SCB or #SCBH, or equal.
G. Solid and swivel brace bracket assemblies shall be Mason Industries #Type SSB or #SSBS, or equal.
H. Rod clamps shall be Mason Industries #SRC or #UCC, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SEISMIC RESTRAINT SYSTEMS

A. Contractor's Statement of Responsibility: Each contractor responsible for installing a Designated Seismic System or any seismic resisting component must submit a statement of responsibility prior to the commencement of work to include acknowledgment of awareness of the need for Special Inspections.
B. All seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.
C. Installation of seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.
D. No connections between the piping or ductwork and the building structure shall be made that degrades the seismic restraint system herein specified.
E. Any conflicts with other trades due to inadequate space or other unforeseen conditions should be brought to the attention of the Owner's Representative prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

END OF SECTION

SECTION 220593 – TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:
   1. Certified TAB reports.
   2. Documentation of work performed per ASHRAE 62.1, Section 7.2.2 - Air Balancing.
   3. Documentation of work performed per ASHRAE/IESNA 90.1, Section 6.7.2.3 - System Balancing.
B. TAB Firm Qualifications: AABC, NEBB or TABB certified.
C. TAB Report Forms: Standard TAB contractor's forms approved by Architect.
D. Perform TAB after leakage and pressure tests on hydronic systems have been satisfactorily completed.

1.2 SUMMARY

A. The installing contractors shall have specific responsibilities relating to demonstrating the equipment and systems provided have been installed and function per the contract specifications. These responsibilities are as follows:
B. Contractors shall provide all motors, sheaves, belts, ladders, etc. as required by the balancer and commissioning agent to accomplish work.
C. The Contractors shall submit start up and test reports to the Architect for approval prior to the commencement of work on this phase of the project. These report documents shall (at a minimum) include (but not be limited to) the following data entries:
   1. Project equipment mark
   2. Manufacturer
   3. Model Number
   4. Fuel type and delivery pressure
   5. Area served and unit location
   6. Rated and actual capacity (BTUH, GPM, kW)
   7. Rated and actual electrical data (Volts, Phase, Cycles) on all systems and individual components within systems (i.e. compressors, evaporator and compressor fans in packaged AC units)
   8. Electrical consumption data (rated FLA, actual FLA)
   9. Rated and actual total, return and supply static pressures
   10. Rated and actual motor and blower RPM's
   11. Motor HP, Frame and Service factor
   12. Method of control
D. It is the Contractor's specific responsibility to complete their respective start-up and checkout procedures, and to ensure the complete readiness of equipment and systems, prior to the start of the balancing phase of the testing and balancing process.
E. Balancing to be done by certified balancing technicians.
F. TAB reports shall be forwarded to the Architect for review and comment.

G. The Contractor shall be responsible for providing qualified representatives, material, equipment, tools, etc., required within the scope of their specialty, to facilitate successfully completing the systems testing and balancing. This contractor shall budget and provide sufficient time and qualified personnel to participate on-site in this process until the process is successfully completed and all deficiencies have been corrected or otherwise resolved. The Architect will issue a certificate of completion at which time the TAB phase of work shall be deemed complete.
H. Specified training on related systems and equipment operation and maintenance shall only commence after final testing and balancing and Commissioning (Cx) is successfully completed, and systems are verified by the Architect to be 100 percent functional.

1.3 PRE-BALANCING CHECKLIST FORMS

A. The Contractor shall be responsible for maintaining and completing copies of equipment start up checklist forms. Checklist forms shall be signed and returned to the Architect and the CB upon completion of all listed items.
B. The checklist forms are not intended to form the final start, test and balance report to the owner. They are to be used by the TAB and Cx Agent to verify that equipment has been started and is ready for testing by that agency.

1.4 SCOPE OF WORK

A. See plumbing drawings for a complete list of all systems that require testing, adjusting, and balancing including project specific special balancing requirements.
B. Mechanical Contractor to provide all requirements testing, adjusting, and balancing as required by the Energy Code and other applicable sustainability standards.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

A. the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
B. Examine the approved submittals for Plumbing systems and equipment.
C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
D. Examine system and equipment installations and verify that field ty-control testing, cleaning, and adjusting specified in individual Sections have been performed.
E. Examine Plumbing equipment and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
F. Examine terminal units and verify that they are accessible and their controls are connected and functioning.
G. Examine automatic temperature system components to verify the following:
    1. Valves and other controlled devices are operated by the intended controller.
    2. Valves are in the position indicated by the controller.
    3. Integrity of valves for free and full operation and for tightness of fully closed and fully open positions.

4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Sensors are located to sense only the intended conditions.
6. Description of operation for control modes is according to the Contract Documents.
7. Controller set points are set at indicated values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to indicated values.

H. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in appropriate testing standards and in this Section.
B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
D. Take and report testing and balancing measurements in inch-pound IP units.

3.3 GENERAL PROCEDURES FOR BALANCING WATER SYSTEMS

A. Verify that motor starters are equipped with properly sized thermal protection.
B. Check condensate drains for proper connections and functioning.
C. Comply with Energy Code requirements pumps with variable speed or ECM drives

3.4 TOLERANCES FOR BALANCING WATER SYSTEMS

A. Not applicable for this project.

3.5 FINAL TESTING, ADJUSTING, AND BALANCING REPORT

A. Final reports shall be neatly completed and provided in a clear and easily readable condition.
B. In every case where a Contractor is unable to comply with an item as listed on the checklist, the Contractor shall immediately notify the TAB and Cx agents in writing as to the reasons for non-compliance.
C. In addition to completion of the final report, Contractors may be required to actively demonstrate compliance with all specified operational criteria as required during the Testing and Balancing and C
D. During the Testing and Balancing and Cx, once issues have been identified and reported as Contractor related deficiencies the Contractor shall be required to correct these issues in a timely manner. The Contractor shall then report all corrections to the TAB or Cx agent in writing.

END OF SECTION

SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Insulation Materials:
   2. Flexible elastomeric
   3. Mineral fiber
   4. Polyolefin
   5. Insulating cements.
   6. Adhesives.
   7. Mastics.
   8. Lagging adhesives.
   9. Sealants.
   10. Factory-applied jackets.
   11. Field-applied jackets.
   12. Tapes.
   13. Securements.
   14. Corner angles.

B. Related Sections include the following:
   1. Division 23 Section "HVAC Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, jackets (both factory and field applied, if any) and furnished accessories for each system.

B. Furnish necessary test data certified by an independent testing laboratory.

C. Provide a statement with the submittal indicating that no product submitted contains an amount equal to or greater than 0.10% by mass of the following chemicals:
   1. Pentabrominated diphenyl ether (CAS#32534-81-9)
   2. Octabrominated diphenyl ether (CAS#32536-52-0)
   3. Decabrominated diphenyl ether (CAS#1163-19-50

D. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product in maintenance manual.

E. Installer Qualification Data: Provide statement of installer qualifications.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
C. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
D. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.8 WARRANTY

A. Refer to Section 22 05 00 for warranty and substantial completion requirements.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in PART 3 schedule articles for where insulating materials shall be applied.
B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
F. Flexible Elastomeric (FE): Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials; thermal conductivity (avg) of 0.27 Btu/hr-ft2-°F or lower at mean temperature of 75°F; 3.0 lbs/ft3 density (ASTM D/622); 0.08 perm-in permeability (ASTM E96); 0.2% water absorption (ASTM C209).
G. Mineral-Fiber Blanket Insulation (MF): Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I; thermal conductivity (avg) of 0.25 Btu/hr-ft2-°F or lower at mean temperature of 75□F. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
H. Mineral-Fiber, Preformed Pipe Insulation (MF): Type I, 850°F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL; thermal conductivity (avg) of 0.25 Btu/hr-ft2-□F or lower at mean temperature of 75°F. Factory-applied jacket requirements are specified in “Factory-Applied Jackets” Article.
I. Mineral-Fiber, Pipe and Tank Insulation (MF): Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 3.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100°F is 0.29 Btu x in./h x sq. ft. x °F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
J. Polyolefin (P): Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials; thermal conductivity (avg) of 0.25 Btu/hr-ft2-°F or lower at mean temperature of 75°F; 1.5 lbs./ft3 density (ASTM D1622); 0.0 perm-in permeability (ASTM E96); 0.0% water absorption (ASTM C209).

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
C. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
D. Service Temperature Range: Minus 20 to plus 180°F.
E. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

F. Color: White.
G. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
H. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
I. Service Temperature Range: Minus 20 to plus 200°F.
J. Solids Content: 63 percent by volume and 73 percent by weight.
K. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
B. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over equipment and pipe insulation.
C. Service Temperature Range: Minus 50 to plus 180°F.
D. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250°F.
   4. Color: Aluminum.
B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250°F.
   4. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I, for applications where systems operate below ambient temperature at least part of the time or where a vapor barrier is required.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I, for applications where systems operate below ambient temperature at least part of the time or where a vapor barrier is required.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II, for applications where systems operate above ambient temperatures or where a vapor retarder is not required.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, as follows:

1. Shall comply with ASTM C921, Type I, for applications where systems operate below ambient temperature at least part of the time or where a vapor barrier is required.
2. Shall comply with ASTM C921, Type II, for applications where systems operate above ambient temperatures or where a vapor retarder is not required.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

C. Adhesive: As recommended by jacket material manufacturer.
1. Color: White.
2. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
3. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
4. Factory-fabricated tank heads and tank side panels.

D. Fitting Covers:
1. PVC Jacket: One or two piece pre-molded high impact PVC fitting covers with fiberglass inserts and accessories. Covers shall be UV resistant and comply with ASTM 1784-92. Covers shall be sized to comply with insulation applications detailed in Part 3.0.
a. Below ambient systems: provide continuous vapor barrier in accordance with manufacturer recommendations.
b. Fiberglass Inserts: Thermal conductivity (ASTM C177), thermal conductivity average of 0.26 Btu/hr-ft2-°F or lower at a mean temperature of 75°F.

E. Metal Jacket:
1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
a. Factory cut and rolled to size.
b. Finish and thickness are indicated in field-applied jacket applications.
c. Moisture Barrier for Outdoor Applications: 2.5-mil thick Polysurlyn.
d. Factory-Fabricated Fitting Covers:
1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 6.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.

C. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
   1. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
   2. Width: 2 inches.
   3. Thickness: 6 mils.
   4. Adhesion: 64 ounces force/inch in width.
   5. Elongation: 500 percent.
   6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Width: 2 inches.
   2. Thickness: 3.7 mils.
   3. Adhesion: 100 ounces force/inch in width.
   4. Elongation: 5 percent.
   5. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:
   1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 0.015 inch thick, 1/2 inch wide with wing seal.
   2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.

B. Insulation Pins and Hangers:
   1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated.
   2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
   3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
      a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
      b. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
      c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   b. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch diameter shank, length to suit depth of insulation indicated.
   c. Adhesive-backed base with a peel-off protective cover.
5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
6. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
   a. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.
   b. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
B. Verify that systems and equipment to be insulated have been tested and are free of defects.
C. Verify that surfaces to be insulated are clean and dry.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.3 PIPING INSULATION APPLICATION

A. Indoor Piping System Insulation: Insulate with insulation types and thickness as listed in the Plumbing Piping Insulation Specification Schedule on the plumbing drawings.
B. If more than one pipe material is listed for a piping system, selection from materials listed is the contractor’s option.
C. Refer to the Plumbing Piping Insulation Specification Schedule on the plumbing drawings for insulation insert and insulation shield requirements.
D. Outdoor Piping System Insulation: All outdoor insulation shall be flexible elastomeric or polyolefin. Provide with weather barrier aluminum jacket.
E. Insulation Omitted: Omit insulation for the following:
   1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.
   2. Discharge piping from trap primer valves connected to building sanitary waste floor drain traps.

3.4 EQUIPMENT INSULATION APPLICATIONS

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.
C. Domestic water hydro-pneumatic storage tank insulation shall be of the following:
   1. Flexible Elastomeric: 1 inch thick and 3-lb/cu.ft. nominal density.
D. Heat-exchanger (water-to-water for domestic water heating service) insulation shall be one of the following:
   1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
   2. Mineral-Fiber Pipe and Tank: 2 inches thick.
E. Domestic hot-water storage tank insulation shall be one of the following:
   1. Mineral-Fiber Board: 4 inches thick and 3-lb/cu. ft. nominal density.
   2. Mineral-Fiber Pipe and Tank: 4 inches thick.
   3. See Energy Code Section C404 for minimum R-value requirements for domestic hot water storage tank insulation.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
G. Keep insulation materials dry during application and finishing.
H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
I. Install insulation with least number of joints practical.
J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
K. For all insulation, seal exposed fiberglass including cut pre-formed pipe sections with manufacturer’s approved mastic.
L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

M. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
   4. For below ambient services, apply vapor-barrier mastic over staples.
   5. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
   6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
Q. For above ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Manholes.
   5. Handholes.
   6. Cleanouts.

3.6 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
   4. Seal jacket to roof flashing with flashing sealant.
B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
   3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

F. Comply with requirements in Division 07 Section "Firestopping" for firestopping and fire-resistive joint sealers.

1. Insulation Installation at Floor Penetrations:
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Firestopping."

3.7 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
   a. Do not weld anchor pins to ASME-labeled pressure vessels.
   b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
   c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
   d. Do not overcompress insulation during installation.
   e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
   f. Impale insulation over anchor pins and attach speed washers.
   g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.

8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

3.8 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Fiberglass inserts with PVC fitting covers are acceptable. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Fiberglass inserts with PVC fitting covers are acceptable. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Fiberglass inserts with PVC fitting covers are acceptable. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Fiberglass inserts with PVC fitting covers are acceptable. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services.

Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Provide 16 gauge galvanized sheet metal insulation shields at all hanger locations. Shields shall be a minimum 12” in length and formed to fit pipe contour.

3.9 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.10 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.11 POLYOLEFIN INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Flanges:
3. Install pipe insulation to outer diameter of pipe flange.
4. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
5. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
6. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.12 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:
   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

END OF SECTION

SECTION 221000 – PLUMBING PIPING, VALVES AND SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to the following:

B. Pipe and Fittings
   1. Domestic cold water
   2. Domestic hot water
   3. Irrigation water
   4. Condensate
   5. Sanitary waste and vent
   6. Storm drainage and overflow
   7. Natural gas

C. Valves and Piping Specialties
   1. Water valves
   2. Balancing valves
   3. Pressure reducing valves
   4. Strainers
   5. Electronic mixing valves
   6. Thermostatic mixing valves
   7. Water meters
   8. Thermometers and gauges
   9. Piping specialties
   10. Pipe escutcheons
   11. Drip pans
   12. Water hammer arrestors
   13. Trap primers
   14. Air vent
   15. Dielectric unions
   16. Unions
   17. Flanges
   18. Pipe sleeves
   19. Sleeve seals
   20. Valve boxes
   21. Backflow prevention valves
   22. Backwater valves
   23. Cleanouts
   24. Roof flashings
   25. Natural gas valves

26. Seismic (earthquake) gas shutoff valves
27. Gas pressure regulator valves
28. Gas solenoid valves
29. Gas connectors

1.2 REFERENCE STANDARDS

A. Comply with requirements of latest codes, standards or as required by local AHJ.
B. See Specification Section 22 05 00 for details on the applicable codes for the project.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications:
   1. Manufactured items furnished shall be the current, cataloged product of the manufacturer.
   2. Replacement parts shall be readily available and stocked in the USA.
B. Codes and Standards:
   1. All work shall be in full accordance with all applicable codes, ordinances and code rulings.
   2. The Contractor shall furnish without any extra charge the labor and material required for compliance of codes.
   3. Perform all tests required by governing authorities and as required under all Division 22 Sections. Provide written reports on all tests.
   4. Electrical devices and wiring shall confirm to the latest standards of NEC; all devices shall be UL listed and so identified.
   5. All plumbing work shall comply with the Americans with Disabilities Act (ADA).
   6. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.
   7. Provide thermostatic mixing valves and fixtures conforming to ASSE 1070 to limit the maximum water temperature to 110°F for all public lavatories and 120°F for all other public fixtures served with hot water. Handle position stops and temperature mixing valves shall be used as required to limit maximum temperature to prevent scalding. Water heater thermostats shall not be considered a suitable control.
   8. All materials (such as piping, insulation, wiring, controls, etc.) located within air plenum spaces, air shafts, and occupied spaces shall have a flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 or UL 723. In addition, the products, when tested, shall not drip flame particles, and flame shall not be progressive. Provide Underwriters Laboratories, Inc., label or listing, or satisfactory certified test report from an approved testing laboratory to prove the fire hazard ratings for materials proposed for use do not exceed those specified elsewhere in the construction drawings. Contractor shall review all mechanical and architectural plans and be fully aware of all building design criteria prior to installation of any work. Any work installed that does not comply with applicable life/safety requirements of all codes and standards shall be replaced and/or repaired at no additional cost to the Owner.
C. Pressure Piping Standards
   1. Comply with ASME B31.1 Power Piping, ASME B31.3-Process Piping and ASME B31.9- Building Services Piping standards for materials, products, and installation per pressure and temperature operating class.

2. Comply with ASME B31.9 Building Services Piping standard for the following services:
   a. Conveying fluid between 0°F (-18°C) to 250°F (121°C).
   b. Fluid pressure less than 350 psig.
3. Comply with ASME B31.3 Process Piping standard for the following services:
   a. Conveying fluid above 250°F (121°C).
   b. Toxic or flammable fluids.

D. Welding Standards
1. Welding Qualifications:
   a. Certification: Each welder shall have a current AWS QC7 welding certification with successful completion of written test and welding samples in compliance with AWS D1.1. The Owner's Representative reserves the right to request sample coupon test welds of each welder to validate quality of welding work.
2. Welding Procedures:
   a. Steel Support Welding: All work shall be performed in compliance with American Welding Society AWS D1.1/D1.1M-Structural Welding Code-Steel.
   b. Pipe Welding: All work shall be performed to meet or exceed the requirements of the American Welding Society AWS B2.1 Specification for Welding Procedure and Performance Qualification and ASME Boiler & Pressure Vessel Code: Section IX "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators."

1.4 PIPING SYSTEM WORKING PRESSURES

A. All fittings, valves, pipe, specialties equipment shall be rated for the working pressure subjected in the installed locations.
B. Drawings indicate working pressure in each system. The rating of the equipment and material shall not be less than that of the system pressures.
C. Fossil fuel gas piping (natural gas, propane) systems for combustion:
1. Low pressure gas service generally includes pressures ranging from 7" to 11" (less than 0.5 psi) to serve gas appliances downstream of pressure regulators.
2. Medium pressure gas service generally includes pressures ranging from 0.5 psi to 5 psi to distribute gas downstream of utility provided service regulators.
3. High pressure gas service generally includes pressures greater than 5 psi including utility distribution pressures and additional installation restrictions where installed within buildings.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for all piping, valves and specialties indicating dimensions, valve CV, tolerances etc.
1. Contractor piping submittals to include the piping material planned to be utilized for each system type. Submittals will include piping system, piping material, applicable pipe size, pipe joining method(s), and acceptable installation location.
B. Shop Drawings: Submit shop drawings indicating underground piping installation showing all fittings with inverts. Indicate all footings and grade beams.
C. Maintenance Data: Submit maintenance instructions on accordance with requirements of Division 01.
D. Submittal for each vibration isolation and seismic-restraint device.

1. Refer to Section 23 05 49 for further information on seismic restraint requirements for piping systems that is provided by the plumbing contractor.
2. Seismic restraint calculations must be provided for all connections to the structure.
3. Include design calculations and details for selecting vibration isolators, seismic restraints, and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
4. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
5. Provide flexible joints, supports and piping joints as required to accommodate movement across seismic expansion joints and vertical building drift between floors.

1.6 WARRANTY

A. Refer to Section 22 05 00 for warranty requirements.

PART 2 - PRODUCTS

2.1 STANDARD PIPE AND FITTINGS: GENERAL

A. Furnish and install all new material, equipment, and apparatus hereinafter specified unless specifically noted otherwise. All material, equipment, and apparatus shall be identified by the manufacturer's name, nameplate, and pertinent data
   1. All pipe, pipe fittings and valves shall be manufactured in North America, or may be import products where manufacturers are specifically identified below. Alternatives may be acceptable, but must be submitted and approved by the Owner’s Representative prior to bidding.
B. All plumbing products in contact with potable water shall be certified Lead Free and NSF 61 or NSF 372 compliant.
C. Type M copper piping is not acceptable for any pressure water piping unless specifically noted otherwise.
D. All plumbing equipment and materials located within return air plenums, as defined by the mechanical code, are to be plenum rated. No plastic material will be utilized unless noted otherwise. See mechanical drawings for details on locations of return air plenums.
E. Where PVC materials are allowed to be utilized in systems as specified on the plumbing drawings the plumbing contractor shall provide solid wall piping. Cellular (foam) core piping is not allowed.
F. For all Grade B piping specified belowground provide a mill report with production identification numbers for piping submitted to permit tracking of pipe by mill and production lot.
G. All materials, equipment, and apparatus are mentioned as standards unless noted otherwise. The words "or approved equal" shall be considered to be subsequent to all manufacturer's names used herein, unless specifically noted that substitutes are not allowed.
H. Provide piping identification labels for all utilities as required by Plumbing Code. Clearly label domestic cold water, domestic hot water, domestic hot water recirculation, natural gas piping, irrigation water and other non-potable water piping, sanitary drainage piping, sanitary vent piping, storm piping, and other similar piping systems. Labels shall occur in mechanical rooms and accessible piping shafts in easily visible locations.

2.2 VALVES AND PIPING SPECIALTIES: GENERAL

A. General: Valve ratings shall exceed respective system operating pressures by 50% (minimum). All valves shall be line size unless otherwise noted.
B. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
C. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.
D. Acceptable manufacturers (manufacturer and model number listed for individual valves indicates minimum acceptable by all manufacturers):
    1. Gate, Ball, Check or Butterfly: Apollo, Hammond, Nibco (commercial grade, US manufacturer only), Milwaukee, Victaulic, Watts or equal.
    2. Lubricated Plug Valves: Homestead, Resun, Rockwell, or equal.
    3. Backflow Preventors: Apollo, Ames, Febco, Cla-Val, Watts, Wilkins, or equal.
    4. Pressure Reducing Valves: Apollo, Cash-Acme, Cla-Val, Watts, Wilkins, or equal.
    5. Solenoid Valves: ASCO, Automatic, Magnatrol, or equal.
    6. Circuit Setters: Griswold (Venturi with characterized ball valve only), Wheatley (Y-globe type only), Armstrong, CircuitSolver, Tour & Anderson, or equal.
E. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on the valve body.
F. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, other than plug valves. Provide one wrench for every 10 plug valves, and one in each size. Provide extended levers/stems for valves on insulated lines. For manual valves 2-1/2" and larger located 8 feet above the floor in mechanical rooms provide chain operator to permit operating the valve from 4'-0" above floor.
G. Valve Features:
    1. General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
    2. Drain: Comply with MSS SP-45 and provide threaded pipe plugs.
    3. Flanged: Valve flanges complying with ASME B16.1 (cast iron), ASME B16.5 (steel), or ASME B16.24 (bronze).
    4. Threaded: Valve ends complying with ANSI B2.1.
    5. Solder-Joint: Valve ends complying with ASME B16.18.
    6. Flangeless: Valve bodies manufactured to fit between flanges complying with ASME B16.1 (cast iron), ASME B16.5 (steel), or ASME B16.24 (bronze).
H. Pipe Coatings and Wrapping
    1. Pipe coatings and/or wrapping may be required for certain pipe materials where pipes are buried in corrosive soils or located in corrosive air environments. Verify local soil and air conditions with building department and engineered soils report, when available. Protect all underground buried steel and copper pipe and fittings. Protect all aboveground exposed steel and copper pipe and fittings located in corrosive air environments. Buried cast iron does not require protection unless specifically required by the AHJ or project engineered Soils Report.
    2. Provide buried pipe protection using one of the following tape methods:

a. Wrap pipe with two layers of 20 mil PVC tape, minimum 2” wide, with 50% overlap and no exposed pipe surface
b. Or cover with pre-fabricated extruded plastic cover with joints sealed with two layers of 20 mil PVC tape.
c. Manufacturer: 3M Scotchrap #51, Pasco Specialty #9000 Series, or equal.

3. Provide buried pipe protection using one of the coating following methods:
   a. Apply general purpose black asphalt paint to exposed buried piping to prevent corrosion. All surfaces should be clean, dry, and free of oil, grease, dirt, loose paint, or other foreign matter. Brush or spray coating at a rate of 1 to 1.5 gallons per 100 sq.ft.
   b. Manufacturers: Karnak #118, or equal.
4. Furnish corrugated stainless steel tubing (CSST) with factory-applied corrosion–resistant polyethylene jacket for use in corrosive atmosphere. Coating properties include the following:
   a. Gastite corrugated stainless steel tube jacket shall be UV-Resistant polyethylene meeting the requirements of ASTM E84 for flame spread and smoke density.

I. Pipe Sleeves:
1. Provide fire proof sleeve assemblies utilizing UL rated sealant systems at all fire rated penetrations. For non-rated sleeve penetrations pack the annular space between the pipe and sleeve with fiberglass and/or mastic.
2. Sleeves shall provide a minimum 1/2" annular clearance around pipe. Where pipes cross through footings or footing walls provide a minimum 1” annular clearance between sleeve and pipe.
3. Sheet metal: Fabricate from 0.025” (0.64 mm) minimum, sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint.
4. Steel pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
5. Iron pipe: Fabricate from cast iron or ductile-iron pipe; remove burrs.
6. Plastic and copper pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
7. Sleeves through interior concrete walls and floors: Telescopic, submerged, adjustable sleeves to extend a minimum of 1” above finished floor. Manufacturers: Adjust-to-Crete, Crete-Sleeve, Hilti, or equal.
8. Through exterior walls and floor on grade: 150-pound class cast-iron pipe sleeve. Where waterproof membranes are used, provide membrane clamps. For insulated piping, sleeve diameter shall not be less than diameter of insulated pipe.
9. Cast-in-place watertight device for protecting penetrating objects from expansion and contraction of concrete. Factory-assembled for use in cast-in-place concrete floors and walls and consisting of two outer sleeves and a one-piece radial extended-flange waterstop gasket, with mid-body seal for embedment and sealing to concrete slab and continuous water seal extending to the penetrating pipe.
   a. Outer Sleeves: EPDM attached to the mid-body seal forming an area with which to attach the device to the structural reinforcing rod determining the position of sleeve in the wall.
   b. Water Stop Mid-Body Seal: Flexible polymer seal with radial extended flange consisting of one to three concentric raised rings which lock into concrete, maintaining seal over time as concrete contracts from sleeve.
   c. Manufacturer: HoldRite #HydroFlame, or equal.

J. Mechanical Sleeve Seals for Underground Penetrations:

1. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
2. All sleeves shall be sealed to prevent intrusion of moisture, dust or insects.
3. Sleeve: To be furnished by same manufacturer of seals; schedule 40 galvanized steel pipe or Century line sleeves, with integral anchor and waterstop collar.
4. Manufacturers: Metraflex #Metraseal, Advance Products & Systems #Innerlynx, GPT #Link-Seal, or equal.

K. Mechanical Sleeve Seals-Aboveground Penetrations:
1. Aboveground: For sleeves passing through walls or floors provide a non-toxic 3-hour rated fire resistant silicone foam sealant with a Flame Spread Rating of 20. Sealant to be tested and approved under UL 263, ASTM E119, and NFPA 251 Standards. All fire rated penetrations shall be sealed with approved UL System.
2. Local Approvals: All seals to be provided shall be in accordance with the regulations of all governing agencies of the city, county, and State Fire Marshal's Office.
3. Wood Decking Description: Cast-in-place, factory-assembled, one-piece watertight firestop device for use in concrete floors formed with wood decking to protect penetrating objects from expansion and contraction of concrete, thermal and seismic movement, and the passage of air, smoke, fire, and hot gasses.
    a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbard Enterprises/HOLDRITE, Hydroflame Sleeve, or equal.
    b. Consists of an outer sleeve lined with an intumescent strip, and a radial extended flange attached to one end of the sleeve for fastening to concrete formwork.
    c. Include a waterstop gasket and mid-body seal consisting of one to three concentric raised rings for embedment and sealing to the concrete slab.
    d. Provide one-hour, two-hour and/or three-hour fire-resistance rated assemblies as required and tested according to ASTM E 814 or ANSI/UL 1479.
4. Steel Decking Description: Cast-in-place, factory-assembled, one-piece watertight firestop device for use in floors formed with steel decking to protect penetrating objects from expansion and contraction of concrete, thermal and seismic movement, and the passage of air, smoke, hot gasses and fire.
    a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbard Enterprises/Holdrite; Hydroflame CMD Metal Deck Device, or equal.
    b. Consists of an outer sleeve lined with an intumescent strip, and wide outside wings attached to one end of the sleeve for fastening to metal deck concrete formwork and span deck corrugations.
    c. Includes a cone attached to the base for extending the device through the metal deck and a water stop gasket and mid-body seal consisting of one to three concentric raised rings for embedment and sealing to the concrete slab.
    d. Provide one-hour, two-hour and/or three-hour fire-resistance rated assemblies as required and tested per ASTM E 814 or ANSI/UL 1479.

5. Concrete Description: Cast-in-place, watertight tub box drain block out firestop device for use in floors formed with wood decking to protect penetrating objects from expansion and contraction of concrete, thermal and seismic movement, and the passage of air, smoke and fire, and hot gasses.
   a. Basis-of-Design Product: Subject to compliance with requirements, provide Hubbard Enterprises/Holdrite, Hydroflame Tub Box, or equal.
   b. Consists of a reinforced polymer box containing a 2-1/2-inches (63.5 mm) thick polystyrene foam insert with an upper water seal consisting of absorbent material and a pitched water trough.
   c. Include a sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork.
   d. Include two support legs each with a radial extended flange for balance and for fastening to concrete formwork, and a lower water-seal and radial extended flange attached to the lower end of the sleeve for fastening to concrete formwork and a water stop gasket with three concentric raised rings for embedment and sealing to the concrete slab.
   e. Provide one-hour, two-hour and/or three-hour fire-resistance rated assemblies as required and tested per ASTM E 814 or ANSI/UL 1479.

2.3 STANDARD PIPE AND FITTINGS: DOMESTIC WATER

A. Domestic Water Pipe & Fittings
   1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
   2. Seamless copper tubing (underground):
      a. Piping construction:
         1) ASTM B88 or B75, Type K, annealed (soft) temper.
         2) ASTM B88 or B75, Type K, hard temper.
      b. Fittings-Brazed:
         1) ASME B16.50 wrought or copper alloy.
      c. Joints-Brazed:
         1) ANSI/AWS A5.8 filler metals.
         2) Water soluble, lead free flux.
      d. For all copper piping installed underground wrap pipe with two layers of 20 mil PVC tape, minimum 2” wide, with 50% overlap and no exposed pipe surface.
   3. Seamless copper tubing (aboveground, includes pumped):
      a. Piping construction:
         1) ASTM B88 or B75, Type K or L, annealed (soft) temper.
         2) ASTM B88 or B75, Type K or L, hard temper.
      b. Fittings-Soldered:
         1) ASME B16.22 wrought copper alloy.
         2) ASME B16.18 cast copper alloy.
      c. Fittings-Brazed:
         1) ASME B16.50 wrought or copper alloy.
      d. Joints-Soldered:
         1) ASTM B32 filler metals.
         2) Water soluble, lead free flux.

e. Joints-Brazed:
   1) ANSI/AWS A5.8 filler metals.
   2) Water soluble, lead free flux.
f. Fittings-Mechanical:
   1) ASME B16.22 wrought copper alloy.
   2) ASME B16.18 cast copper alloy.
g. Joints-Mechanical:
   1) Mechanical press fitting system shall be copper or copper alloy fittings conforming to ASME B16.18 or B16.22, IAPMO PS 117, and NSF 61/372.
   2) Sealing elements shall be factory installed EPDM.
h. Fittings-Grooved:
   1) ASTM F1476 grooved fittings
i. Joints-Grooved couplings:
   1) Manufactured in two segments of cast ductile iron, confirming to ASTM A536, Grade 65-45-12.
   2) Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
   3) Gasket: Gaskets shall be pressure responsive synthetic rubber, Grade E EPDM conforming to ASTM D-2000. Any gaskets used in potable water service shall be ANSI/NSF 61 certified. Elastomer composition for operating temperature range up to 250°F.
   4) Accessories: Standard steel bolts, nuts, and washers. Use stainless steel bolts, nuts, and washers where pipe is installed in corrosive environments
   5) Rigid Couplings:
      a) Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, and NFPA 13.
      b) 2” through 8” Copper Pipe Installation: Use Victaulic Style 607 or equivalent. Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade “EHP” EPDM compound with red color code designed for operating temperatures from -30 deg F (-34 deg C) to +250 deg F (+120 deg C).
   6) Flexible Couplings:
      a) Use in locations where vibration attenuation and stress relief are required. Three couplings, for each connector, shall be placed in close proximity to the vibration source.
      b) 2” through 8”: Use Victaulic Style 177 or equivalent. Installation ready flexible coupling for direct stab installation without field disassembly. Gasket shall be Grade “EHP” EPDM compound with red color code designed for operating temperatures from -30°F (-34°C) to +250°F (+120°C).

4. Stainless steel tubing (aboveground, includes pumped):
   a. Piping construction:
      1) ASTM 312 Type 304 or Type 316

b. Fittings-Grooved:
   1) ASTM F1476 grooved fittings
c. Joints-Grooved couplings:
   1) Manufactured in two segments of cast ductile iron, confirming to ASTM A536, Grade 65-45-12.
   2) Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion.
   3) Gasket: Gaskets shall be pressure responsive synthetic rubber, Grade E EPDM conforming to ASTM D-2000. Any gaskets used in potable water service shall be ANSI/NSF 61 certified. Elastomer composition for operating temperature range up to 250°F.
   4) Accessories: Standard steel bolts, nuts, and washers. Use stainless steel bolts, nuts, and washers where pipe is installed in corrosive environments
   5) Rigid Couplings:
      a) Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, and NFPA 13.
      b) 2” through 8” Steel Pipe Installation: Use Victaulic Style 107H or equivalent. Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade “EHP” EPDM compound with red color code designed for operating temperatures from -30°F (-34°C) to +250°F (+120°C).
      c) 10” through 12”: Use Victaulic Style 07 or equivalent. Standard rigid coupling. Gasket shall be Grade “E” EPDM compound with green color code designed for operating temperatures from -30°F (-34°C) to +230°F (+110°C).
   6) Flexible Couplings:
      a) Use in locations where vibration attenuation and stress relief are required. Three couplings, for each connector, shall be placed in close proximity to the vibration source.
      b) 2” through 8”: Use Victaulic Style 177 or equivalent. Installation ready flexible coupling for direct stab installation without field disassembly. Gasket shall be Grade “EHP” EPDM compound with red color code designed for operating temperatures from -30°F (-34°C) to +250°F (+120°C).
      c) 10” through 12”: Use Victaulic Style 75 or 77 standard flexible couplings or equivalent. Gasket shall be Grade “E” EPDM compound with green color code designed for operating temperatures from -30°F (-34°C) to +230°F (+110°C).

B. PEX Domestic Water Pipe & Fittings (Aboveground):
   1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
   2. Manufacturer: Uponor, Rehau, Viega, approved equal.
   3. Components
      a. Piping construction:

1) All pipe shall be high-density crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (PEXa). Pipe shall conform to ASTM F876, ASTM F877 CSA B137.5, NSF/ANSI 14 and NSF/ANSI 61.
2) Supplier shall provide pipe in sizes up to 3" in diameter.
3) Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature (690 kPa @ 82°C), and 80 psi gauge pressure at 200°F temperature (550 kPa @ 93°C).
4) Pipe shall be certified by PPI to standard TR-3, with applicable plumbing and mechanical code certifications.
5) Pipe to be manufactured using a high-pressure peroxide method with a minimum degree of crosslinking of 70-89% when tested in accordance with ASTM D2765, Method B.
6) Pipe to be tested for resistance to hot chlorinated water in accordance with ASTM F2023. Pipe to have a minimum extrapolated time-to-failure of 50 years, calculated in accordance with section 13.3 of F2023 and listed as "3306" per the ASTM F876 standard.
7) When required, PEX pipe to have a co-extruded red, white or blue UV Shield made from UV-resistant polyethylene providing a minimum UV resistance of 6 months when tested according to ASTM F2657.
8) Pipe to be manufactured in an ISO 9001 certified production facility.
9) Bend Radius:
    a) The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter, or a required by manufacturer.
    b) Bends with a radius less than this shall require the use of a bending template as supplied by the pipe manufacturer, and/or hot air.
10) Pipe to have a Flame Spread Index and a Smoke Developed Index listing to ASTM E84.
11) All fittings shall be located above grade and not concealed in concrete or buried underground.

b. Fittings (Uponor)
    1) Fittings shall be manufactured of Engineered Polymer (EP) and shall be supplied by the PEX tubing manufacturer. Lead free brass materials are allowed only for transition fittings. Fitting connections shall be made to the requirements of ASTM F1960. PEX-a cold expansion type fittings shall be an assembly consisting of insert and PEX-a cold expansion ring. Brass Fitting Type: Uponor lead free ProPEX brass fittings.

c. Fittings (Raheu)
    1) All Fittings used with crosslinked polyethylene (PEX) water distribution pipe intended for plumbing applications shall be certified to the respective fitting standards. Rehau Everloc brass or stainless steel compression-sleeve fittings.

d. Fittings (Viega)
    1) PEX Press fittings shall be manufactured from UNS, C87700, C87710 Bronze, meeting the requirements of ASTM F877 tested as a system with Viega PEX tubing. The PEX Press sleeve shall be manufactured out of a 304 grade or better stainless steel and have three view holes (attached sleeve) to ensure proper PEX tubing insertion. The attached sleeve fitting will incorporate a tool locator ring that shall be in place while

making a proper press connection. The PEX Press connection shall be made with a Viega supplied ratcheting PEX Press hand tool or PEX Press power tool.

e. Manifolds
   1) Material: Distribution manifolds shall be manufactured of copper and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.
   2) Copper manifolds shall be manufactured from Type L copper, minimum, or polymer with compression connections as provided by the manufacturer.
   3) Copper and/or brass outlets shall be high-temperature brazed (lead-free) into headers or polymer type as provided by the tubing manufacturer.

f. Accessories
   1) Tubing Wall Penetration Brackets: Brackets designed for tubing wall membrane penetrations shall be supplied by PEX tubing manufacturer.

g. Markings
   1) Pipe shall carry the following markings every three (3) feet (0.9 meters): Manufacturer’s name or trademark, nominal size, PEXa 3306 (material designation) SDR9 (standard dimension ratio), ASTM F876/ F877 / F2080, CSA B137.5, NSF-pw, UPC, 160 psi @ 73.4°F / 100 psi @
   2) 180°F / 80 psi @ 200°F, POTABLE TUBING, manufacturing date and footage mark.

C. Trap Primer Piping:
   1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
   2. Seamless copper tube:
      a. ASTM B88 or B75, Type K, annealed (soft) temper.
   3. Fittings (underground):
      a. No joints allowed underground.
   4. Fittings (aboveground):
      a. ASME B16.22 wrought copper alloy.
      b. ASME B16.18 cast copper alloy.
   5. Joints-Soldered:
      a. ASTM B32 filler metals.
      b. Water soluble, lead free flux.
   6. PEX tubing may be allowed as an alternate material to materials listed above where approved and acceptable by the local authority having jurisdiction.
   7. For all copper piping installed underground wrap pipe with two layers of 20 mil PVC tape, minimum 2” wide, with 50% overlap and no exposed pipe surface.

2.4 VALVES AND PIPING SPECIALTIES: DOMESTIC WATER

A. Ball Valves:
   1. 2" and Smaller: 600 psi, 2-piece, bronze body, soldered ends for copper pipe and threaded ends for iron pipe, chrome plated brass ball, Teflon seat, brass stem, steel handle, full port, low lead compliant.

B. Butterfly Valves:

1. 2-1/2” and Larger: MSS SP-67, lug wafer, ductile iron body, stainless steel disc, stainless steel stem, EPDM seat, low lead compliant, memory stop control, lever handle thru 5" size and worm gear operator for 6" and larger. Mount stem in horizontal position.

C. Check Valves:
1. 2" and Smaller: Class 125, MSS SP-80, ASTM B62 and ASTM B16, cast bronze body, soldered ends for copper pipe, screwed cap, swing type, Teflon bronze disc, low lead compliant.
2. 2-1/2" and Larger: Class 125, MSS SP-71, ASTM A126 class B cast iron body, bolted bonnet flanged ends, bolted cap, swing type, cast iron disc with bronze face rings, low lead compliant.
3. Vertical or High Flow: Class 125, cast bronze, high-flow body, TFE seat, brass check, low lea compliant, stainless steel guide and spring.

D. Angle Stop Valves:
1. Heavy duty 1/4 turn commercial stop, brass body, chrome plated, 125 psi working pressure, ASME A112.18.1, low lead compliant. Provide with loose key handle in public access spaces for vandal resistance.

E. Low Pressure Y-Type Pipeline Strainers:
1. Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125% of the working pressure of piping system, with Type 304 stainless steel screens, with 3/64" perforations (233 @ 0.045" perforations per square inch).
2. Threaded ends, 2" and smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with hose bibb.
3. Flanged ends, 2-1/2" and larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with hose bibb.
4. Grooved ends 2-1/2” and larger: Ductile iron body, bolted screen retainer with off center blowdown fitted with hose bibb.

F. Slow Closing/Quick Opening Solenoid Valve (2-Way/2-Position):
1. 1/2” to 2-1/2”: Class 125, brass body, stainless steel core, snubber slows disc closing to protect system against water hammer, minimum operating pressure differential 5 psi, 120 VAC input, normally closed (closed when deenergized). Lead-free construction and UL/NSF compliant. Valve shall full stroke close in 4 to 10 seconds and open immediately when energized.

G. Modulating Actuator for Butterfly Valve:
1. 2-1/2” and larger butterfly valves: Valve actuator with integrated linkage for 90° degree rotation and visual position indicator. Power supply with input voltage from 24 to 240 VAC. Power consumption in operation 20 watts and resting power consumption of 6 watts maximum. Adjustable running time of 30 to 120 seconds for full stroke. Ambient humidity to 95% RH non-condensing and operating temperature from -22°F to 122°F (-30°C to 50°C). Die cast aluminum Type 4X enclosure. Open/close or floating point operation as required by system operation.

H. Balancing Valves:
1. Pressure Dependent Water Flow
   a. Maximum 125 Psig System Working Water Pressure
   b. 1/2" and Larger: Construction and attachment style as required by piping system. Ball or globe valve design with memory stop. Valves shall be field adjustable. Install in pipe with minimum length of unrestricted straight pipe equivalent to five pipe diameters upstream and two pipe diameters downstream.
   c. Manufacturer: B&G, Armstrong, Tour & Anderson, or equal.

I. Pressure Reducing Valves:
   1. Pressure Reducing Valves
      a. Lead free single seated, direct operated type; high capacity, having bronze body, serviceable in line, sealed spring cage, reinforced Buna-N diaphragm, by-pass feature, pressure gauge tapings, inline strainer and complying with requirements of ASSE Standard 1003.
      b. Manufacturer: Watts #LF 223 Series or equal. Refer to schedule on drawings as applicable.
   2. Automatic Pressure Reducing Valves
      a. Lead-free pilot operated diaphragm valve type designed to automatically reduce a fluctuating higher upstream pressure to a constant lower downstream pressure. The valve shall contain a disc and diaphragm assembly that forms a sealed chamber below the valve cover, separating operating pressure from line pressure.
      b. The main valve body shall be ASTM A536 ductile iron. Internal cast components shall be ductile iron or 316 stainless steel. All ductile iron components shall be lined and coated with NSF 61 certified epoxy coating applied by electrostatic heat fusion. All main valve trim and throttling components shall be stainless steel. The diaphragm shall be constructed of nylon reinforced Buna-N.
      c. Pilot control system for valves 3” and smaller shall contain a flow clean strainer, fixed orifice closing speed, adjustable opening speed control and pressure reducing pilot. Pilot control systems for valves 4” and larger shall contain an external Y-strainer, fixed orifice closing speed, pressure reducing pilot and isolation ball valves on all body connections. All pilot control systems shall utilize copper tubing and brass fittings. The adjustment range of the pressure reducing pilot shall be 30-300 psi.
      d. Manufacturer: Watts #LFM115 Series or equal. Refer to schedule on drawings as applicable.

J. Pressure Relief Valves
   1. Pressure Relief Valve: Lead free bronze body construction, thermostat and test lever, and initial pressure relief set at 125 psi (adjust for system requirements). Certified to meet ASME low pressure heating boiler code.
   2. Manufacturer: Watts or equal.

K. Temperature And Pressure Relief Valves
   1. Temperature and Pressure Relief Valve: Lead free bronze body construction, thermostat and test lever, temperature relief set at 210°F, and pressure relief set at 125 psi. Certified to meet ASME low pressure heating boiler code and ANSI Z21.22.
   2. Manufacturer: Watts or equal.

L. Vacuum Relief Valves
   1. Vacuum Relief Valve: Lead free brass body construction, protective cap, 1/2” male NPT, maximum operating temperature 250°F. Tested and rated to ANSI Z21.22.
   2. Manufacturers: Watts or equal

M. Electronic Mixing Valve
   1. See plumbing drawings and Specification Section 223000.

N. Thermostatic Mixing Valves
   1. For drinking water service provide valves complying with ANSI/NSF 61.
   2. Contractor shall engage manufacturer’s representative for system startup and calibration of mixing valve.
   3. Building Master Mixing Valves:

a. Shall comply with ASSE standard 1017.
b. Provide factory assembled and tested digital assembly consisting of stainless-steel valve, actuator, controller, and sensors.
c. Valve shall be a lead free 3-way mixing valve with 304 stainless steel body and trim. Valve shall have maximum working pressure of 225 psi and maximum operating temperature of 300°F
d. Actuator shall be capable of traveling the complete valve stroke from fully open to fully closed in less than 20 seconds and shall calibrate to the actual valve stroke.
e. Controller shall be microprocessor based with built in transformer, digital display of temperature and set point, and LED indicator. It shall display the valve opening percentage to match actuator percentage. The controller shall maintain a set point temperature with a minimum flow of 0.5 GPM in accordance with ASSE 1017.

4. Point of Use Mixing Valves:
   a. Shall comply with ASSE standard 1070
   b. Provide factory assembled and tested mixing valve. Valve shall be made of lead-free bronze with copper encapsulated thermostat assembly and stainless steel springs. Valve shall include integral check valves on hot and cold inlets.
   c. Minimum flow of 0.5 GPM or lower.
   d. Shower mixing valves (residential)
   e. Shall comply with ASSE standard 1016.
5. Manufacturers
   a. Leonard TM 1520 2P
   b. Leonard Model 270-LF
   c. Or equal

O. Domestic Water Meters
1. One domestic hot water meter will be provided and installed in each residential dwelling unit by the plumbing contractor in accordance with Energy Code Section C404.9.
2. Provide and install a standard manufacturer spool piece and couplings for a future domestic cold water meter in each residential dwelling unit.
3. Meter make and model will be Next Century Wireless M201 Series with NSF 372 and NTEP certifications or approved equal. Meter shall be rated for design cold and hot water temperatures of system (between 40°F and 125°F).
   a. The meters and meter bases are to be provided and installed by the plumbing contractor. Meters will utilize wireless technology. Installation of wireless routers, central data logger, and phone line to central monitoring is by the Electrical Constractor.
   b. Metering system vendor contact: Submeter Solutions
4. The plumbing contractor will install a meter spool piece and couplings for each meter prior to final installation of the meter. After domestic water system startup flush and fill to eliminate debris and system pressure testing the meter(s) and meter base(s) will be installed by the plumbing contractor to replace the spool pieces.
5. The meter(s) and spool piece(s) shall be located accessibly within the residential units. Meters and isolation valves shall be installed in the wall behind an access panel. Final location to be coordinated with the architect.

a. Preference is for meters and shutoff valves to be installed concealed in an unrated wall cavity or unrated ceiling cavity and accessed via access panel without lock.
b. If they cannot be installed in an unrated wall cavity or unrated ceiling cavity then they should be installed exposed in a closet above the upper shelf.

6. The plumbing contractor will provide an Automated Meter Reading system (AMR) to collect the data from the meters. Meters and meter reading system shall be procured from a common vendor. Electrical Contractor will provide receptacles for routers and central data logger.

P. Irrigation Water Meters
1. Provide irrigation deduct meter capable of communicating with Seattle Public Utilities.
a. Deduct meter shall be programmed to broadcast in 100 cubic feet and must be compatible with SPU ITRON automated meter reading requirements.
b. Meter shall be connected to an ITRON 100W E+ Electronic Receiver/Transmitter (ERT). The ERT must be programmed in "hard-to-read" mode from the manufacturer prior to delivery.
2. See plumbing drawings for details.

Q. Clothes Washer Box
1. See plumbing fixture schedule on plumbing drawings for details.

R. Trap Primers
1. See plumbing fixture schedule on plumbing drawings for details.

S. Water Hammer Arrestors
1. See plumbing fixture schedule on plumbing drawings for details.

T. Hose Bibs, Wall Hydrants, and Roof Hydrants
1. See plumbing fixture schedule on plumbing drawings for details.

U. Thermometers and Gauges
1. General:
a. Certification: Provide meters and gauges whose accuracies, under specified operating conditions, are certified by manufacturer.
b. No mercury shall be used in thermometers due to hazardous material classification.
c. Manufacturers: Weksler, Winters, Trerice, Marshalltown or US Gauge.
2. Thermometers:
a. Bi-Metal Type: Provide bi-metal glass thermometers of materials, capacities, and ranges indicated, designed and constructed in service indicated. Accuracy shall be 1% +/- full scale with adjustable recalibration.
1) Case: Type 300 series stainless steel, hermetically sealed, glass window, 3" diameter dial, with adjustable angle.
2) Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.
3) Scale: Satin faced, non-reflective aluminum, permanently etched markings.
4) Stem: Stainless steel, adjustable angle socket, length to suit installation.
b. Glass Thermometer: Provide adjustable angle 9” thermometer of materials, capacities and ranges as appropriate to medium being measured and designed and constructed for service indicated. Accuracy to be 1% +/- of full scale.
1) Case: Aluminum or reinforced plastic.
2) Temperature Sensitive Gage Liquid: Organic non-toxic. No mercury permitted.
3) Scale: Aluminum painted white with black markings.

4) Connection: 1/2” NPT with thermowell or 1-1/4” UNF swivel nut without thermowell.

c. Photovoltaic Cell Powered LCD Thermometer
1) Case: ABS Plastic
2) Accuracy: 1% of full scale.
3) Display: 16 LUX rating LCD display. Switchable Fahrenheit and Celsius.
4) Connection: 3/4” NPT with thermowell or 1-1/4” UNF swivel nut without thermowell.

d. Conform to the following temperature ranges:
1) Hot Water: 20°F - 240°F with 2°F scale divisions.
2) Cold Water: -40°F - 160°F with 2°F scale divisions.

3. Thermometer Test Wells:
a. Provide thermometer test wells as indicated, constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.

4. Pressure Temperature Ports:
a. Provide temperature gauge connector plugs pressure rated for 500 psi and 200°F (93°C).
b. Construct of brass and finish in nickel-plate, equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" OD probe assembly from dial type insertion thermometer.
c. Portable rated, lead free, and NSF 61 compliant.
d. Equip orifice with gasketed screw cap and chain.
e. Provide extension, length equal to insulation thickness, for insulated piping.
f. Manufacturer: Watts LFTP or equal.

5. Pressure Gauges:
a. General: Provide pressure gauges of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
b. Type: General use, 1% accuracy ANSI B40.1 grade A, phosphor bronze bourbon type, bottom connection.
c. Case: Drawn steel or brass, glass lens, 4-1/2" diameter.
d. Connector: Brass with 1/4" male NPT.
e. Scale: White coated aluminum, with permanently etched markings.
f. Pressure differential range shall be 100 psig minimum for the appropriate application with maximum 1 psig divisions.

6. Pressure Gauge Cocks:
a. General: Provide pressure gauge cocks/valves between pressure gauges and gauge tees on piping systems. Two-piece bronze body ball valve with threaded ends. Manufacturers: Milwaukee #BA-100 or equal.
b. Snubber: 1/4" brass or stainless steel bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating. Manufacturers: Wika #910.12, Ashcroft #1112, or equal.

7. Pressure Gauge Connector Test Plugs:
a. Provide pressure gauge connector plugs pressure rated for 500 psi and 200°F (93°C). Constructed of lead-free brass, with 1/4” or 1/2" NPT fitting, with self-sealing valve core type neoprene or Buna-N gasketed orifice suitable for inserting 1/8" O.D. probe assembly from

dial type insertion pressure gauge. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.

V. Piping Specialties
   1. General:
      a. Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service or provide proper selection to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is installer's option.
   2. Pipe Escutcheons:
      a. Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime zinc base paint finish for unoccupied areas.
      b. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide stainless steel, cast brass or sheet brass escutcheons, solid or split hinged.
      c. Pipe Escutcheons for Dry Areas: Provide stainless steel escutcheons, solid or split hinged.
   3. Air Vent with Valves:
      a. Cold water and hot water vent valve with 1/4 turn ball shut-off valve. Tapped at top for 1/8” or 1/4” NPT drain connection. Removable top and built-in check valve. Maximum operating pressure 75 psi. Maximum operating temperature 250°F.
      b. Manufacturer: Hoffman #79, Dole #75 or equal.
   4. Drip Pans:
      a. Provide drip pans fabricated from 16-gauge galvanized sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top by structural angles. Provide hole, gasket, and flange at low point for watertight joint and 1" copper drain line connection. Extend 1” drain to nearest approved receptor.
   5. Valve Boxes:
      a. Concrete body, cast iron cover with vandal resistant screws, extensions as required to extend full depth to valve. Valve box cover lettering shall correspond to the valve service, "Water", "Gas", "Fire", "Sewer", etc.
      b. Manufacturer: Christy #G8 or equal.

W. Unions:
   1. Unions shall be of type specified in following schedule:
   2. Black Steel, 2" and smaller: 250 lb. screwed malleable iron, ground joint, brass to iron seat.
   3. Black Steel, 2-1/2" and larger: 150 lb. cast iron screwed flanged, flat faced, full faced gasket.
   4. Soldered Copper or Brass Pipe, 2" and smaller: 150 lb. cast bronze or copper, ground joint, non-ferrous seat with soldered ends.
   5. Screwed Copper or Brass Pipe, 2" and smaller: 150 lb. cast brass, ground joint, brass to brass seat, with threaded ends.
   6. Flanged Copper or Brass Pipe, 2-1/2" and larger: two (2) 150 lb. cast bronze flanges.
   7. Manufacturer: EPCO, Mueller, Stanley G. Flagg, Watts, or equal.

X. Flanges:
   1. Provide flanges at flanged connections to equipment, tanks and valves. Faces of flanges being connected shall be alike in all cases. Connection of raised-face flange to flat-faced flange not permitted.
   2. Use ASTM A307, Grade B, bolts and nuts for cast iron flanges and ASTM A193 for steel flanges. Regular square head unfinished bolts with heavy semi-finished hex nuts ASTM A194. Cadmium plated where exposed to weather.
   3. Ratings: 150 lb. or 300 lb. in high pressure portions.
   4. Type of pipe and corresponding flanges as follows:
      a. Screwed Black Steel Pipelines: 125 lb. black cast iron screwed flange, flat faces.
      b. Welded Steel Pipe, 150 lb. black forges steel welding flanges, 1/16" raised face ASTM A181 Grade I. Use flat face when connected to flat faced companion flange.

Y. Dielectric Fittings:
   1. Dielectric Unions:
      a. Provide standard products recommended by manufacturer for use in service indicated to effectively isolate ferrous from non-ferrous piping to prevent galvanic action and related corrosion.
      b. Manufacturer: Watts #LF3000 Series, Zurn #DUX Series, or equal.
   2. Dielectric Waterways/Nipples:
      a. Comply with standard IAPMO PS 66.
      b. Electroplated steel waterway/nipple complying with ASTM F1545 or ASTM F492.
      c. Pressure Rating: 300 psig (2070 kPa) at 225°F (107°C).
      d. End Connections: Male threaded or grooved.
      e. Lining: Inert and noncorrosive, propylene.
      f. Manufacturer: Mifab #MI-DE Series, Victaulic #Series 647, or equal.
   3. Dielectric Flanges:
      a. Comply with standard ASSE 1079.
      b. Factory-fabricated, bolted, companion-flange assembly.
      c. Pressure Rating: 125 psig (860 kPa) minimum at 180°F (82°C).
      d. End Connections: Solder or brazed joint copper alloy and threaded ferrous; or threaded solder-joint copper alloy and threaded ferrous.
   4. Dielectric-Flange Insulating Kits:
      a. Nonconducting materials for field assembly of companion flanges.
      b. Gasket: Neoprene or phenolic.
      c. Bolt Sleeves: Phenolic or polyethylene.
      d. Washers: Phenolic with steel backing washers.
      e. Manufacturer: Watts #LF3100 Series or equal.
   5. Transition Couplings:
      a. Coupling connection for grooved end AWWA ductile iron pipe to grooved end IPS stainless steel pipe, including valves or fittings of the same nominal size. Use grooved dielectric nipple for transition to copper tubing.
      b. Housing: Ductile iron conforming to ASTM A-536, grade 65-45-12 or ductile iron conforming to ASTM A-395, grade 65-45-15.
      c. Coating: Coal tar epoxy coating, 3 mils minimum thickness, for buried piping transition.

d. Gasket: Grade “M” FlushSeal, halogenated butyl (brown color code). Temperature range –20°F to +200°F (–29°C to 93°C). Specially compounded to conform to ductile pipe surfaces. UL classified in accordance with ANSI/NSF 61 for cold potable water service.
e. Bolts/Nuts: Heat-treated plated carbon steel or stainless steel 316 for buried applications, compliant with the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183.
f. Manufacturer: Victaulic #Style 307 or equal.

Z. Expansion compensators
1. General: Pipe expansion, in general, is to be absorbed in bends, swing joints, expansion loops, and offsets. All piping mains, branches and runouts shall be installed to allow for free expansion and contraction without developing leaks or undue stressing of pipe. Stresses shall be within allowable limits of ASME B31.1 for pressure piping. Vertical piping shall be provided with expansion joints at each floor. Expansion products to conform to the standards of the Expansion Joint Manufacturer's Association. Expansion joints shall not require packing. Installer shall select materials and pressure/temperature ratings to suit intended service. Select packless expansion joints to provide 150% absorption capacity of calculated maximum piping expansion between anchors. All connections shall have ends to match piping system application.
2. Expansion Compensators (Pipe Compression and Extension): Multiple stainless steel bellows and stainless steel liner with shroud and end fittings. Manufacturers: Keflex #311 series or equal.
3. Flexible Expansion Joint/Seismic Connector for Steel Pipe: Stainless steel hose and braid, 180° return, CSA approved, and end fittings. Manufacturers: Metraflex #Metraloop or equal.
4. Flexible Connection for Steel Pipe (Piping and Equipment Located Outside the Building): Stainless steel hose and braid, with threaded or flanged ends. Manufacturers: Metraflex #SST or equal.
5. Flexible Connection for Copper Pipe: Bronze hose and braid, copper tube ends. Manufacturers: Metraflex #BBS or equal.
6. For non-critical pump connections. Furnish with fluorelastomer tube and cover to ASTM D2000 Grade 1HK710. The body shall be reinforced with rectangular body rings and six bias plies of fiberglass/Kevlar fabric rated 190#/26" vacuum at 250°F. Provide galvanized flat (not L shaped) back up rings and control rods to limit maximum axial extension. Manufacturers: Garlock #206 EZ-FLO or equal.
7. Flexible Ball Pipe Joints: Provide flexible ball pipe joints where indicated for piping systems, with materials and pressure/temperature ratings selected by installer to suit intended service. Design joints for 360° rotation, and with minimum of 50° angular flexing movement for sizes 1/4" to 4". Provide two composition gaskets for each joint. Barco or approved equal.
8. Pipe Alignment Guides: Provide pipe alignment guides on both sides of expansion joints, and elsewhere as indicated on drawings. Guide shall be of carbon steel construction with split guiding cylinder and integral anchor base and internal four finger two-piece spider. Cylinder wall thickness shall be equal to schedule 40 wall thickness of pipe being guided. Spider shall be capable of clamping directly to pipe and moving only in an axial direction while inside cylinder. Anchoring directly to building substrate. Manufacturers: Metraflex #Style IV or equal.
9. Expansion Loops: Provide field fabricated pipe expansion loops as an alternate to mechanical expansion joints.

2.5 STANDARD PIPE AND FITTINGS: CONDENSATE

A. Condensate and Indirect drains (Gravity Flow):
1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
2. Seamless copper tubing (aboveground, includes pumped):
a. Piping construction:
1) ASTM B88 or B75, Type L, annealed (soft) temper.
2) ASTM B88 or B75, Type L, hard temper.
b. Fittings-Soldered:
1) ASME B16.22 wrought copper alloy.
2) ASME B16.18 cast copper alloy.
c. Fittings-Brazed:
1) ASME B16.50 wrought or copper alloy.
d. Joints-Soldered:
1) ASTM B32 filler metals.
2) Water soluble, lead free flux.
e. Joints-Brazed:
1) ANSI/AWS A5.8 filler metals.
2) Water soluble, lead free flux.
f. Fittings-Mechanical:
1) ASME B16.22 wrought copper alloy.
2) ASME B16.18 cast copper alloy.
g. Joints-Mechanical:
1) Mechanical press fitting system shall be copper or copper alloy fittings conforming to ASME B16.18 or B16.22, IAPMO PS 117, and NSF 61/372.
2) Sealing elements shall be factory installed EPDM.
3. Insulate condensate drain pipes with minimum 1/2" insulation to prevent moisture dripping from pipe where required in Plumbing Piping Specifications on plumbing drawings.

2.6 STANDARD PIPE AND FITTINGS: SANITARY

A. Sanitary Sewer and Vent Pipe & Fittings:
1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
2. Cast Iron Piping (gravity drainage):
a. Pipe and Fittings: Cast iron, bituminous coated or epoxy coated with “No-Hub” fittings complying with ASTM A74, ASTM A888, CISPI 301.
1) Manufacturer: Charlotte, Tyler, or equal.
b. Couplings Underground: Heavy Duty Type 301 or 304 stainless steel couplings conforming to ASTM C1540 with heavy-duty shield and neoprene sealing sleeve conforming to ASTM C564, CISPI 301 and FM-1680. Minimum four bands up to 4” diameter and six bands for 5” and larger diameters.
1) Manufacturer: Anaco Husky #SD-4000, Clamp-All (Norma Group) #Hi-Torq 125, Mission #HeavyWeight, Ideal Tridon #HD, or equal.

c. Couplings Aboveground: Type 301 or 304 stainless steel couplings conforming to ASTM C1540 with heavy-duty shield and neoprene sealing sleeve conforming to ASTM C-564, CISPI 310 and FM-1680.
   1) Manufacturer: Anaco Husky #HD-2000, Clamp-All (Norma Group) #Hi-Torq 80, Mission #HeavyWeight, Ideal Tridon #MD, or equal.

3. PVC Piping (gravity drainage):
   a. Piping construction: Polyvinyl chloride (PVC) material with bell and spigot style solvent sealed joint ends. Solid Wall Schedule 40, PVC conforming to ASTM D 1785 & ASTM D 2665 standards. Cellular (foam) core piping is not allowed.
   b. Fittings: Schedule 40 PVC conforming to ASTM D 2665 or ASTM F 1866 standards.
   c. Joints: Solvent weld with solvent cement conforming to ASTM D 2564 and primers conforming to ASTM F 656.
4. Galvanized Steel Piping (pumped, above grade):
   a. Piping construction: ASTM A53 Schedule 40, pressure fittings, and threaded joints.
   b. Fittings:
   c. Joints:
   d. Pressure rated transition coupling where connecting to dissimilar materials.
5. PVC Piping (pumped)
   a. Piping construction: Polyvinyl chloride (PVC) material with bell and spigot style solvent sealed joint ends. Solid Wall Schedule 80, PVC conforming to ASTM D 1785 & ASTM D 2665 standards. Cellular (foam) core piping is not allowed.
   b. Fittings: Schedule 40 PVC conforming to ASTM D 2665 or ASTM F 1866 standards.
   c. Joints: Solvent weld with solvent cement conforming to ASTM D 2564 and primers conforming to ASTM F 656.
6. Hard temper copper tube pipng (pumped):
   a. Piping construction: ASTM B88 or B75, Type K, hard temper.
   b. Fittings-Brazed: ASME B16.50 wrought or copper alloy
   c. Joints-Brazed: ANSI/AWS A5.8 filler metals with water soluble, lead free flux.
7. Ductile Iron (pumped):
   a. Pipe (Sizes 2” and larger): ANSI/AWWA C150/A21.50, ductile iron for grooved-joint piping and grooved joints.
   b. Fittings: Mechanical grooved-end couplings, carbon steel or ductile iron or 316 stainless steel. Painted or galvanized. ASTM A536 compliant. 316 Stainless-steel bolts and nuts. EPDM-rubber gaskets. Minimum Pressure Rating: 250 psig. Manufacturer: Victaulic #31, Anvil (Gruvlok), Grinnell, Shurjoint, or equal.
   c. For all metallic piping installed underground wrap pipe with two layers of 20 mil PVC tape, minimum 2” wide, with 50% overlap and no exposed pipe surface.

2.7 VALVES AND PIPING SPECIALTIES: SANITARY

A. Backflow Prevention Valves
   1. General: All backflow prevention valves shall be State approved and listed.
   2. Reduced Pressure Principal Backflow Prevention Assembly for High Hazard Applications:
   3. 2" and Smaller: Assembly shall consist of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies shall be lead free and include test cocks and pressure-differential relief valve

located between two positive seating check valves and shall comply with requirements of ASSE Standard 1013 and AWWA C511. Bronze construction, threaded ends, stainless steel internal parts, and air gap fitting. Route pipe from air gap fitting to approved waste receptor.

a. Manufacturer: Apollo #RP4ALF Series valve with #AGD4A air gap fitting, Watts #LF009 Series with #909 air gap fitting, or equal.

4. 2-1/2" and Larger: Assembly shall consist of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies shall be lead free and include test cocks and pressure-differential relief valve located between two positive seating check valves and shall comply with requirements of ASSE Standard 1013 and AWWA C511. Stainless Steel body construction, flanged ends, center stem guided check valves, and air gap fitting. Route pipe from air gap fitting to approved waste receptor.
   a. Manufacturer: Apollo Lead Free #RP4ALF-OS&Y valve with #AGD4A air gap fitting, Watts #LF9090 Series with #909 air gap fitting, or equal.
5. Double Check Valve for Low Hazard Applications:
   a. 2" and Smaller: Assembly shall consist of shutoff ball valves in inlet and outlet, and strainer on inlet. Assemblies shall include test cocks and two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C510. Bronze construction, threaded ends, and stainless steel internal parts.
      1) Manufacturer: Apollo Lead Free #DC4ALF Series or equal.
   b. 2-1/2" and Larger: Assembly shall consist of shutoff OS&Y gate valves in inlet and outlet, and strainer on inlet. Assemblies shall include test cocks and two positive seating check valves and shall comply with requirements of ASSE Standard 1015 and AWWA C506. Epoxy coated cast iron body construction, flanged ends, and stainless steel internal parts.
      1) Manufacturer: Apollo Lead Free #DC4ALF Series or equal.
6. Atmospheric Vacuum Breaker: Assembly shall consist of a bronze vacuum breaker body with silicone disc, and full size orifice. Device shall be IAPMO listed, lead free and comply with ASSE 1011. Chrome plated in finished occupied areas.
   a. Manufacturer: Apollo #HB Series or equal.
7. Pressure Vacuum Breaker: Assembly shall consist of a bronze or stainless steel body, with stainless steel spring loaded check, lead free, atmospheric vent and ASSE 102 compliant. Chrome plated in finished occupied areas.
   a. Manufacturer: Apollo #PVB Series or equal.
8. Carbonated-Beverage-Dispenser, Dual-Check-Valve Backflow Preventers: Assembly shall consist of a non-metallic body, Acetal or equal, or stainless steel for corrosion resistance. Assembly shall include replaceable/repairable check valves, strainer, atmospheric vent, and ASSE 1022 and ANSI/NSF-61 compliant.
   a. Manufacturer: Apollo #CBBP Series or equal.
9. Cleanouts
   a. See plumbing fixture schedule on the plumbing drawings for details.
10. Roof Flashings
    a. All sanitary vent pipes passing through the roof shall be provided with lead roof flashings constructed with a minimum of2-1/2 pound sheet lead with bases extending no less than ten inches on each side of the pipe.

b. Lead flashings shall be furnished by Plumbing Contractor and turned over to Roofing Contractor for installation.

2.8 STANDARD PIPE AND FITTINGS: STORM

A. Storm Water Pipe & Fittings:
1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
2. Cast Iron Piping (gravity drainage):
a. Pipe and Fittings: Cast iron, bituminous coated or epoxy coated with “No-Hub” fittings complying with ASTM A74, ASTM A888, CISPI 301.
1) Manufacturer: Charlotte, Tyler, or equal.
b. Couplings Underground: Heavy Duty Type 301 or 304 stainless steel couplings conforming to ASTM C1540 with heavy-duty shield and neoprene sealing sleeve conforming to ASTM C564, CISPI 301 and FM-1680. Minimum four bands up to 4” diameter and six bands for 5” and larger diameters.
1) Manufacturer: Anaco Husky #SD-4000, Clamp-All (Norma Group) #Hi-Torq 125, Mission #HeavyWeight, Ideal Tridon #HD, or equal.
c. Couplings Aboveground: Type 301 or 304 stainless steel couplings conforming to ASTM C1540 with heavy-duty shield and neoprene sealing sleeve conforming to ASTM C-564, CISPI 310 and FM-1680.
1) Manufacturer: Anaco Husky #HD-2000, Clamp-All (Norma Group) #Hi-Torq 80, Mission #HeavyWeight, Ideal Tridon #MD, or equal.
3. PVC Piping (gravity drainage):
a. Piping construction: Polyvinyl chloride (PVC) material with bell and spigot style solvent sealed joint ends. Solid Wall Schedule 40, PVC conforming to ASTM D 1785 & ASTM D 2665 standards. Cellular (foam) core piping is not allowed.
b. Fittings: Schedule 40 PVC conforming to ASTM D 2665 or ASTM F 1866 standards.
c. Joints: Solvent weld with solvent cement conforming to ASTM D 2564 and primers conforming to ASTM F 656.
4. Galvanized Steel Piping (pumped, above grade):
a. Piping construction: ASTM A53 Schedule 40, pressure fittings, and threaded joints.
b. Fittings:
c. Joints:
d. Pressure rated transition coupling where connecting to dissimilar materials.

B. Underslab Drainage and Foundation Drainage Pipe & Fittings:
1. See Plumbing Piping Materials Specifications on plumbing drawings for project specific acceptable piping material types by system, pipe size and installation location.
2. Perforated pipe only allowed outside the foundation and shall not run under the foundation or penetrate any portion of the foundation.
3. Pipe and Fittings
a. PVC pipe shall comply with the following standards: ASTM D1785, ASTM D3034 or ASTM F959; Schedule 40 or SDR35; cell class 12454 per ASTM D1784.
b. Circular hole pattern shall be ASTM F758. Circular holes shall be cleanly cut, not more than 3/8 inch (10 mm) and not less than 3/16 inch (5 mm) in diameter and arranged in rows

parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches (75 mm) apart, center-to-center, along rows. The rows shall be approximately 1- 1/2 inches (38 mm) apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 160 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket and perforations shall continue at uniform spacing over the entire length of the pipe.

c. Manufacturer: Charlotte Pipe or equal.

4. Joints
   a. Hub and spigot joints:
      1) Gasket material shall conform to ASTM F477.
   b. Glued joints:
      1) Adhesive primer shall comply with ASTM F656. Primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR59, Subpart D (EPA Method 24).
      2) Solvent cement shall comply with ASTM D2564. Solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR59, Subpart D (EPA Method 24).

2.9 STANDARD PIPE AND FITTINGS: NATURAL GAS

A. Natural Gas Pipe & Fitting (Aboveground):
   1. Pipe: ASTM A53, Schedule 40 black steel.
   2. Fittings: 150 lb. rating, ASME B16.3, malleable iron threaded; ASME B16.5, flanged; ASME B16.9, steel.
   3. Joints 2" and smaller: Threaded in accessible areas. Welded in concealed areas such as shafts and plenums.
      a. Optional: Steel compression fittings shall conform to the material and sizing requirements of ASME B16.3 or ASTM A420. Fittings shall have an HNBR O-ring seal, 420 stainless steel grip ring, and 304 stainless steel separator ring. Viega #MegaPress G, or approved equal.
   4. Joints 2-1/2" and larger: ASME B16.25 bevelweld, ASME B16.5 flanges, or ASME B16.11 socket weld. Welded in concealed areas such as shafts and plenums.
   5. Welded Fittings: Comply with ASTM A234/A234M, ASME B16.9, ASME B16.25, and ASME B16.11.
   6. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
   7. Shop fabricated Bonney Forge “Weldolet” or “Thredolet” type fittings may be used in lieu of tee fittings, but field (site) welding will not be permitted.

B. Natural Gas Piping (Underground):
   1. Polyethylene, plain ends, heat fused joints. Compliant with ASTM D2513, ASME D-B31.8, NFPA-54 and NFPA-58. Pipe shall be marked “Gas” and “ASTM D2513”. Refer to “Section 220500: Basic Plumbing Materials and Methods” for identification requirements. Manufacturer: Gastite or equal.
   2. Building gas service riser, annodeless polyethylene to steel riser, epoxy coated steel.
      a. Manufacturer: Lyall Lyco or equal.

2.10 VALVES AND PIPING SPECIALTIES: NATURAL GAS

A. Natural Gas Service Valves

1. General: All valves to be UL listed for the required fluid service.
2. Ball Valves:
   a. 1/2" and 3/4": Brass body, UL listed, CSA approved for pressure of system, bronze ball valve, 175 WOG, with integral lever handle. Apollo #77F Series, Watts #FBV-1 or equal.
   b. 1" thru 1-1/2": 175 psi working pressure, CSA and UL approved, bronze body, welded ends, stainless steel ball, stainless steel stem, steel handle with memory stop tab, conventional port.
   c. Manufacturer: Apollo #77F-140 Series or equal.
3. Lubricated Plug Valve, 2" and Larger: Class 125, MSS SP-78, 200 PSI, UL listed, CSA approved for pressure of system, lubricated plug type, semi-steel body, loose wrench operated, straight way pattern round port, combination button head fitting and lubricant screw, Teflon seal and discs.

B. GAS CONNECTORS
1. General Areas: CSA rated, UL listed, braided stainless steel gas hose of size and capacity to meet appliance input requirements.
2. Food Service Equipment: CSA rated, UL listed, plastic coated braided stainless steel gas hose with quick disconnect, swivel fitting and coiled restraining device. Manufacturers: Dormont #1675BPQS or approved equal.
3. Gas connectors for outdoor applications shall be listed for exterior use.

C. Seismic (Earthquake) Gas Shutoff Valves:
1. 3/4” thru 4” (low and medium pressure, screwed body): UL Listed valve meeting ASCE 25-97, positive closure, soft seal seating, visual open-close indicator, manual reset, and closure time interval within 5 seconds when subjected to a sinusoidal oscillation with peak acceleration of 0.3G and a period of 0.4 seconds. Pacific Seismic Products #Series 300, or equal, sized for 7 psi max operating pressure, respectively.
2. 3/4” thru 4” (high pressure, screwed body): UL Listed valve meeting ASCE 25-97, manual reset, soft seat construction for positive sealing, visual open-close indicator, tripping mechanism with non-creeping rolling latch, and closure time interval within 5 seconds when subjected to sinusoidal oscillation with peak acceleration of 0.3G and a period of 0.4 seconds. Pacific Seismic Products #Series 300, or equal, sized for 60 psi maximum operating pressure.
3. 2” thru 8” (high pressure, flanged body): UL Listed valve meeting ASCE 25-97, manual reset, soft seat construction for positive sealing, visual open-close indicator, tripping mechanism with non-creeping rolling latch, and closure time interval within 5 seconds when subjected to sinusoidal oscillation with peak acceleration of 0.3G and a period of 0.4 seconds. Pacific Seismic Products #Series 300 or equal, sized for 60 psi maximum operating pressure.

D. Gas Pressure Regulator Valves – Vented
1. Operation: Direct operated lever acting, spring-loaded diaphragm style with adjusting screw and vent connection port.
   a. Gas capacity and pressure as indicated in schedules on drawings:
   b. Maximum inlet pressure: 5 psi.
   c. Minimum inlet pressure: 1 psi.
   d. Outlet pressure range: 7-14 inches w.c. as required by appliances.
   e. Ambient temperature limits: -40°F to 205°F (-40°C to 96°C).
2. Body: Steel, cast iron, aluminum or ductile iron construction as required for application.

3. Line gas pressure regulators shall be listed as complying with ANSI Z21.80/CSA 6.22. Regulators shall be approved for use by the serving gas supplier.
4. Where gas supply regulator will be located indoors provide internal relief valve with overpressure protection and set to discharge at 10% above equipment operating setpoint. Route relief vent pipe to exterior of building in compliance with code.
5. At supply pressures in excess of 2 psi, the ANSI Z21.80/CSA 6.22 standard for line pressure regulators requires an overpressure protection device - OPD. The OPD must be integral or factory preassembled, approved and tested for use with the regulator, to limit the downstream pressure to 2 psi maximum, in the event of line regulator failure.
6. Manufacturer: Maxitrol #325 or #210 Series, Emerson Fisher #CS Series, Pietro Fiorentini Governor #30000 or #31000 Series, Sensus #243 Series, Elster American Meter (Honeywell) #1800 Series, or equal.

E. Solenoid Valves
1. UL listed, globe pattern bronze valve with threaded ends, stainless steel pilot, bronze piston, malleable iron solenoid assembly with 1/2" tapped conduit connections and Class "A" coil, 120 Volt, 60 Hertz.
2. The valve shall close instantly on application of current and open when de-energized.
3. Provide solenoid valve on gas line into boiler and water heating rooms where the aggregate gas input is over 400,000 Btuh. Wire to “mushroom” button(s) outside of each door to room.

F. Gas Utility Meters
1. Gas meter shall be approved for use by local gas district.
2. Meter shall include “dual-output” capability using a programmable frequency pulse output compatible with BAS (Building Automation System) integration. Coordinate BAS integration requirements with BAS Controls Installer for monitoring and trend logging of natural gas use.
3. Provide gas meter with shutoff valves on each side of meter

G. Gas Meters
1. See plumbing drawings for details.

PART 3 - EXECUTION

3.1 GENERAL

A. Workmanship shall be performed by licensed journeymen or master mechanics and shall result in an installation consistent with the best practices of trades.
B. Install water piping and fixtures uniform, level and plumb, in relationship to lines of building. Do not install any diagonal, or otherwise irregular work, unless so indicated on Drawings or approved by Architect or Owner’s Representative.
C. Pipe showing rust or cracks in coating shall be removed and replaced.
D. Follow manufacturers' directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the Drawings or covered in these Specifications.
E. Coordinate the work between the various Plumbing Sections and with the work specified under other Divisions of the work or contracts toward rapid completion of the entire project. If any cooperative work must be altered due to lack of proper supervision or failure to make proper provisions in time, then the

work hereunder shall include all expenses of such changes as are necessary in the work under other contracts, and such changes shall be directly supervised by and made to the satisfaction of the Owner's Representative.

F. The cooperative work not included in the Plumbing Division related to the general construction work is as follows:
   1. All formed concrete work.
   2. Framed openings in masonry and other Architectural and Structural elements.
   3. Wood grounds and nailing strips in masonry and concrete.
   4. Sloping of floors to drains and floor sinks.
   5. Sloping of roof surfaces to roof drains and overflow drains.

G. Inspect all material, equipment, and apparatus upon delivery and do not install any that may be subject to rejection as a result of damage or other defects. Provide tarps (waterproof membrane) to protect equipment and piping delivered to and stored at the site.

H. All backflow preventers require adequate access clearance for future testing and maintenance. The backflow prevention device shall be installed with not less than 12 inches of clearance between the lowest portion of the assembly and grade, floor or platform. Installation of backflow prevention devices mounted more than 5 feet above the floor shall be provided with a permanent platform capable of supporting a tester or maintenance person. The measurement is taken from the centerline of the device to the floor or platform.

I. Piping Accommodation for Vertical Building Shrinkage:
   1. Buildings with wood frame structural construction (Type III or Type V) accommodation for building height shrinkage during dry out will be provided.
   2. All vertical piping systems will be designed and installed to accommodate the potential of a minimum of approximately 3/8 to 1/2 inch of shrinkage/compression at each wood frame floor level. Final criteria to be confirmed by structural engineer. Provide for expansion and contraction of piping to accommodate building settlement/shrinkage during dry-out of wood frame structure as follows:
      a. Wherever possible, plumbing vertical pipe risers are not to be installed and glued until after the building dry-out shrinkage is complete to the full extent allowed by the project schedule.
      b. Utilize piping offsets where feasible. Where piping offsets are not feasible due to insufficient room for offsets utilize one of the following:
         1) One-piece expansion/ contraction sleeves: Fernco model XJ, FlexicraG Slip-on Drainage Expansion Joint model DWVxxxx or similar. Install such that the joint is in a neutral position (no expansion nor contraction) following the building dry-out period.
         2) Sleeve-type expansion/ contraction joint: Canplas Expansion joint model 21381#XXX, Canplas Expansion Joint Model 113814ABC, or approved equal. Install such that the joint is in a neutral position (no expansion nor contraction) following building dry-out period. Contractor is to design, provide calculations, and indicate locations of offsets and expansion joints on shop drawings. Design per Plumbing Code, and manufacturer's guidelines.
      c. PVC waste and vent risers shall be provided with expansion compensation every 30 feet per IAPMO design standards and Plumbing Code. Provide mechanical slip joint or piping offset sized based on pipe lengths in contractor shop drawings. Offsets may serve for both thermal expansion and building shrinkage compensation.

3.2 EXCAVATION AND BACKFILL

A. Underground piping shall be installed in stable, open trench work. Trench excavations shall be a minimum of 16” wide, true to line and grade. Contractor shall exercise all due shoring and safety procedures. No stones larger than 1” may be present in the trench to a minimum depth of 4” below the trench bottom. The trench shall be free of job site debris, and free of corrosive media.
B. Pipe crown, outside the building footprint, shall be not less than 24” below the finished ground surface for metallic pipe, and 30” for non-metallic pipe, unless otherwise indicated on the Civil drawings or directed by the Owner’s Representative. Trenches shall be kept free of excess moisture and shall be kept open for only a short a time as necessary for installation, testing and inspection. Dispose of surplus excavation and seepage water as directed by the Owner’s Representative. Comply with minimum depths as defined in local plumbing code for building sewer piping outside the building footprint.
C. Piping shall be properly bedded and backfilled over stable trench bottom to a level of at least 12” above the pipe crown where located outside the building footprint, and not less than 2” above pipe crown where pipes are located within the building footprint. Use thin layers of unwashed sand, dampened but not puddle, and free of organic or corrosive materials and excessive moisture. Backfill shall be placed in thin layers not to exceed 6” and tamped by mechanical tampers to a minimum 90% Modified Proctor Density, in accordance with ASTM D-1557-58T. Alternate backfill material may be Class I or II SE-30+ fill with minimum 30 percent sand and maximum 1/2" diameter particle size.
D. Trenches shall be backfilled to a minimum depth of 36” prior where vehicle loading is required.
E. Replace to their original condition all turf, plants, concrete, asphalt, or other improvements which constitute landscaping, traffic areas or other improved areas which become disturbed by excavation. In graded and undeveloped areas, in addition to procedures specified above, backfill trenches with crown 8” above the surrounding surface.
F. Excavated and backfill in soils of unstable nature shall be provided as directed the Owner’s Representative.

3.3 PIPING SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve- seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.
C. Aboveground, Cast-in-Place Watertight Sleeves. Select sleeve size based on pipe size and material to be inserted, and thickness of wall.
    1. Install cast-in-place watertight sleeves for pipes NPS 6” (DN 150) and smaller in diameter.
    2. Position cast-in-place watertight sleeve in wall space securing sleeve to reinforcing steel using tie wire.
D. Underground, Exterior-Wall, Cast-in-Place Watertight Penetrations. Select sleeve size based on pipe size and material to be inserted, and thickness of wall.
    1. Install cast-in-place watertight sleeves for pipes NPS 6” (DN 150) and smaller in diameter.
    2. Secure sleeve to the reinforcing steel using tie wire.

E. Fire-Resistance Rated, Cast-in-Place Sleeve Installation: Select sleeve size based on size and type of pipe and thickness of the floor. Position and secure sleeve to concrete form using nails or staples.

F. Mechanical sleeve seals:
   1. Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form a watertight seal.
   2. Fire Barrier Penetration Seals: Fill entire opening with sealing compound in compliance approved and listed UL system number. Adhere to manufacturer's installation instructions.

3.4 PIPING INSTALLATION

A. Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints or couplings, but with adequate and accessible unions for disassembly and maintenance or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ASME B31 Code for Pressure Piping.

B. Buried piping installation:
   1. Where buried domestic cold water routes into a building-on-grade the piping shall not penetrate the slab or perimeter structure and must extend vertically a minimum of 12 inches above finished floor level before penetrating the exterior perimeter wall.
   2. A blue insulated copper tracer wire or other approved conductor shall be installed adjacent to underground nonmetallic piping. Access shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic piping. The tracer wire size shall be not less than 14 AWG and the insulation type shall be suitable for direct burial.
   3. Pipes Penetrating Foundation Walls and Grade Beams: Any pipe that passes through a foundation wall or grade beam shall be provided with a relieving arch or a pipe sleeve shall be built into the foundation wall or grade beam. The sleeve shall be constructed of a section of pipe that is two pipe sizes greater than the pipe passing through the structure. Coordinate the location and size of each penetration with the structural engineering design before any work is performed.

C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

D. Elevator Machine Rooms, Electrical Switchgear, Generator, Telecommunications, Telephone Rooms, and Electrical Equipment Spaces: Special precautions must be adhered to in such rooms and in the vicinity of electrical equipment. Do not run piping through these electrical equipment spaces and enclosures unless unavoidable and coordinated with the electrical consultant and contractor. Where, unavoidable, install

drip pan, with 2” high sides, under water piping and drainage piping that must be run through electrical spaces. Route 3/4" drip pan drain piping to floor drain, floor sink or other approved receptor.

E. Install automatic air vents, with shutoff valves, in all closed specialty plumbing systems at high points of systems and at any other point necessary to free system of air. A shut-off valve shall be provided in riser to each vent valve to facilitate servicing. A 1/4” or 3/8" type "L" copper tubing drain line shall be run to drain receptor to carry away water that valve discharges.

3.5 PIPING SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
B. Pipes passing through foundation walls or grade beams shall be provided with a relieving arch or a pipe sleeve built into the foundation wall or grade beam. The sleeve shall be a minimum of two (2) pipe sizes larger than the pipe passing through the wall or beam. Coordinate specific sleeve penetration locations with structural design for placement of sleeves.
C. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) minimum annular clear space between piping and concrete slabs and walls.
    1. When cast-in-place watertight sleeve seals are required, select sleeve size to match the size and type of pipe to be installed.
    2. Sleeves are not required for core-drilled holes.
D. Install sleeves in concrete floors, concrete roof slabs, and concrete/masonry walls as new slabs and walls are constructed.
    1. For concrete floors extend 2” (50 mm) minimum above finished floor level.
    2. For woodframe floors cut sleeves to length for mounting flush with both surfaces.
    3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
E. Install sleeves for pipes passing through fire rated interior partitions as required by assembly construction.
    1. Cut sleeves to length for mounting flush with both surfaces.
    2. Install sleeves that are large enough to provide 1/4” (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
    3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."
    4. Rated Wall and Horizontal Assembly Penetrations: Maintain indicated fire rating of walls, ceilings, floors, floor/ceiling, and roof/ceiling assemblies at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."
    5. When fire-resistance-rated cast-in-place watertight sleeve seals are required for floor penetrations, additional firestopping is not necessary.
F. Expansion compensation:
    1. Expansion Loops/Connectors at Expansion Joints:
        a. Provide flexible hose expansion loop(s) or connectors as indicated on the contract drawings or as required to accommodate any thermal expansion, contraction, building settlement, or seismic movement of the piping system.

b. Flexible hose expansion loops shall be manufactured complete with two parallel sections of corrugated metal house, compatible braid, 180 deg return bend, with inlet and outlet connections. Field fabricated loops shall not be acceptable.
c. Flexible loops shall be capable of movement in the ±X, ±Y, and ±Z planes to meet or exceed the limits identified in the structural design.
d. Flexible hose expansion loops and connectors shall impart no thrust loads to system support, anchors or building structure.
e. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by installer to properly anchor piping in relationship to expansion loops.
f. Where plans do not indicate spacing of guides or other pertinent information, install per manufacturer's recommendations.

2. Expansion Compensation for Risers and Terminals:
   a. Install connection between horizontal piping mains and vertical piping risers with at least five pipe fittings including tee in main. Install connections between piping risers and terminal units with at least four pipe fittings including tee in riser.
3. Thermal Expansion Compensation:
   a. Provide piping U-Bend, Z-Bend, L-Bend or flexible devices to accommodate thermal expansion and contraction in piping system where shown on drawings and as required to impart minimal stress in water piping and building structure.
4. Cathodic protection of metal pipe
   a. Cathodic Protection: Provide cathodic protection for buried exposed steel or copper piping.
   b. Assume that 25 percent of the exterior of the steel casing is exposed metal. Cathodic protection systems shall have a minimum design life of 25 years and shall be designed in accordance with recommendations of NACE SP-01-69 Control of External Corrosion on Underground or Submerged Metallic Piping Systems (latest edition).
   c. Provide all anodes, wiring, dielectric pipe flange kits, and any additional required isolation devices, at points necessary within vaults or at building terminations.
   d. Provide test stations at grade on each section of the piping system.
   e. Isolation flanges and unions shall be rated for the carrier pipe service temperature and pressure. Coordinate with Section 264200 Cathodic Protection.

3.6 PIPING SYSTEM JOINTS

A. All piping shall be cut squarely, free of rough edges/burrs, and reamed to full bore. Piping shall be mechanically cleaned prior to make-up of joints and fully inserted into fittings. Bevel plain ends of steel pipe.
B. Piping shall be capped during construction to prevent entry of foreign material.
C. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
D. Provide joints of type indicated in each piping system and as required to meet the maximum allowable working pressure and maximum testing pressures.
E. Thread pipe in accordance with ANSI/ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly.
   1. Apply appropriate (Teflon) tape or thread compound to external pipe threads. on male threads at each joint and tighten joint to leave not more than three (3) threads exposed.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

F. Soldered and brazed copper water tube and fittings: Comply with maximum allowable rated internal working pressures as defined in ASME B31.9, and matching table in ASHRAE Handbook-HVAC Systems and Equipment, based on maximum service temperature and pipe diameter.

G. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM B-32, in accordance with plumbing code requirements, ASTM B828 and Copper Development Association (CDA) recommended procedures. Joints shall be cleaned by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes shall be applied liberally to the outside of the pipe and the solder cup of the fitting. Fluxes shall be water soluble for copper and brass potable water applications and shall meet CDA standard test method 1.0 and ASTM B813. Solder shall be applied until a full fillet is present around the joint. Solder and flux shall not be applied in such excessive quantities as to run down interior of pipe. Lead solder or corrosive flux shall not be present at the jobsite.

H. Mechanically Formed Extruded Tee Fittings: Form tee in copper tube according to ASTM F2014. Forming procedures shall be in accordance with the tool manufacturer's recommendations. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar. Formed tee fitting shall not be greater than 50% of the diameter of the main run tube/pipe. Soldered joints are not allowed.

1. Mechanically formed extruded outlets shall be perpendicular to the axis of the run tube (main pipe). Holes shall be formed by drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch wall.
2. Branch tubes shall not restrict the flow in the run tube. A dimple (depth stop) shall be formed in the branch tube to ensure that penetration into the collar is of the correct depth. For inspection purposes, a second dimple shall be placed 0.25 inch above the first dimple. Dimples shall be aligned with the tube run.
3. Manufacturer: T-Drill or equal.

I. Braze copper tube and fitting socket or mechanically formed tee fittings with BCUP series filler metal without flux. Listed brazing flux shall be used for joining of copper tube to brass or bronze fittings and shall meet AWS FB3A or FB3C. "Shock" cooling is prohibited. A continuous fillet shall be visible around the completed joint. After cooling, flux residue shall be thoroughly removed with warm water and a brush prior to testing. Do not use BCUP filler on copper alloys containing over 10% nickel.

J. Brazing fittings may use a mechanically limited depth that is not less than the minimum cup depth (overlap) specified by ANSI/ASME B16.50 for Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings. Manufacturer of mechanical dimpler: Brazing Dimpler Corp or equal.

K. Domestic water piping mechanical press type connections are acceptable for use as indicated in the Plumbing Piping Schedule on the plumbing drawings.

1. Copper press fittings shall be made in accordance with the manufacturer's installation instructions.
2. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting.
3. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
4. The joints shall be pressed using the tool approved by the manufacturer.
5. Copper press fittings shall conform to the material and sizing requirements of ASME B16.22. O-rings for copper press fittings shall be EPDM.

L. Cast-Iron Sanitary Sewer Joints: Comply with coupling manufacturer's Cast Iron Soil Pipe Institute Standards and installation instructions.

M. Joint Construction for Grooved-End Copper Tubing: Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

N. Joint Construction for Grooved-End, Ductile-Iron Water Piping to Copper Tubing: For transition site piping to building copper piping make joints according to AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

O. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9. Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

P. Weld pipe joints in accordance with recommendations of American Welding Society AWS D1.1 and ASME Boiler and Pressure Vessel Code Section IX.
   1. Weld pipe joints only when ambient temperature is above 0°F.
   2. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles, and dirt.
   3. Use pipe clamps or tack-weld joints with 1" long welds, 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" and larger.
   4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and at edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes, and non-metallic inclusions.
   5. Do not weld out piping system imperfections by tack-welding procedures. Refabricate to comply with requirements.
   6. At Installer's option, install forged branch-connection fittings whenever branch pipe is indicated, or install regular T-fitting.

Q. Transition fitting installation:
   1. Install transition couplings at joints of dissimilar piping.
   2. Transition Fittings in Underground Domestic Water Piping Outside of Building Footprint:
      a. Fittings for NPS 1-1/2” (DN 40) and Smaller: Fitting-type coupling.
      b. Fittings for NPS 2” (DN 50) and Larger: Sleeve-type coupling or grooved type fitting.
   3. Transition Fittings in Aboveground Domestic Water Piping: Unions, flanges, grooved fittings, or connect to isolation valve to meet field conditions and maintain pressure testing requirements.

R. Dielectric fitting installation:
   1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing such as copper to zinc plated equipment fittings. Dielectric couplings shall not be used as unions in a copper to copper piping systems with connections to brass or stainless steel valves/devices.
      a. Dielectric Fittings for NPS 2” (DN 50)] and Smaller: Use dielectric couplings, nipples, unions.
      b. Dielectric Fittings for NPS 2-1/2” to NPS 4” (DN 65 to DN 100): Use dielectric flange kits or threaded nipples.
      c. Dielectric Fittings for NPS 5” (DN 125) and Larger: Use dielectric flange kits.

3.7 VALVE INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements:
   1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves to be accessible. Provided separate support as necessary.
   2. Install manual shutoff valves to isolate cold and hot water services to each restroom group. Back-to-back or adjacent men's and women's restrooms are considered a group. Shutoff valves shall be located immediately above or adjacent to the restroom(s) for easy maintenance access.
   3. Install valves on all services connected to kitchen equipment.
   4. Install valves, except butterfly valves, with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane without prior written approval. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
   5. Install butterfly valves with stems mounted horizontally.
   6. All valves mounted higher than 7' above floor in mechanical rooms and where indicated shall be installed with stem horizontal and equipped with chain wheels and chains extending to 6' above floor.
   7. For multistory buildings with showers and without domestic cold water pressure booster system: Provide a pressure reducing valve in the cold water service downstream of the cold water branch serving the water heating equipment where the cold water service pressure is greater than 10 psi above the domestic hot water serving the remote shower mixing valves. This will equalize the pressures serving the shower valves to normalize the operation of the valves to assure proper temperature operation. The requirement for a pressure reducing valve cannot be assessed until completion of piping, valves, mixing valves and water heating installation.
B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
C. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends of types of pipe/tube connections:
   1. Copper Pipe, 2-1/2" and Smaller: Soldered-joint valves.
   2. Steel Pipe, 2" and Smaller: Threaded joint valves.
   3. Larger Pipe Sizes: One of the following, at installer's option:
      a. Flanged valves.
      b. Lug valves.
D. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
E. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
F. Fluid Control: Except as otherwise indicated, install gate, ball, plug, circuit setter, globe, and butterfly valves to comply with ASME B31.9.
G. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
H. Wafer Check: Install between 2 flanges in horizontal or vertical position.

I. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.

J. Backwater Valve: Provide backwater sewer valve in gravity discharge piping to protect the ground floor, and lower levels of the sanitary sewer system, where any floor levels are below the next upstream street manhole cover, not invert limited. Fixtures, including grease traps, installed on a floor level that is lower than the next upstream manhole cover of the public or private sewer shall be protected from backflow of sewage by installing an approved type of backwater valve. Fixtures on such floor level that are not below the next upstream manhole cover shall not be required to be protected by a backwater valve. Fixtures on floor levels above such elevation shall not discharge through the backwater valve. Cleanouts for drains that pass through a backwater valve shall be clearly identified with a permanent label as “backwater valve downstream”.

K. Valve Identification: Tag each valve in accordance with Section 220500.

L. Cleaning: Clean factory-finished surfaces. Repair marred or scratched surfaces with manufacturer's touch-up paint.

M.

N.

3.8 PIPING INSTALLATION: PEX

A. Examination
   1. Verify that site is ready to receive tubing, manifold, wiring and controls.

B. Acceptable Installers
   1. As a minimum, installation shall be performed by qualified laborers trained by the manufacturer in the procedures of PEX systems appropriately licensed for the jurisdiction where the installation will take place.
   2. Installers must comply with manufacturers technical guidelines, including but not limited to technical manuals, installation guides, technical bulletins and product submittals.

C. Examination
   1. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions are corrected.
   2. Beginning of installation means acceptance of existing conditions.

D. Preparation
   1. Coordinate with related trades and manufacturer’s recommendations with regard to installation in conjunction with:
   2. Preparation of space for manifold installation
   3. Prepare a suitable cavity for the manifold, with a secure mounting plate that will secure the manifold at least 30” (75 cm) above floor level. Manifold must be installed in an area that will allow easy access for piping as well as future access for maintenance.

E. Installation
   1. Install in accordance with manufacturer's published installation manual and/or technical guidelines and final drawings. Technical guidelines are the most current and applicable versions of all the technical literature, including but not limited to technical manuals, installation guides, technical bulletins, training presentations and submittals

2. Changes in Direction: PEX tubing shall not exceed an eight times the tubing outside diameter (OD) free bend radius or a five times the tubing OD supported bend radius, with use of a Viega approved bend support. Install fittings for changes in direction where any minimum bend radius is exceeded and branch connections.
3. Manifolds shall be mounted as level as possible.
4. Route piping in an orderly manner, according to layout and spacing shown in final drawings. All installation notes shown on the drawings shall be followed.
5. At connections and fittings, use a plastic pipe cutter to ensure square (90°) and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants.
6. Pipe shall be dispensed using a suitable uncoiling device. Remove twists prior to securing pipe. Pipe shall lie flat on an even plane.
7. Piping that passes through expansion joints or walls shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 in (38 cm) on each side of the joint. Sleeving shall be secured on pipe to prevent movement during installation.
8. Where piping enters or exits a wall a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 in (15 cm) into the wall and exiting by a minimum of 6 in (15 cm). For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.
9. PEX Fittings: install fittings and couplings as required by manufacturer's installation instructions using manufacturer specific joining tools.
10. PEX Tubing Protection: Protect PEX tubing from exposure to direct and indirect sunlight exposure. PEX tubing shall be stored under cover, shielded from direct and indirect sunlight when material is stored for any length of time.
11. Penetration Protection: Provide allowance for thermal expansion and contraction of PEX tubing passing through a wall, floor, ceiling or partition by wrapping with pipe insulation, or by installing through an appropriately sized sleeve. Penetrations of fire resistance rated assemblies shall maintain the rating of the assembly.
12. Horizontal Support: PEX tubing must be supported every 32" horizontally with approved suspension clips or plastic insulators.
13. Vertical Support: PEX tubing must be supported at each floor or ceiling penetration and every four feet in between.

F. Field Quality Control
1. Filling, Testing & Balancing: Tests of domestic plumbing systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.
2. Pressure gauges used in testing and balancing shall show pressure increments of 1 psig and shall be located at or near the lowest points in the distribution system.
3. Air Testing: In lieu of a water test, the PEX tubing system shall be air tested in accordance with local code after installation, or at least system working pressure, no less than 40 psi and no greater than 100 psi. The test shall be conducted for a period of no less than 15 minutes and no greater than an hour and not leak more than 8 psi over the test duration. Refer to the PEX manufacturers' installation instructions for safety considerations while conducting air testing. Use soap solution to check for leakage at manifold and fitting connections.
4. Water Testing: The PEX tubing system shall be pressure tested in accordance with local code after installation or to at least minimum system working pressure, no less than 40 psi, and for a period

of no less than 15 minutes. Water used for this testing shall come from a potable water source. Test should not exceed pressure rating of PEX tubing and shall have no leaks.

5. Water Test
    a. Purge air from pipes.
    b. Charge the completed, yet unconcealed pipes with water.
    c. Take necessary precautions to prevent water from freezing.
    d. Check the system for leakage, especially at all pipe joints.
6. Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psig for 30 minutes.
    a. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes.
    b. At the end of the 30-minute preliminary test, pressure shall not fall by more than 8 psig from the maximum, and there shall be no leakage.
7. After successfully performing the preliminary pressure test, perform the main pressure test immediately.
    a. The test pressure shall be restored and continued as the main test for 2 hours.
    b. The main test pressure shall not fall more than 3 psig after 2 hours.
    c. No leakage shall be detected.
8. Complete inspection and furnish test reports supplied by the manufacturer of the system.

G. Cleaning
1. Clean exposed surfaces upon completion of installation using clean, damp cloth. No cleaning agents are allowed.
2. Comply with manufacturer’s recommendations.
3. Disinfection: The PEX hot and cold water distribution system may require system disinfection. When no other method is available, follow the time limitations and exposure levels listed below.
    a. Flush the system with potable water until discolored water does not appear at any of the outlets.
    b. Fill the system with a water chlorine solution containing at least 50 parts per million of chlorine. The system shall be valved in the closed position and to stand for 24 hours. Alternatively, the system shall be filled with water chlorine solution containing at least 200 parts per million of chlorine. The System shall be valved in the closed position and allowed to stand for 3 hours.
    c. Following the standing time, the system shall be flushed with water until the chlorine is purged from the system.

H. Protection
1. Protect installation throughout construction process until date of final completion.
2. Replace components that cannot be repaired.

3.9 EQUIPMENT PIPING CONNECTIONS

A. General: Pipe sizes indicated shall be carried full size to equipment served. Any change of size to match equipment connection shall be made within one foot of equipment piping connection.
B. At temperature control valves with sizes smaller than connected lines, reduction shall be made immediately adjacent to valve.

3.10 DOMESTIC HOT WATER PIPE LENGTH TO FIXTURES

A. The maximum allowable piping length for domestic hot water from the nearest source of heated water to the termination of the fixture supply pipe shall comply with requirements of Energy Code Sections C404.3.1 and C404.3.2.
B. For public lavatories and hand washing sinks the maximum piping length shall not exceed three feet (one meter) or as allowed by the Energy Code Sections C404.3.1 and C404.3.2.
C. For other fixtures, such as showers, kitchen sinks, and scrub sinks, the maximum piping length shall not exceed length allowed by Energy Code Sections C404.3.1 and C404.3.2.
D. Adjust routing of hot water supply and recirculation piping as required to meet these maximum piping lengths.

3.11 TEMPERATURE GAUGES AND THERMOMETERS

A. General: Install temperature gauges/thermometers in vertical upright position and tilted to be easily read by observer standing on floor without supplemental illumination.
B. Install in the following locations and elsewhere as indicated:
    1. All locations shown on the plumbing drawings. See schematics and details for installation locations.
    2. At outlet of hot water heaters and boilers over 100,000 Btuh (30 kW) input.
C.

3.12 CONDENSATE DISPOSAL

A. Primary drain pan shall be provided with cooling coil and extend beyond the leaving side of the coil and underneath the cooling coil connections.
B. Where indicated on mechanical drawings provide secondary drain pipe for mechanical equipment above ceilings and route to visible location or approved receptor.
C. All air conditioning and heat pump condensate drain lines from each air handling unit and rooftop unit shall be piped full size of the unit drain outlet, with “P” trap, and piped to nearest drain. See details shown on the drawings or the manufacturer’s instructions for depth of unit condensate trap to exceed unit static pressure. Condensate drain lines shall not be less than 3/4" internal diameter and shall not decrease in size from the outlet of the drain pan connection to the place of condensate disposal.
D. Equipment manufacturer shall provide outlet size to align with condensate drain sizing tables in the mechanical and plumbing codes. Unit outlet size shall be 3/4" for equipment capacity to 20 tons of cooling capacity and 1” for equipment capacity over 20 tons to 40 tons of cooling capacity.
E. Run horizontal indirect waste condensate drainage piping at uniform pitch of not less than 1/8" per foot (1%).

3.13 PIPING INSTALLATION: NATURAL GAS

A. Natural Gas Requirements:
    1. Where buried gas piping transitions into a building-on-grade the piping shall not penetrate the slab or perimeter structure and must extend vertically a minimum of 12” above finished grade/ground floor level before penetrating the exterior perimeter wall.
    2. Underground piping systems shall be installed with a cover not less than 12 inches (305 mm). Where external damage to the pipe or tubing from external forces is likely to result, the cover shall

be not less than 18 inches (457 mm). Where a cover not less than 12 inches (305 mm) cannot be provided, the pipe shall be installed in conduit or bridged/shielded.

3. A yellow insulated copper tracer wire or other approved conductor shall be installed adjacent to underground nonmetallic piping. Access shall be provided to the tracer wire or the tracer wire shall terminate above ground at each end of the nonmetallic piping. The tracer wire size shall be not less than 18 AWG and the insulation type shall be suitable for direct burial.
4. Ball valves used in gas systems shall be UL listed, CSA approved for pressure of system, no exception.
5. Provide gas meter as required by the local servicing utility, code and where shown on drawings. Provide shut-off valves at inlet and outlet side of each meter. Coordinate communications wiring and programming with BAS and local gas utility as required.
6. Gas pressure regulator requirements:
7. Provide access to each pressure regulator.
8. Where regulators are located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak-limiting device.
9. Provide seismic shut off valve on the natural gas main downstream of meter adjacent to outside of building, mounted per manufacturer instructions, level in all planes, and anchored to the building structure wherever possible to avoid nuisance tripping.

B. Provide shutoff valve upstream of each regulator and test tees.
C. Provide a tee fitting with one opening capped or plugged located between the regulator and its upstream shutoff valve. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument.
D. Provide a tee fitting with one opening capped or plugged installed not less than ten (10) pipe diameters downstream of the regulator outlet.
E. Provide a tee fitting with one opening capped or plugged located downstream of the downstream shutoff valve. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument to verify gas pressure available to gas appliance.
F. Corrugated stainless steel tube (CSST) option:
G. CSST tubing, fitting, and strike-protection are to be Gastite and shall be installed per the current version of the Gastite Design & Installation Guide and per approval of local Authority Having Jurisdiction. Gastite supplied training shall be obtained by all installers prior to installation. The gas-piping system shall be pressure tested in accordance with all requirements of local Authority Having Jurisdiction, ANSI LC-1 and the most current edition of the Gastite Design and Installation Guide.
H. Gastite mechanical tube fittings manufactured from ASTM B16 type 360 brass whose design incorporates a double wall flare for gas-tight seal with Jacket Lock, mechanical capture of the jacket for enhanced tubing protection.

3.14 PIPE INSPECTIONS

A. Inspections shall be performed at each phase while under tests required for administrative authorities, and prior to concealment, i.e. “rough-in”, “top-out” and “final”.
B. Inspection – Underground: All piping installed underground shall be inspected prior to burial by the Owner’s Representative. Contractor must notify Owner’s Representative no less than 24 working hours prior to inspection time. Should the piping be buried prior to inspection the contractor may be requested to uncover the piping at no delay to the project and at no additional cost to the Owner.

C. Inspection – Aboveground: All piping installed Aboveground shall be made available for inspection upon completion and prior to finish of walls and ceilings. Contractor must notify Owner's Representative no less than 24 working hours prior to the desired inspection time. Should the piping be hidden within the structure prior to inspection the contractor may be requested to uncover the piping at no delay to the project and at no additional cost to the Owner.

3.15 CLEANING, FLUSHING, DISINFECTING

A. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any).
B. Inspect each run of each system for completion of joints, supports, and accessory items. Inspect pressure piping in accordance with procedures of ASME B31.
C. Flush out piping systems with clean water before proceeding with required tests.
D. Disinfect domestic (potable) water piping systems in accordance with notes on the plumbing drawings.

3.16 TESTING

A. See Plumbing Piping Materials Specifications on plumbing drawings for pressure and leakage testing requirements for each piing system.
B. Provide all tests specified hereinafter. All tests shall meet or exceed the minimum requirements of applicable codes and local ordinances. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation.
C. Upon completion of testing, certify to the Architect, in writing, that the specified tests have been performed and that the installation complies with the specified requirements and provide a report of the test observations signed by qualified inspector.
D. Piping: Remove from the system, during testing, all equipment which would be damaged by test pressure. Replace removed equipment when testing has been accomplished. The system may be tested in sections as the work progresses; however, any previously tested portion shall become a part of any latter test of a composite system. Correct leaks by remaking joints with new material.
E. Test time will be accrued only while full test pressure is on the system, unless indicated otherwise. "Tolerance" shall be no pressure drop, except that due to temperature change in a 24-hour period. Inspect and test all work prior to burying or concealing. Test pressure shall be one and one-half times the system operating pressure or the listed test pressure below, whichever is greater:
F. Valves: Test all valve bonnets for tightness. Test operate all valves at least once from closed-to- open-to-closed position while valve is under test pressure. Test all automatic valves, including solenoid valves, and temperature and pressure relief valves, safety valves, and temperature and pressure relief valves not less than three (3) times.
G. Piping Specialties: Test all thermometers, pressure gauges, and water meters for accurate indication; automatic water feeders, air vents, trap primers, and vacuum breakers for proper performance. Test all air vent points to ensure that all air has been vented.
H. Backflow Preventers: Each testable backflow prevention device shall be tested and approved by certified testers after installation. Submit test results.

END OF SECTION

SECTION 223000 –PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
   1. Domestic water variable flow booster pump systems with hydropneumatic tank
   2. Sump pumps
   3. Sewage ejector pumps
   4. Domestic hot water heaters
      a. Tank-type hot water heater (electric resistance)
      b. Instantaneous hot water heater (electric resistance)
      c. Air-to-water heat pump (electric)
   5. Domestic hot water storage tank
   6. Electronic mixing valves
   7. Domestic hot water recirculation pump
   8. Domestic hot water recirculating pump controller
   9. Thermostatic Balancing Valves
   10. Expansion tanks
   11. Temperature and Pressure Relief Valves
   12. Vacuum Relief Valves
   13. Air elimination valve

1.2 QUALITY ASSURANCE

A. Quality assurance for pumps will meet the following requirements:
   1. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products.
   2. Codes and Standards: Provide pumps which conform to the requirements of:
      a. Hydraulic Institute (HI): Manufacturer pumps in accordance with "Standards for Centrifugal Rotary and Reciprocating Pumps."
      b. National Electrical Manufacturers Association (NEMA): Provide electrical components which comply with NEMA Standards.
      c. National Fire Protection Association (NFPA) 70: National Electrical Code.
      d. Underwriters Laboratories (UL) UL-778: Motor Operated Water Pumps.

B. Quality assurance for water heaters will meet the following requirements:
   1. Manufacturers and Representatives Qualifications. Firms regularly engaged in manufacture of water heating equipment, systems and service shall have been active in the field and whose products have been in satisfactory use in similar service for not less than five years.

2. Uniform Energy Factor (UEF): Water heater efficiency metric applicable to residential and small commercial water heaters. The higher the UEF value is, the more efficient the water heater. UEF is determined by the Department of Energy's test method in 10 CFR Part 430, Subpart B, Appendix E. UEF rating label must be applied to water heater.
3. First Hour Rating (FHR): An estimate of the maximum volume of hot water in gallons that a storage water heater can supply within an hour that begins with the water heater fully heated. The FHR is measured at a 135°F outlet temperature in the Energy Factor test method and at a 125°F outlet temperature in the Uniform Energy Factor test method.
4. ASME Compliance: Condensing water heaters must be constructed in accordance with ASME Water heater and Pressure Vessel Code, Section IV (HLW) Potable Water Heaters.
5. ANSI Compliance: Gas condensing water heaters must be tested for compliance with ANSI Z21.10.3 (2011) / CSA 4.3 Gas Water Heater. For use as a potable water heater, "American National Standard / CSA Standard for Gas Water Heaters." Condensing water heaters shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for units showing dimensions, weights (shipping, installed, and operating), capacities, ratings, performance with operating point clearly indicated, motor electrical characteristics, finishes of materials, and installation instructions.
   1. Submittal information to verify all scheduled characteristics are met including efficiency.
   2. Submittals to clearly indicate all components that are shipped loose for field installation.
B. Shop Drawings: Submit manufacturer's shop drawings indicating dimensions, weight (shipping, operating), required clearances, methods of assembly of components, and location and size of each field connection.
C. Maintenance Data:
   1. Submit maintenance instructions, including instructions for lubrication, tube replacement, motor and drive replacement, and spare parts lists.
   2. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals.
D. Wiring Diagrams:
   1. Submit manufacturer's ladder-type wiring diagrams for power and control wiring required.
   2. Differentiate between factory-installed and field-installed wiring.
E. Operation and Maintenance Data: Submit maintenance data and parts lists for each type and size of water heater, control, and accessory, including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual, in accordance with requirements of Division 01. Submit operational manuals.
F. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver units to the site in containers with manufacturer's stamp or label affixed.
B. Store and protect products and units against dirt, water, chemical, and mechanical damage. Do not install damaged units - remove from project site.
C. Rigging: Comply with the manufacturer's rigging and installation instructions.

1.5 WARRANTY

A. Refer to Section 22 05 00 for warranty requirements.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER VARIABLE FLOW BOOSTER PUMP SYSTEM

A. Furnish and install a UL listed prefabricated pump water pressure booster system, duplex or triplex as schedules on the plumbing drawings.
   1. Refer to scheduled equipment on Contract Drawings for capacities of pumps and motors.
B. Pumps
   1. Pumps shall be single stage end-suction design of cast iron bronze fitted construction, equipped with mechanical shaft seal. Or, multi-stage, vertical inline design with cast iron stainless steel fitted construction.
C. Drip-Proof Type Motor
   1. Each pump motor shall be premium efficient TEFC (suitable for use with VFD's) and selected to not exceed the service factor of the nameplate horsepower at any point on the pump capacity head curve. ECM are recommended.
   2. Each pump shall be fitted with isolation valves and union connections or flanges to facilitate future service requirements.
   3. Each pump shall be furnished with a silent check valve with bronze trim.
D. Power and Control Panel
   1. The control panel shall include the following components:
      a. Main power disconnect, non-fused.
      b. Control circuit transformer with fused secondary.
      c. Variable frequency drive for each pump
      d. Digital programmable logic controller (PLC) with PID control functions.
      e. Color graphic touch screen display, minimum 6" diagonal, mounted on the panel door with display units in selectable language and engineering units.
      f. Audible general fault alarm, including a push to silence button and a set of dry contacts wired to a terminal strip for remote monitoring.
      g. The PLC shall be capable of connection to a Building Management System (BMS) using BACnet, Modbus or LonWorks protocol as defined in Division 23.
      h. The control logic shall include a dynamic set point adjustment, which automatically lowers or increases the system discharge operating pressure set point as the system demand changes in accordance with local energy code. Manufacturers without this feature shall provide their discharge pressure transducer loose and installed at the furthest remote location of the system to account for variable friction losses within the piping system.
      i. The control logic shall automatically stage pumps and adjust the pump speed based on discharge pressure control. The lead and lag pumps shall be rotated after each system shutdown. The controls shall start a lag pump on lead pump failure. The controls shall include pump minimum run time and pump maximum run time adjustable set points.
      j. The control logic shall include an energy saving proof of no system demand and automatically shutdown the lead pump if no demand is proven. The lag pump(s) shall shutdown when operated at minimum speed for an adjustable elapsed time.

k. Compliant with UL 508.

E. Factory Prefabrication
1. The entire booster system shall be factory prefabricated on a common structural steel stand with all interconnecting piping and wiring completed and hydrostatically tested prior to shipment.
2. Purge valve shall be thermally actuated to notify control panel of over-temperature conditions to initiate an alarm and shutdown system.
3. The complete package shall also include isolation valves on the suction and discharge of each pump. Stainless steel suction and discharge pipe manifolds, as well as copper tubing with shutoff cocks for gauges and pressure switches, will be furnished assembled. Provide pressure gauges to read suction and discharge pressures for field verification without accessing control system.
4. Field connections include connection to the system suction and discharge headers, drain tube, piping to the hydropnuematic pressure tank with union ball valve, and the power connection at the control panel.

F. Hydropneumatic Tank:
1. A hydropneumatic tank shall be included by booster skid manufacturer to facilitate low flow conditions.
2. Tank shall be a full acceptance replaceable bladder style, sized at 65% acceptance volume, and include a union isolation valve, tank drain and pressure gauge.
3. Tank may be shipped loose for field installation as indicated on the plans.
4. Tank shall be ASME constructed with ring base and minimum pressure rating of 125 psi.

G. Manufacturer: Flowtherm, SyncroFlo, Patterson Aqua~FlowPac, Grundfos, or approved equal.

2.2 SIMPLEX SUMP PUMP SYSTEM

A. Provide where indicated on plumbing drawings, a Simplex submersible sump pump. Pump to have bronze fitted construction with submersible sealed motor, stainless steel shaft, bronze impeller, mechanical seal, and waterproof power cord. Pump to have flow and head capacity as schedule on the plumbing drawings. Motors to be as scheduled. Pump shall have a fully submersible float switch for mounting on pump discharge pipe.

B. Provide with differential mercury float switches for (1) on-off operation and (2) high water alarm.

C. Provide check valve and shut-off valve on discharge side of pump.

D. High water alarm: Local alarm with dry contacts for connection to BAS.

E. Manufacturer: Weil, Liberty, Zoeller, or approved equal.

2.3 DUPLEX SUMP PUMP SYSTEM

A. Furnish and install duplex submersible sump pump, Weil Pump Series 1600 or equal, as scheduled and shown on drawings.

B. Motors shall be air filled design.
1. Oil filled motor shells shall not be considered equal.
2. Motor end bell shall be designed as a terminal box and separated from the motor shell by a combination bearing support and inspection plate.
3. The inspection plate shall permit viewing and access to the motor from the top side of the motor.
4. Motors shall be housed in a watertight cast iron shell with extended cooling fins and shall have Class "F: insulation and permanently lubricated double seal ball bearings having a rater life of 17,500 hours.

5. Motors using sleeve type bearings will not be considered equal. The mating surfaces between the motor end bell, motor shell and seal housing shall be sealed by means of "X" cross section QUAD RINGS.
6. Motor shaft shall be 300 series stainless steel with keyway for positive positioning of impeller.
7. Carbon steel shafts are not considered equal.

C. The impeller shall be multi-vane and shall be made of close grained bronze and accurately machined to the proper diameter and to be statically and dynamically balanced.

D. A double mechanical seal system shall be furnished.
1. The entire double mechanical seal assembly shall be housed in a seal chamber filled with clean dielectric oil. Seal surfaces shall be of solid silicon carbide variety.
2. Carbon ceramic, tungsten carbide or systems that allow the lower seal mechanism to come in contact with the pumped media, shall not be considered as equal.

E. Each pump shall be computer tested and a report of the test will be kept.
1. Test data will consist of 6 duty points at various heads and capacities, one of which will be the design point.
2. Test data will include actual efficiencies; horsepower requirements and amp draw at each point.
3. This test data will be made available to the engineer and owner upon request.

F. Furnish remote packaged factory pre-wired duplex pump controller, Weil 8101E with the following:
1. NEMA 4 double door dead front steel lockable enclosure.
2. Magnetic starter with overload reset through inner door, each pump.
3. Fused disconnect switch with handle through inner door, each pump.
4. Automatic alternator separately fused.
5. Overload reset buttons, each pump.
6. Running lights, each pump.
7. H-O-A switches, each pump.
8. Control circuit transformer for 120V operation for each pump independently.
9. Output connections for high water annunciation at Simplex system.
10. Alarm silencing switch.
11. Alarm light with flasher.
12. Numbered and wired terminal strip.
13. Alarm output contact for connection to Building Management System
14. Single point electrical connection.
15. All wiring between control panel and pump provided under Division 22.

G. Furnish and install Weil Series 8230 mercury float switches complete with galvanized rod and wall support bracket.
1. Each pump control switch will consist of 2 normally open mercury switches, encapsulated in epoxy resin.
2. The float casing will be polypropylene.
3. The switch cable will be type STO PVC jacket 4 #18 conductor, 41 strand, 600-volt insulation.
4. The cable will be secured to the support rod with a polypropylene composition clamp with stainless steel bolts.
5. Switches used for high water alarm service will be of the same construction as the pump switches, except that 2-conductor cable will be furnished.
6. The switch housing will be color-coded to distinguish between the pump and alarm switches.

7. All wiring between control panel and float switches provided under Division 22.

H. Provide reinforced fiberglass basin with steel anti-flotation ring. Provide with matching gasketed steel cover.
   1. Install basin and pour concrete all around to secure in place.

I. Manufacturer: Weil, Liberty, Zoeller, or approved equal.

2.4 DUPLEX SUBMERSIBLE SEWAGE EJECTOR

A. Furnish and install a duplex submersible sewage ejector system, Weil Pump Series 2500 or equal, as scheduled and shown on drawings.

B. The pump casing shall be one piece cast iron constructed with tripod support legs that provide an even distribution of weight.

C. The mating surfaces between the motor end bell, the motor shell and the seal chamber shall be sealed by means of "X" section QUAD RINGS. Designs using conventional circulate 'O' rings or rectangular cross sectional gaskets shall not be considered equal.

D. Pump motor shall be vertical, NEMA-6 and of an air filled, hermetically sealed design for premium efficiency. Oil filled shell shall not be considered equal.

E. Motor end bell shall be cast iron, designed as a terminal box and separated from the motor shell by a combination bearing support and inspection plate.

F. The motor shall be housed within a water tight, heavy duty cast iron shell with integral extended cooling fins. Motor shall have Class 'F' insulation and permanently lubricated, double sealed ball bearings having a minimum life of 17,500 hours. Motors using sleeve type bearings shall not be considered equal.

G. Motor shaft shall be 300 series stainless steel with keyway for positive positioning of impeller. Motors using carbon steel shafts or stainless stub shafts shall not be considered equal.

H. Impeller shall be multi-vane design, constructed of bronze, accurately machined and dynamically balanced to the job site conditions. The impeller shall not require the use of wearing rings to insure proper operation and shall be capable of passing 4 inch minimum solids.

I. A double mechanical seal system shall be furnished and housed in a machined cast iron seal chamber filled with clean dielectric oil, providing constant lubrication. Lower seal surfaces shall be of solid silicon carbide to provide longer life. Carbon ceramic, tungsten carbide or systems that allow the lower seal surfaces to come in contact with the pumped media, shall not be considered equal.

J. Each pump shall be tested and a computer generated report will be kept in file and made available upon request. The reported test data shall consist of six duty points of various heads and capacities, one of which will be the design point and shall include actual efficiencies and horsepower requirements.

K. Furnish remote packaged factory pre-wired duplex pump controller with the following:
   1. NEMA 4X, UL listed label enclosure
   2. PLC with color touch-screen and BMS communication via Modbus
   3. Isolated contacts for high water, pump on, and motor overload
   4. Motor overload protection (one per pump). Instantaneous magnetic trip for short circuit protection. Field adjustable within the full load amp range.
   5. One lockable panel disconnect; through-the-door style with door interlock.
   6. Lockable pump disconnects; one for each motor.
   7. Automatic alternator.
   8. Power supply for control circuit; transient surge voltage protection.
   9. High water alarm, 95 dB horn with silence button on touch screen.

10. Auto, Off, Hand, and Test modes of operation via touch screen.
11. Exercise feature - provides a brief run cycle for prolonged idle pumps.
12. PLC shall display the following:
    a. Pump run status and amperage draw.
    b. High water alarm and general alarm indication.
    c. Pump status icons for On/Off, Run and Disabled.
    d. Sump tank level bar graph (if using level transmitter).
    e. Lead pump display; next pump to start on sequence alternation.
    f. Alarm history, date and time stamped.
    g. Alarms with self-help diagnostics to assist fault troubleshooting.
    h. Preventive maintenance reminder.
    i. Hour meter; one per pump and resettable.
13. Control terminal board, numbered and wired.
14. Single point electrical connection. All wiring between control panel and pump provided under Division 22.

L. Furnish and install a level transmitter and base with 316 stainless steel housing and a sturdy base for wet well floor placement. Transmitter to use a piezo resistive sensing element, have a maximum operating temperature of 176°F, maximum sump depth of 23 feet., and a power requirement of 10- 28 Vdc. Transmitter shall be UL approved intrinsically safe.
    1. All wiring between control panel and transmitter provided under Division 22.
    2. Transmitter may be mounted to a pipe, suspended from wet well, or position on basin floor; refer to Drawings for mounting configuration.

M. Manufacturer: Weil, Liberty, Zoeller, or approved equal.

2.5 TANK-TYPE HOT WATER HEATER (ELECTRIC RESISTANCE)

A. Tank type hot water heater with integral electrical resistance heating elements and insulated tank. Refer to drawings for locations, capacities, flow rates, power requirements and models.
B. Refer to equipment schedules on plumbing drawings for water inlet and outlet connection sizes.
C. All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused-to-steel. Tank shall be cathodically protected with adequate extruded magnesium anode. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Tank shall have a 150 psig working pressure. Foam insulated tank to meet or exceed Energy Code requirements.
D. Electric heating elements shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch. Factory wired for non-simultaneous operation. Set initial water heater temperature to 140°F (minimum).
E. Heater shall include ASME pressure and temperature relief valve.
F. Manufacturers: Lochinvar or approved equal.

2.6 INSTANTANEOUS HOT WATER HEATER (ELECTRIC RESISTANCE)

A. Instantaneous hot water heater with integral electrical resistance heating elements. Refer to drawings for locations, capacities, flow rates, power requirements and models.
B. Maximum Flow: The heater design flow rate shall be as scheduled and will be rated for the full pressure zone circulation GPM through the heater. No side stream piping and balancing shall be utilized.
C. Controls:

1. Automatic water thermostat with externally adjustable temperature range.
2. High temperature limit thermostat.
3. No external temperature sensors are required.

D. Accessories:
1. Brass water connections.
2. Drain valve.
3. Magnesium anode.
4. ASME temperature and pressure relief valve.
5. NSF 61 listed non-ASME thermal expansion absorber, max 150 psig working pressure

E. Manufacturers: Hubbell or approved equal.

2.7 AIR-TO-WATER HEAT PUMP (ELECTRIC)

A. Electric air-to-water heat pump to be connected to external storage tank (specified separately). The heat pump transfers heat and humidity from ambient air and uses this to heat potable water. Refer to drawings for locations, capacities, flow rates, efficiency, power requirements and models. The heat pump water heater shall be packaged air source equipment, factory assembled, charged, and tested.

B. The heat pump shall be suitable for heating potable water, be rated a single-pass equipment and have the capability of producing leaving water temperatures scheduled in the equipment schedules on the plumbing drawings.

C. Heat Pump unit shall consist of compressor, condenser, evaporator coil, fan, hot water circulating pump, piping, and controls, factory assembled, charged, and tested. The heat pump shall contain the following components, and features:

D. Cabinet: Designed and constructed for outdoor installation on rooftop

E. Condenser Fan: Plenum Fans. Low-sound condenser fan provided to meet acoustical ratings noted in the equipment schedules on the plumbing drawings.

F. Refrigerant: R-513A (BOD) or R-744 (CO2)

G. Evaporator Coil: Evaporator coil with drain pan. Drain pan to have condensate piping connection. Condensate piping to be heat traced, insulated, and routed to roof drain.

H. Condenser: Stainless steel brazed plate vented double wall type. Single wall condenser construction shall not be allowed. UL Listed and suitable for high temperature operation with potable water.

I. Compressor: Reciprocating.

J. Water Circulating Pumps: Shall be in-line all bronze or stainless steel body centrifugal type able to deliver rated flow against the external head shown on the plumbing drawings.

K. Accessories: Provide condenser fan discharge fan acoustical hood. See plumbing and mechanical drawings for details.

L. Unit Controls:
1. The heat pump unit shall be factory wired for fully automatic operation.
2. Safeties shall include compressor and fan motor thermal overload protection, manual reset pressure stats, anti-cycling compressor relays, plus standard items recommended by the equipment manufacturer.
3. Constant Leaving Water Temperature Control: Heat pump shall be factory equipped with electronic temperature control valve (e-TCV) or variable speed circulating pump which automatically controls to maintain a constant leaving water temperature (regardless of entering water temperature).

4. Leaving water temperature is set by the heat pump operator/user via a field adjustable electronic temperature controller.
5. Compressor controls/accessories must include the following:
    a. High and Low Refrigerant Pressure Safety Switches
    b. Anti-Short Cycle Control: Units shall be factory wired to allow the manufacturer maximum recommended number compressor starts per hour to prevent compressor short cycling and allow time for suction and discharge pressures to equalize permitting the compressor to start in an unloaded condition.
6. Heat pumps shall include controls that comply with ANSI/CTA 2045-B.

M. Manufacturer: Nyles or approved equal.

N. Domestic Hot Water Heating System Controls:
1. Domestic hot water heater system control and monitoring system to stage and monitor all equipment and system temperatures as required for efficient system operations and Energy Code requirements. See domestic hot water piping diagram on plumbing drawings for further details.
2. Domestic hot water heater system control and monitoring system to provide all monitoring and fault detection as required by owner and Energy Code Section 404.2.1.5 requirements. See domestic hot water piping diagram on plumbing drawings for further details.
3. Domestic hot water heater system control and monitoring system to provide automatic controls in accordance with the Energy Code Section C406.3 for load management control of the domestic hot water storage water volume. Automatic controls to include a minimum of one of the following:
    a. Electric utility demand response control signal
    b. Electric utility price response control signal
    c. Peak price period time control signal, or
    d. Local building demand monitoring control signal.

2.8 DOMESTIC HOT WATER STORAGE TANK

A. Factory jacketed and insulated domestic hot water storage tank designed for storing potable water and connected hot water sources such as instantaneous water heaters, heat pump water heaters, and solar thermal heat sources. Refer to drawings for locations, sizes, capacities, connections and model numbers.

B. Features:
1. Storage section shall be constructed and stamped for 150 psi working pressure under Section VIII of the ASME Code. Heavy gauge steel with powder coat paint.
2. Tank shall be insulated and jacketed.
3. Insulation shall be minimum R-30 to meet Energy Code requirements.
4. Tank liner shall be glass coated or ceramic porcelain to provide corrosion resistance.
5. Cathodic protection with magnesium anodes.
6. Hand hole cleanout for maintenance removal of accumulated lime and sediment.
7. Temperature and pressure relief valve opening on top of tank.
8. Temperature sensor wells located in the upper and lower portions of the tank to accommodate field supplied 1/4” round temperature sensors. See plumbing drawings for sensor quantity and location. Coordinate sensor quantity and location with heat pump manufacturer requirements for control and staging of units.
9. Water inlet and outlet piping connections shall be as specified on equipment schedules and schematics on plumbing drwings.

10. Bottom drain outlets shall be minimum 1” NPT with drain valve.

C. Manufacturers: Lochinvar or approved equal.

2.9 ELECTRONIC MIXING VALVES

A. Manufacturer’s Quality System:
   1. Registered to ISO 9001:2008 Quality Standard.
   2. The control must be UL tested and certified per standard 916, Temperature Indicating and regulating Equipment.
   3. The control and valve shall be certified to comply with ASSE 1017.
   4. The control and valve shall be certified to comply with NSF/ANSI 61.
   5. The control and valves shall be certified to comply with California Lead-Free AB1953 code.

B. Regulatory Approvals
   1. Underwriters Laboratories, Inc. (UL)
      a. The control shall be tested per standard 916, Temperature Indicating and Regulating Equipment.
   2. American Society of Sanitary Engineers (A.S.S.E.) (www.asse.org)
      a. The control, valve, and actuator/motor shall be certified to comply with ASSE code 1017.
   3. CSA International
      a. The control and valve shall be certified to comply with NSF/ANSI 61.
   4. California Domestic Water Lead-Free Law AB1953
      a. The valve shall be certified to comply with California Lead-Free Fixture AB1953 (applies to stainless steel valves only).

C. Control Operation
   1. Description: The control shall operate on 120VAC. The control shall be pre-engineered and programmed for the direct valve actuator operation in a domestic hot water heating system or the regulation of system water temperature in heating or cooling applications. It shall incorporate the following components:
      a. Control: A microprocessor Electronic Tempering Valve control with PID-type logic, built-in transformer, digital display of temperature and set point, and LED indicator. It shall be capable of controlling a set point range from 40°F to 200°F (4.5°C to 93.3°C). It shall display the valve opening percentage to match actuator percent. The control shall maintain set point temperature within ±2° during a domestic draw of 0.5 gpm to full flow capacity in accordance with ASSE 1017.
      b. Actuator: An actuator/Motor and linkage capable of traveling the complete valve stroke from fully OPEN to fully CLOSE in less than 20 seconds. It shall calibrate to the actual valve stroke. The actuator is also capable of operating in the reverse direction, allowing the interchangeability of the HOT and COLD connections to the valve body.
      c. Stainless Steel Valve: An NPT threaded 3-way mixing valve with 304 stainless steel body and trim (Meets California AB1953 and Massachusetts domestic water codes). The maximum operating temperature of the valve shall be 300°F (149°C) with a maximum working pressure of 225 psi.
      d. Sensor: Temperature sensor of the thermistor type that can measure from -30°F to 250°F (-34.5°C to 121°C).
   2. Sequence of Operation: The control shall modulate the mixing valve to match the set point.

3. Mixing Valve Features:
    a. Setpoint: The control shall offer the user the ability to adjust the setpoint using a menu option and it shall display the setpoint at all times on the default screen.
    b. Modes of Operation: The control shall operate in one of three modes: as an electronic tempering valve, as a high temp alarm / safeguard, or as an electronic tempering valve with high temp alarm / safeguard.
    c. Remote Setpoint: The control shall offer a 4-20mA remote setpoint option to allow a BMS (Building Management System) to remotely change the setpoint.
    d. Schedules: The control shall offer the user the ability to set a schedule where the control overrides the setpoint and sets an absolute water temperature. The control shall offer schedules for each day, every day, weekdays only, and weekends only. Up to four periods can be configured per day.
    e. Flow Switch: The control shall offer an input that can accept a dry-contact flow switch to detect when no water flow is detected.
    f. Auto Calibration: After initial startup calibration, the actuator/motor shall automatically calibrate itself to the valve attached.
    g. Multiple Actuator Connection: The control shall be capable of operating multiple valves piped in parallel with a single 0–10Vdc output signal.
    h. Display: The control shall have an alphanumeric display. All control operation information shall be available for display.
    i. Memory and Backup: The control shall store all configuration and settings on EEPROM. In case of power failure, the control shall be able to retrieve all of its latest settings when power is restored.
    j. Sensor Inputs: The control shall be capable of supporting three standard sensor inputs. One sensor input shall be of the thermistor type. Thermistor operating temperature range shall be -30°F to 250°F (-34.5°C to 121°C). Should the sensor show a fault condition, the control shall automatically close the hot port of the valve until the situation is rectified. Two sensor inputs shall be auxiliary inputs capable of being configured as temperature sensors or switch sensors. When configured as a switch sensor, the sensors detect open or close. When configured as a temperature sensor, the sensor monitors water or other system temperatures.
    k. Alarm / Safeguard Option: The control shall have a manual reset button that will exit the control from its alarm status. The reset function shall only work when the temperature has dropped below the alarm setpoint. When connected to a safety valve (motorized ball valve), the control will power the valve close, turn on an alarm indicator, and energize both alarm relays for optional external alarms. When the alarm is corrected and the control is reset, the control will power the valve open for normal operation.
    l. Power Failure: The control shall automatically shutoff the flow of hot water in the event of a power failure.
    m. Remote Communication Option: The control shall be capable of communicating remotely, allowing the user the ability to view and change control settings. The control shall be capable of supporting the following communication options: RINET / Internet, BACnet IP, BACnet MSTP, or MODBUS (RTU).

n. The control communication option can be installed directly from the factory or as a field upgrade option installed by a qualified Field Technician.
o. IP65 "Rainproof" Rated Option: The actuator enclosure should be rated as per IP 65 for outdoor installation

D. Manufacturers
1. Heat Timer
2. Leonard
3. Or approved equal

2.10 DOMESTIC HOT WATER RECIRCULATING PUMPS

A. Furnish and install pumps with capacities as shown on plans.
B. Pumps shall be in-line type for installation in vertical or horizontal piping.
C. Pump must be capable of being serviced without disturbing piping connections.
D. Pump body shall be lead-free bronze or stainless steel construction and rated for 150 psi working pressure and 225°F.
E. Impeller shall be lead-free bronze or stainless steel.
F. The pump shall have water-tight seals.
G. The motor shall be non-overloading at any point on the pump performance curve.
H. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.
I. Manufacturers: Bell and Gossett #NBF or ecocirc Series, Grundfos #Magna3, Taco or equal.

2.11 DOMESTIC HOT WATER RECIRCULATION PUMP CONTROLLER

A. Electronic programmable controller with 7-day or 365-day programming feature to operate the recirculating pump during occupied periods. Controller shall have a minimum of four start/stop periods per day. Minimum mode switching intervals of 15 minutes.
B. The aquastat shall connect to the controller and override the ON time conditions whenever the temperature conditions are met to disengage the pump.
C. Thermostat (aquastat) switching modes: The pump shall engage (ON mode) whenever the return water temperature drops below 110°F (adjustable) and shall disengage (OFF) whenever the return water temperature exceeds 120°F (adjustable).
D. Temperature sensor shall be rated for temperature monitoring between -20°F and +284°F with response times less than 5 seconds and accuracy or +/- 1%. Adjustable well length and stainless steel body. Cable length and sensitivity as required for application.
E. Power supply: 115-120 VAC, 60 Hz, single phase.
F. Manufacturers: Honeywell, Kele, Mamac, Bell and Gossett or approved equal.

2.12 THERMOSTATIC BALANCING VALVE (TBV)

A. Furnish and install as indicated on the plumbing drawings in the domestic hot water return piping. Thermostatic balancing valve (TBV) shall be self-contained and fully automatic without additional piping or control mechanisms.
B. Thermostatic balancing valve shall regulate the flow of recirculated domestic hot water based on water temperature entering the balancing valve regardless of system operating pressure.

1. When fully closed the TBV shall bypass a minimum flow to maintain dynamic control of the recirculating loop and provide a means for system sanitizing.
2. Thermal actuator shall be spring operated and self-cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.
3. The TBV shall be factory set at 100°F (37.7°C) as required by project conditions and specified on the drawings.

C. Body and all internal components shall be constructed of stainless steel with major components constructed of type 303 stainless steel or equal. TBV shall be rated to 200 PSIG maximum working pressure in all sizes. TBV shall include standard tapered female pipe thread (NPT). All TBVs shall be rated to 300°F (121°C) maximum working temperature. TBV shall be ANSI/AWWA C800 compliant. Provide with union, upstream manual isolation valve, pressure temperature port, and downstream check valve for maintenance service. Minimum 3/4" line size.

D. NSF 61 certified with zero lead content for use in domestic water systems.

E. Manufacturers: ThermOmegaTech #CircuitSolver CS Series or equal.

2.13 THERMOSTATIC BALANCING VALVE (TBV) – ADJUSTABLE

A. Furnish and install as indicated on the plumbing drawings in the domestic hot water return piping. Adjustable balancing valve (ABV) shall be self-contained and adjustable.

B. Adjustable thermal balancing valve for domestic hot water recirculation circuits. Internal thermostatic balancing cartridge automatically modulates flow to ensure constant temperature which is adjustable from 95°F to 140°F (35°C to 60°C).

C. Thermal disinfection function for domestic hot water recirculation circuits with thermostatic by-pass cartridge. Disinfection temperature 160°F (70°C), closing above temperature 170°F (75°C) and disinfection flow rating with 1.2 Cv (1.0 Kv).

D. Features:
1. Sizes 3/4” with NPT female connections
2. Low-lead brass valve body
3. Stainless steel and copper adjustable thermostatic cartridge, peroxide-cured EPDM hydraulic seals, 302 stainless steel springs, ABS adjustment knob with temperature adjustment scale and tamper-proof adjustment locking screw, and 10 mm temperature gauge/probe dry-well port.
4. Integral check valve and pre-formed insulation shell.
5. Outlet temperature gauge: 30°F to 180°F scale (0°C to 80°C), 1-1/2” diameter.
6. Maximum working pressure: 230 psi (16 bar).
7. Maximum differential pressure: 15 psi (1 bar).
8. Maximum inlet temperature: 195°F (90°C).
9. Flow rating: 2.1 Cv (1.8 Kv) maximum, 0.23 Cv (0.2 Kv) minimum, 0.52 Cv (0.45 Kv) design.
10. Comply with NSF 372. Certified to low-lead laws and listed by ICC-ES, file PMG-1360, for use in accordance with U.S. and Canadian plumbing codes. Certified to NSF 61 (180°F/82°C Commercial Hot), Drinking Water System Component - Health Effects, by ICC-ES, file PMG-1512.

E. Manufacturers: Caleffi #1162 or equal.

2.14 EXPANSION TANKS

A. Diaphragm Type Pre-pressurized:

1. The pressurization system shall include a diaphragm-type expansion tank which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting this pressure increase at all components in the system to the maximum allowable pressure at those components. It shall maintain minimum operating pressure necessary to eliminate all air. The only air in the system shall be the permanent sealed-in air cushion contained in the diaphragm-type tank. Bladder shall be heavy duty butyl, FDA approved.
2. The expansion tank shall be welded steel, constructed, tested and stamped in accordance with Section VIII of the ASME Code for a working pressure of 125 psi and pre-charged to the minimum operating pressure. Tank shall be epoxy lined.
3. Manufacturer: Wessels, Amtrol, Taco, B&G, Wilo or approved equal.

2.15 TEMPERATURE AND PRESSURE RELIEF VALVES

A. Temperature and Pressure Relief Valve: Provide where shown on piping schematics and called out in equipment schedules on the plumbing drawings.
B. Lead free bronze body construction, thermostat and test lever, temperature relief set at 210°F, and pressure relief set at 125 psi.
C. Certified to meet ASME low pressure heating boiler code and ANSI Z21.22.
D. Manufacturers: Watts #LF Series (100XL, 40, 140, N240, 340), Wilkins or equal.

2.16 VACUUM RELIEF VALVES

A. Vacuum Relief Valve: Provide on incoming cold water service where hot-water storage tank or indirect water heater is located at an elevation above the plumbing fixture outlets.
B. Lead free brass body construction, protective cap, 1/2” male NPT, maximum operating temperature 250°F.
C. Tested and rated to ANSI Z21.22.
D. Manufacturers: Watts #LFN36 Series, Wilkins, or equal.

2.17 AIR ELIMINATION VALVE (AUTOMATIC)

A. Air shall be eliminated to the atmosphere as fast as it is separated from system water, through a float activated remote pressure operated, air elimination valve installed at the top of the air separator.
B. The air elimination valve shall have a high removal rate at low pressure differentials and shall be fully open for the removal of air at all pressures in the operating range from 2 to 150 psig. It shall be tightly sealed against loss of system water and prevent entrance of air in negative pressure situations.
C. The air elimination valve shall be constructed of metal and all working parts shall be non-corrosive. Working pressure shall be 125 psi.
D. Provide minimum 3/8” drain line from vent and route to nearest floor drain or floor sink or other approved drainage location.
E. Manufacturer: Amtrol, Hoffman or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected. Refer to drawings and other specification sections for locations, dimensions and features required for each piece of equipment.
B. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
C. Orient equipment so controls and devices needing service and maintenance have adequate access and code required clearances.
D. Connect piping with shutoff valves and unions as required for maintenance and system isolation.
E. Connect all drain outlets and route to approved termination locations as shown on the drawings and as required by code.
F. Start-Up: Start-up, test, and adjust equipment in accordance with manufacturer's start-up instructions. Check and calibrate controls. Start-up to be by authorized manufacturer's representative or agent.

3.2 INSTALLATION OF PUMPS

A. All equipment, unless otherwise shown or noted on the Drawings, is to be installed in accordance with industry standards and manufacturer's recommended installation instructions.
B. Provide vibration isolation, inertia bases, seismic snubber, flexible pipe connections, etc, as specified on the drawings and specifications.
C. For variable flow pumping applications, see Section 23 09 02 Variable Frequency Drives for additional requirements.
D. Install booster pump system controls and pressure sensors to comply with Energy Code Section C404.13.
E. Contractor to assist testing and balancing contractor in verifying correct pump rotation and system operation.
F. Flush and clean equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls.
G. Isolation for Service: Provide pump installations with a discrete isolation valve on both the supply and intake side of the pump to permit service of the pump and any related strainer, check or balancing valves.
H. Balancing Coordination and Impeller Trimming: Coordinate final pump flow with test and balance contractor. For pumps larger than 5 horsepower, if the system tests and balance indicate that flow exceeds the specified flow by greater than 20%, it is not acceptable to reduce flow merely by adjusting balance valves to create additional head or reducing VFD peak flows. Excess system flow must be reduced by trimming the impeller to match the load.

3.3 WATER HEATER EXAMINATION

A. Before water heater installation, examine roughing-in for equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual locations, sizes and other conditions affecting water heater performance, maintenance and operations.

B. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
C. Examine mechanical spaces for suitable conditions where equipment heaters will be installed. Coordinate with Owner's Representative if there are concerns about proposed equipment locations. Proceed with installation only after unsatisfactory conditions have been corrected.
D. WATER HEATER INSTALLATION
E. Install water heaters and tanks level on bases or platforms as required and as shown on drawings. Coordinate with Division 03 for concrete materials and installation requirements.
F. Install water heaters in accordance with local, state, provincial, and national codes, laws, regulations, and ordinances.
G. Comply with manufacturer's installation instructions, including required service clearances and venting guidelines.
H. Provide seismic anchorage attachments on vertical tanks heaters with support points at upper 1/3 and lower 1/3.
I. Assemble and install water heater ASME listed Pressure/Temperature Relief Valve.
J. Install electrical devices furnished with water heater but not specified to be factory mounted.
K. Install control wiring to field-mounted electrical devices.

3.4 WATER HEATER CONNECTIONS

A. Piping installation requirements are specified in other Division 22 sections. Drawings indicate general arrangement of piping, fittings and specialties.
B. Install piping adjacent to water heater to permit service and maintenance.
C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection and pitched for gravity flow.
D. For condensing water heaters, provide condensate neutralizer in condensate drain pipe before termination at floor sink or other approved termination.
E. Connect gas piping to water heater gas valve with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required at final connection.
F. Install flue venting and combustion air intake duct full size to water heater connections.
G. Connect cold and hot water piping to inlet and outlet connections with shutoff valves and dielectric union or flanges at each connection.
H. Multiple heaters shall be piped such that all cold water entering the system will go through the heat exchanger first. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.
I. Install piping from safety pressure and temperature relief valves to nearest floor sink or to the exterior of the building.
J. Install vacuum relief valve in incoming cold water pipe to water heaters.
K. Provide one (1) glass thermometer and thermowell in the hot water pipe on the discharge side of the water heater or water heating system. Thermowell shall be brass or stainless steel. Install thermowell into tee fitting within 36" of water heater outlet. Thermowell may be installed horizontally or vertically, but thermometer must be mounted vertically and positioned for easy reading from a standing position. Adjust installation of thermometer and thermowell to extend no more than 2" into water flow path. Thermowell probe shall not restrict the water flow in the hot water pipe, therefore the tee fitting must

be enlarged. Tee fitting diameter shall be oversized to equal, or exceed, the diameter of the supply water pipe plus the diameter of thermowell for the entire depth of thermowell probe.

L. Drain valve shall be readily accessible for installation of hose to facilitate maintenance draining. Elevate water heater and tanks, as necessary, to accommodate hose connection. See drawings for additional requirements.
M. Ground equipment according to Division 26 Section - Grounding and Bonding for Electrical Systems.
N. Connect wiring according to Division 26 Section - Low-Voltage Electrical Power Conductors and Cables.

3.5 WATER HEATER FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
   1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies and equipment installations, including connections, and to assist in testing.
B. Tests and Inspections
   1. Installation and Startup Test: Perform installation and startup checks according to manufacturer's written instructions.
   2. Leak Test: Repair leaks and retest until no leaks exist.
   3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air- fuel ratio and combustion, if necessary.
   4. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
      a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
      b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
C. Remove and replace malfunctioning units and retest as specified above.
D. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits for this purpose.

3.6 INSTALLATION OF AIR-TO-WATER HEAT PUMPS

A. Provide supports, independent of building structural framing members as indicated in Isolation & Tiedown Schedule – Equipment, Piping & Ductwork.
B. See Specification Section 23 05 48 Vibration Control of Mechanical Systems for requirements for vibration isolation.
C. Inspect isolated equipment after installation and submit report. Include static deflections.
D. Install condenser fan outlet acoustical hood.
E. Connect inlet and outlet domestic hot water piping.
F. Pipe condensate drain to roof drain. Heat trace and insulate condensate drain.
G. Clean and flush after installation. Seal until pipe connections are made.
H. Provide factory-authorized service representative to provide startup of the heat pump water heater, inspect components, assemblies, and equipment installations, including connections, and to assist in testing and training upon completion of the startup.

3.7 INSTALLATION OF DHW RECIRCULATION SYSTEMS

A. All equipment, unless otherwise shown or noted on the Drawings, is to be installed in accordance with industry standards and manufacturer's recommended installation instructions.
B. Install hot water recirculation piping to maintain required minimum hot water temperature to all plumbing fixtures. Hot water service piping to each fixture shall be minimized to provide hot water, minimum temperature of 95°F, within 10 to 30 seconds. Minimum recirculation piping shall not be less than 3/4” diameter.
C. Install hot water recirculation pump and accessories in accordance with Plumbing Code, manufacturer’s instructions, and approved Shop Drawings.
D. Provide isolation shutoff valves on inlet and outlet sides of hot water recirculation pump, sensors and fittings.
E. Provide automatic air relief vent at high point of recirculation piping within four feet of the inlet to the pump. Route the 1/4” relief vent tubing to an approved discharge receptor such as floor sink, janitor sink or outside landscaping.
F. Provide swing check valve at discharge side of the pump.
G. Provide a drain valve with hose bibb threads and brass cap downstream of the check valve to allow for startup air bleeding and maintenance draining of the system.
H. Provide electronic 7-day or 365-day programmable controller where required by Energy Code Section C404.7 to operate the recirculation pump during occupied and unoccupied periods. Controller shall have a minimum of four start/stop periods per day.
I. Provide aquastat temperature controller and remote temperature sensor where required by Energy Code Section C404.7 to disengage the recirculation pump when the return hot water temperature is greater than setpoint of 95°F (adjustable).
J. Install thermostatic balancing valve (TBV) in each domestic hot water return piping branch beyond last hot water device in that branch. Provide line size isolation valves and unions at each TBV for future maintenance. Provide suitable access panel as required in non-accessible ceilings and walls.
K. Coordinate with electrical installer to connect power and control wiring.
L. Contractor to assist testing and balancing contractor in verifying correct pump rotation and system operation.
M. Flush and clean equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls.

3.8 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify pump systems mounting, verify piping installation, verify control wiring, verify power wiring, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four hours of travel from the jobsite.

3.9 TESTING, ADJUSTING, AND BALANCING OF DHW RECIRCULATION SYSTEMS

A. Test and adjust flows, setpoints, and valves for proper operation.
B. See special balancing notes on plumbing drawings for further details.

END OF SECTION

SECTION 224000 –PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Water closets
   2. Urinals
   3. Flush valves
   4. Shower mixing valve assemblies
   5. Lavatories
   6. Stainless steel sinks
   7. Faucets
   8. Drains
   9. Wastes
   10. Service sinks
   11. Laundry sinks
   12. Drinking fountains
   13. Water coolers
   14. Garbage Disposals
   15. Wall hydrants
   16. Supplies with angle stops
   17. Fixture by others

B. Related Sections include the following:
   1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

C. Products installed but not furnished under this Section include:
   1. Owner-supplied fixtures, as indicated.
   2. Accessories, appliances, appurtenances, and equipment specified in other sections, requiring plumbing services or fixture- related devices, as indicated.

1.3 SUBMITTALS

A. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

B. Wiring diagrams for field-installed wiring of electrically operated units.

C. Color Charts

D. Operation and Maintenance Data: For plumbing fixtures to includes emergency operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
   1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" as required by State Code for plumbing fixtures for people with disabilities.
D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
F. Lead Free Requirements: All plumbing pipes, fittings, valves, fixtures, and other components in systems providing water for human consumption shall be ‘lead-free’ in accordance with the “Reduction of Lead in Drinking Water Act” and the “Safe Drinking Water Act”, where the term ‘lead-free’ is defined to mean – “not containing more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.”
   1. Lead-free products shall be compliant with the requirements of either NSF 61-G or NSF 372.
   2. Lead-free products shall bear a certified mark by a nationally accredited certification body.
G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
H. Comply with all applicable standards and other requirements specified for plumbing fixtures.

1.5 WARRANTY

A. Refer to Section 22 05 00 for warranty requirements.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
   2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
   3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 2 of each type.
   4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
   5. Flushometer Tank, Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than 2 of each type.
   6. Water-Closet Tank, Repair Kits: Equal to 5 percent of amount of each type installed.
   7. Toilet Seats: Equal to 5 percent of amount of each type installed.
   8. Electric Water Cooler Strainers: Equal to 100 percent of the amount installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.
B. Store plumbing fixtures on elevated platforms in a dry location.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURE BASIS OF DESIGN

A. See Plumbing Fixture Schedule on Plumbing Drawings for details on the plumbing fixtures.
B. Plumbing Fixtures Schedule provides only general performance guidance for the plumbing fixtures in finished areas. Owner and architect have not confirmed basis of design plumbing fixtures to date.
C. Contractor to include allowance and indicate preferred manufacturer and make of finished area plumbing fixtures included in their budget for owner review.
D. Plumbing fixture basis of design to be confirmed in IFC set based on further coordination with owner, architect, and contractor.
E. See architectural and plumbing drawings for further details.

2.2 PLUMBING FIXTURES, GENERAL

A. Provide plumbing fixtures and trim, fittings, other components, and supports as specified in the Plumbing Fixture Schedule on the Plumbing Drawings.
B. Provide plumbing fixtures and trim, fittings and other components that are certified in accordance with NSF 61 and NSF Annex G to contain less than 0.25% lead content, for all products in contact with drinking water.

2.3 MANUFACTURERS

A. Vitreous China Fixtures:
    1. American Standard
    2. Niagra
    3. Kohler
    4. Zurn One
    5. Sloan
    6. Toto
    7. Or equal
B. Stainless Steel Counter Sinks:
    1. Elkay
    2. Just
    3. Or equal
C. Flushometer:
    1. Sloan
    2. Zurn
    3. Or equal
D. Faucets:
    1. Chicago
    2. Delta

3. Zurn Aqua Spec
4. Or equal

E. Mop Basin:
1. Mustee
2. Or equal

F. Showers:
1. Chicago
2. Symmons
3. Powers
4. Zurn Temp Guard
5. Leonard
6. Delta Commercial
7. Or equal

G. Water Cooler:
1. Elkay
2. Or equal

H. Drinking Fountain:
1. Elkay
2. Or equal

I. Enameled Cast Iron Fixtures:
1. American Standard
2. Crane
3. Eljer
4. Kohler
5. Zurn One
6. Or equal

J. ADA Trap Wrap:
1. Truebro
2. Handi Lav-Guard
3. Brocer Products
4. Trap Wrap
5. Pro Wrap
6. Zurn
7. Proflo
8. Or equal

K. Toilet Seats:
1. Church
2. Bereke
3. Olsonite
4. Sperzel
5. Centoco
6. Proflo
7. Zurn
8. Bemis

9. Or equal

L. Plumbing Supports:
   1. Josam
   2. Wade
   3. Smith
   4. Zurn
   5. Watts
   6. Mifab
   7. Or equal

M. Traps and Supplies:
   1. Zurn Traps and Supplies
   2. Chicago
   3. Brass Craft
   4. Central
   5. Royal
   6. Dearborn
   7. T&S
   8. Keeney
   9. Or equal

N. Garbage Disposal:
   1. In-Sink-Erator
   2. Or equal

2.4 FAUCETS

A. Faucets General: Unless otherwise indicated, provide faucets that are solid, one piece cast brass with polished, heavy chrome-plate finish conforming to ASME A-112.18.1M. Lead content shall be less than 0.25%.

2.5 FITTINGS, EXCEPT FAUCETS

A. Fittings General: Unless otherwise specified, provide fitting fabricated of brass, with polished heavy chrome plate finish.
B. Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips, of depth adequate to conceal protruding roughing-in fittings.

2.6 SUPPLIES WITH ANGLE STOPS

A. Construction: Polished chrome plated solid brass construction. Plastic stems are not allowed. Lead content shall be less than 0.25%.
B. Cartridge: Slow compression, renewable cartridges designed to close with water pressure.
C. Supply Riser: 3/8” O.D. x 12” flexible copper, chrome plated supply riser.
D. Handle: Removable, chrome plated, 2 ¼” metal loose key tee.
E. Escutcheon: Chrome plated metal wall flange.
F. Performance:
   1. 20-125 psi rated operating pressure.
   2. 40-140°F rated operating temperature.

G. Codes: ASME A112.18.1M.

2.7 FLUSHOMETERS

A. Provide flushometers compatible with fixtures, with features and of consumption indicated.
B. Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.
C. Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.
D. Water Closet Flushometers: Furnish with the following features.
   1. Non-hold-open feature.
   2. Screw driver angle stop with seat bumper and cap.
   3. Metal oscillating handle actuation.
   4. Wall and spud flanges.
   5. Adjustable tailpiece.
   6. Vacuum breaker connection.
   7. Furnish flushometers with factory-set, field-adjustable water consumption per cycle:
      a. Consumption: See plumbing fixture schedule on plumbing drawings for maximum GPF
E. Urinal Flushometers: Furnish with the following features.
   1. Non-hold-open feature.
   2. Screw driver angle stop with cap.
   3. Metal oscillating handle actuation.
   4. Wall and spud flanges.
   5. Adjustable tailpiece.
   6. Vacuum breaker connection.
   7. Furnish flushometers with factory-set, field-adjustable water consumption per cycle:
      a. Consumption: See plumbing fixture schedule on plumbing drawings for maximum GPF

2.8 TOILET SEATS

A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.
B. Toilet Seats: Heavy-duty, commercial/industrial type, elongated, open front, solid plastic, with self-sustaining check hinge, less cover.

2.9 GARBAGE DISPOSALS

A. Disposals: Continuous-feed-type food waste disposer conforming to UL 430, horsepower motor and model in accordance with plumbing fixture schedule on plumbing drawings, overload protection, and wall-switch operated; corrosion-resistant construction, with quick-mounting feature, stainless steel sink flange, cushioned suspension, and stainless steel grinding chamber; jam-resistant cutting/shreding mechanism with swivel-mounted impellers on turntable, cast tool steel grinding ring, and cutlery steel undercutter blade; insulated housing for grinding chamber; and anti-splash guard and combination cover/stopper. Provide five year warranty.

2.10 WATER FILTER FOR WATER COOLERS

A. Capacity of 3000 gallons, 1.5 GPM, 105 psi. Conform to NSF/ANSI 42 and 53 for chlorine taste, odor, particulate Class 1 and lead reduction. Filter shall be integral to water cooler and installed in the factory.

2.11 PLUMBING FIXTURE SUPPORTS

A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.
B. Support categories are:
   1. Water Closet Carriers: Supports for wall-hanging water closets. Provided coated cast iron, floor-mounted carrier with adjustable connection and rough-in height, adjustable feet, ABS extension with integral test cap, chrome plated trim, coated accessories,and neoprene fixture gasket. Provide with cast iron, adjustable anchor feet for stability. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gage with carriers for wall-hanging water closets. Long barrel in vertical applications.
   2. Sink or Similar Fixture Carriers: Supports for wall-hanging sinks, lavatories or similar fixtures. Provide floor-mounted welded feet and supports with steel uprights and concealed arms. Provide with leveling and securing screws. Verify arm type with fixture.
   3. Urinal Carrier: Supports for wall hanging urinal. Provide floor-mounted welded feet and supports with steel upright, upper hanger plate, lower bearing plate and adjustable supporting rods.
   4. Water Cooler Carrier: Supports for wall hanging water cooler. Provide floor mounted welded feet and supports with steel uprights, upper hanger plate, lower bearing plate, adjustable rods and chrome plated trim. Provide bi-level type for bi-level water cooler.
   5. Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.
C. Support Types: Provide support of category specified, of type having features required to match fixture.
D. Provide supports specified if a part of fixture description, in lieu of category and type requirements above.
E. Subject to compliance with requirements, provide plumbing fixture supports from one of the following:
   1. Josam Mfg. Co.
   2. Smith (Jay R.) Mfg. Co.
   3. Wade; Subs of Tyler Pipe Corp.
   4. Zurn Industries; Hydromechanics Division
   5. Watts Drainage
   6. Mifab

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
   1. Carriers for following fixtures:
      a. Wall-hanging water closets.
      b. Wall-hanging fixtures supported from wall construction.
   2. Chair carriers for the following fixtures:
      a. Wall-hanging urinals.
      b. Wall-hanging lavatories and sinks.
      c. Wall-hanging drinking fountains and electric water coolers.
   3. Heavy-duty chair carriers for the following fixtures:
      a. Accessible lavatories.
      b. Fixtures where specified.
   4. Reinforcement for the following fixtures:
      a. Floor-mounted lavatories required to be secured to wall.
      b. Floor-mounted sinks required to be secured to wall.
      c. Recessed, box-mounted drinking fountains and water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing- in drawings, and referenced standards.
B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.
C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.
D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.
E. Install wall-hanging, back-outlet urinals with gasket seals.
F. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
G. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.
H. Fasten wall-mounted fittings to reinforcement built into walls.
I. Fasten counter-mounting-type plumbing fixtures to casework.
J. Secure supplies behind wall or within wall pipe space, providing rigid installation.
K. Set shower receptors and mop basins in leveling bed of cement grout.
L. Install stop valve in an accessible location in each water supply to each fixture.
M. Install trap on fixture outlet except for fixtures having integral trap.
N. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
O. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in Division 7. Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
B. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 22.
C. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
D. Replace washers or cartridges of leaking and dripping faucets and stops.
E. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
F. Review the data in Operating and Maintenance Manuals. Refer to Division 1 Section "Project Closeout."

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.
B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.
C. Protect interceptors during construction period, to avoid clogging with construction materials and debris, and to prevent damage from construction debris and traffic.

END OF SECTION

SECTION 230001 –MECHANICAL PE STAMP COVERSHEET

DIVISIONS: 230000 TO 238239
EXCLUDING SECTION 230548 VIBRATION CONTROL FOR HVAC (BY A3 ACOUSTICS)

SPECIFICATIONS ARE PREPARED BY:
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MECHANICAL ENGINEER: ERIC K. VANDER MEY

DATE OF SIGNATURE: PRELIMINARY

END OF SECTION

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION AND TEAM

A. Multifamily mid-rise apartment building Seattle, WA.
   1. Project includes commercial retail spaces that will be delivered as core and shell spaces for the initial buildout.
   2. See architectural drawings for a complete description of building areas, building height, building occupancies and uses, residential Group R-2 dwelling unit count, amenities, parking garage, and other building features.

B. See Architectural Code Basis “G” Drawing Sheets for further information on the code basis for the project, Note: Detailed “G” Drawing Sheets were not yet available for this schematic design drawing set.

C. Project Team:
   1. See architectural drawings for details on project team and contact information.
   2. Owner: SCIDpda/Friends of Little Saigon
   3. Architect: GGLO
   4. General Contractor: BNBuilders

1.2 PROJECT INTRODUCTION

A. Delta E Consulting is the Engineer of Record for the Mechanical, Electrical and Plumbing Systems. See MEP drawings and Division 22, 23, and 26 Specifications for contract document. The set will be utilized for bidding and selection of the MEP subcontractors. There will be an Issued for Construction (IFC) set that is issued after the subcontractors are selected.

B. This section aims to outline the approach for project design and delivery, upon which contractors are expected to prepare a bid for preconstruction and construction services. For additional information about the project requirements for bidding and contractor selection refer to the owner or general contractor request for proposal (RFP) document. If there are discrepancies between the RFP and the specifications/drawings please notify the owner or general contractor so that these can be resolved prior to the bid or contractor selection date.

C. All tasks covered in this section must adhere to the standards set forth in the General Conditions, Supplemental Conditions, Special Conditions, and Division 01 – General Requirements, including the fire

D. Discrepancies among drawings, this specification section, and other specification sections will not serve as a basis for determining project or cost exemptions. Decisions on exemptions due to document discrepancies will be determined based on the engineer of record's official responses to bid clarification inquiries or Requests For Information (RFIs).

1.3 DESCRIPTION OF BID DOCUMENTS

A. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment.

B. Drawings:
1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and details of installation.
2. Before proceeding with work check and verify all dimensions.
3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
4. Make adjustments that may be necessary or requested, to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
5. If any part of Specifications or Drawings appears unclear or contradictory, apply to the Owner's Representative for interpretation and decision as early as possible, including during bidding period.

1.4 RELATED DOCUMENTS

A. Specifications:
1. Specifications, in general, describe quality and character of materials and equipment.

B. Drawings:
1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and details of installation.
2. Before proceeding with work check and verify all dimensions.
3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
4. Make adjustments that may be necessary or requested, to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
5. If any part of Specifications or Drawings appears unclear or contradictory, apply to the Owner's Representative for interpretation and decision as early as possible, including during bidding period.

1.5 DEFINITIONS & ABBREVIATIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.

3. PEX: Cross-lined polyethylene (PEX-a)
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.6 CODES & STANDARDS

A. As required by the Building Code and jurisdictional requirements the Contractor is responsible for meeting all code, standard, and jurisdictional requirements not explicitly detailed in these specifications or drawings, but which may be reasonably inferred or implied from the nature of the project, must be provided as part of the contract. Contractor is responsible for requesting further information or clarifications in regard to meeting applicable jurisdictional requirements, code and standards if they find the contract documents do not clearly describe the project scope or intended means for code compliance.

B. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.

C. All accessible mechanical work shall comply with the Americans with Disabilities Act (ADA)and local amendments.

D. Mechanical equipment, electrical devices and wiring shall conform to the latest standards of NFPA 70. All materials and equipment covered under the UL Testing Laboratory Service must be certified by the Underwriters Laboratories for their intended use and bear the UL mark. ETL or CSA marks may also be used if they are accepted by the Authorities Having Jurisdiction (AHJs).

E. Mechanical equipment and systems shall comply with Energy Code requirements. Mechanical and plumbing equipment efficiencies to comply with certification and listing requirements of Energy Code Sections C403.3.2 and C404.2.

F. Equipment Short-Circuit Current Ratings (SCCR): The SCCR on unit nameplates must equal or exceed the AIC rating of the panel serving the equipment. All small package equipment must have a listing for a minimum of 5,000 AIC. Larger packaged equipment are required to be listed for at least 64,000 AIC, unless otherwise specified. The final SCCR is determined based on the Electric Contractor coordination study.

G. Perform all tests required by governing authorities and required by the contract documents. Provide written reports on all tests.

H. The following codes and standards apply to the design of the project:

CODES & STANDARDS ABBREVIATION LEGEND	
ABBREVIATION	**PROJECT SPECIFIC CODE REFERENCE**
ENERGY CODE	2021 SEATTLE ENERGY CODE FOR COMMERCIAL BUILDINGS (SEC-C)
BUILDING CODE	2021 SEATTLE BUILDING CODE WITH WASHINGTON STATE AMENDMENTS
ACCESSIBILITY CODE	2021 SEATTLE BUILDING CODE AND ICC A117.1-2009
SEISMIC CODE	ASCE 7-2016 AS REFERENCED BY 2021 SEATTLE BUILDING CODE
FIRE CODE	2021 SEATTLE FIRE CODE
MECHANICAL CODE	2021 SEATTLE MECHANICAL CODE
FUEL GAS CODE	2021 SEATTLE FUEL GAS CODE 2021 NATIONAL FUEL GAS CODE (NFPA 54) 2020 LIQUEFIED PETROLEUM GAS CODE (NFPA 58)
PLUMBING CODE	2021 SEATTLE PLUMBING CODE
BOILER CODE	2024 SEATTLE BOILER CODE
ELECTRICAL CODE	2023 NATIONAL ELECTRICAL CODE WITH 2023 SEATTLE AMENDMENTS (NFPA 70)
ELEVATOR CODE	ASME A17.1-2019 SAFEY CODE FOR ELEVATORS AND ESCALATORS WITH WASHINGTON STATE AMENDMENTS
NFPA STANDARDS	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS AS REFERENCED BY THE CODES ABOVE
SUSTAINABILITY	ESDS V4, WITH THE FOLLOWING CREDITS UNDER V3.0.1: 5.1A, 5.2A AND 7.5.

GENERAL NOTES:

DELTA E CONSULTING: TEMPLATE REV DATE: REVISED FOR PROJECT

A. WHERE DRAWINGS AND SPECIFICATIONS REFER TO THE "BUILDING CODE" (FOR EXAMPLE) THIS REFERS TO THE PROJECT SPECIFIC CODE LISTED IN THE TABLE ABOVE. SEE CODES & STANDARDS BASIS OF DESIGN IN THE DRAWINGS FOR FURTHER DETAILS REGARDING THE APPLICABLE CODE SUCH AS EFFECTIVE DATE, ETC.

1.7 SCOPE OF WORK

A. See mechanical drawings for an outline of the specific scope of work and mechanical systems for this project.
B. Specifications may include additional typical systems that may not be utilized for this specific project. Where system types or equipment types are not utilized for this specific project the contractor is not required to submit on these components.
C. Energy Code Compliance
   1. See project drawings and specifications for details on project energy code compliance.
   2. Energy code compliance is utilizing the prescriptive path in accordance with Energy Code Section C401.2 Item 1.
D. Sustainability Protocol Compliance
   1. Project is required to comply with ESDS v4 protocol. See project drawings and specifications for details on requirements.

1.8 PROJECT PRICING ALTERNATES

A. See owner or general contractor request for proposal (RFP) for a complete list of project pricing alternates (deductive or additive) that are required to be priced as part of the project milestone budgeting or contractor selection process.
B. See Table below for a list of project pricing alternates that have been identified for this project:

Alternate #	Pricing Alternate Description	MEP Impacts
ALT-01	**Base:** None **Alternate:** None	Divisions 22, 23, 26

1.9 INTERPRETATION OF PLANS

A. In general, the Drawings are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements.
B. Drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail of construction. All work shall be constructed from field measurements taken at the site. This shall include all rises, drops and offsets necessary to avoid structural members or equipment and materials installed by other trades. The contractor shall coordinate the ductwork and piping layout before construction. No additional costs will be allowed for piping and ductwork fabrications without field verification of available space. If it is found, before installation, that a more convenient, suitable or workable arrangement of any or all phases of construction would result by altering the arrangement indicated on the Drawings, the architect/engineer may require the contractor to change the arrangement of their work without additional cost to the owner.
C. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.
D. The drawings and specifications are intended to supplement each other. Any items shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed the same as if mentioned and shown.
E. The greatest quantity or more expensive work shall govern where there is a conflict noted anywhere on the drawings and/or specifications.

1.10 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
    1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
    2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
C. Lead Free Requirements: All plumbing pipes, fittings, valves, fixtures, and other components in systems providing water for human consumption shall be ‘lead-free’ in accordance with the “Reduction of Lead in Drinking Water Act” and the “Safe Drinking Water Act”, where the term ‘lead-free’ is defined to mean – “not containing more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.”
    1. Lead-free products shall be compliant with the requirements of either NSF 61-G or NSF 372.
    2. Lead-free products shall bear a certified mark by a nationally accredited certification body.

1.11 COORDINATION

A. Coordinate equipment and materials installation with all other building components.
B. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of re

quired access panels and doors. Allow ample space for removal of all parts that require replacement or servicing without impacting adjacent equipment or piping. This work shall include furnishing access doors required for install by others.

C. Joints and fittings shall not be located in inaccessible locations such as wall, floor and roof penetrations.
D. Refer to the acoustical specifications for additional installation requirements.
E. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
F. Coordinate the cutting and patching of building components to accommodate the installation of equipment and materials. Cutting, patching, and painting is by others.
G. All cutting or drilling of joists must adhere to requirements provided by the Structural Engineer.
H. Materials within plenums shall be noncombustible or shall be listed and labeled as having a flame spread index of not more than 25 and a smoke-developed index of 50 or less when tested in accordance with ASTM E84 (NFPA 255) or UL-2043.
I. All fire stopping of through penetrations and membrane penetrations is by the installing Contractor
J. Coordinate installation of floor drains and floor sinks with work of other trades. Finished floors shall slope to floor drains as shown on Architectural drawings. Floor sinks will typically be installed flush with surrounding floor. Review plans and design intent for floor sinks that may require elevated rims.
K. Pipes, pipe fittings, plumbing fittings and fixtures that come into contact with the wetted surface of a public water system or any plumbing in a facility providing water for human consumption shall be “Lead Free” and NSF 61/NSF 372 compliant.

1.12 PRODUCT SUBSTITUTIONS

A. Equipment manufacturer’s where indicated on the drawings are the basis for design. The contractor accepts responsibility for all design implications when providing approved equipment other than the design basis.
B. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics than the basis of design may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. Required electrical modifications must be approved by the Electrical Engineer and be provided at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
C. Dimensional and Weight Changes: Equipment with dimensions or weight different than the basis of design may be furnished provided such proposed equipment is approved in writing. The contractor is responsible for verifying proposed equipment maintains the design intent for access and serviceability and reserves space for future equipment where required. Cost implications to other trades are the responsibility of the contractor.

1.13 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified (refer to Division 01).

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
2. RFIs shall address single questions and related issues only.
3. All RFIs shall be thoroughly reviewed and approved by the General Contractor and/or Construction Manager for accuracy and need for information required before submittal to the Owner's Design Representative.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. General RFI requirements:
   a. All information required by RFI's in accordance with Division 01 specifications
   b. Project name.
   c. Date.
   d. Name of Contractor.
   e. RFI number, numbered sequentially and unique.
   f. RFI subject.
   g. Specification Section number and title and related paragraphs, as appropriate.
2. Specific RFI detail:
   a. Drawing number and detail references, as appropriate.
   b. Field dimensions and conditions, as appropriate.
   c. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   d. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
   e. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Allow a minimum ten business days for Engineer's response for each RFI, plus additional time for Architect and General Contractor to review and forward. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
1. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
2. The following Contractor-generated RFIs will be returned without action:
   a. Incomplete RFIs or inaccurately prepared RFIs.
   b. RFIs submitted without indication of review and approval for submission by General Contractor or Construction Manager.
   c. RFIs addressing multiple unrelated issues.
   d. Requests for approval of submittals or shop drawings.
   e. Requests for approval of product substitutions.
   f. Requests for approval of Contractor's means and methods.
   g. Requests for adjustments in the Construction Cost Sum or Contract Time.
   h. Requests for interpretation of Engineer's actions on submittals unless review comments indicate an RFI is required to clarify the contract documents.

1.14 SUBMITTALS

A. Provide submittals for all materials and equipment in accordance with Division 01 specification requirements.

B. Provide a list of all required submittal and timeline for submission and approval for owner and design consultant review.

C. Submittals and Shop Drawings:

1. Submit electronic copies of manufacturer's submittal sheets in one (1) coordinated package per Specification Division. Multiple submissions will not be accepted without prior approval of the Owner's Representative. Organize submittal sheets in sequential order aligned with matching specification section numbers.

2. Submittals to include at a minimum the following information in addition to the requirements required by the drawings and specifications:

a. General Information:

1) Project name and location
2) Architect company name and Engineer of Record Company Name
3) Contractor name(s) and contact information
4) Local vendor name and contact information
5) Manufacturer name and contact information
6) Applicable Energy Code Cycle project is permitted under. See "Codes and Standards" Section for details.

b. Schedule of all materials and equipment included in the submittal:

1) Electronic bookmarks will be provided to each product or equipment (by type or tag) listed in the Submittal Section Schedule.
2) Where electronic bookmarks are not provided submittal will be returned rejected and will not be reviewed until electronic bookmarks are added.

c. Energy Code and Sustainability Protocol Compliance:

1) Include all equipment efficiency required by the Energy Code
2) Include all information required by the project specific sustainability standard where applicable.

d. Parts:

1) Indicate in submittal of all equipment parts ship loose or ship separately that require assembly by the contractor.
2) Provide a list of all spare parts that will be provided and when they will be provided.

e. Startup: Description of responsible party for equipment startup. Where equipment startup is required by a manufacturer representative it shall be included. Provide a description of any all startup services provided by the material and equipment manufacturer.

f. Warranty:

1) Base warranty: Provide detailed description of material or equipment warranty including all items warranties are contingent upon.
2) Optional warranty: Provide a detailed description of optional warranties that need owner review and approval where required by the drawings or specifications.

3. Provide electronic copies of contractor coordinated shop drawings prepared to show details of the proposed installation. Copies of contract design drawings submitted to demonstrate shop drawing compliance will not be accepted.
4. Paper submittals will only be acceptable if specifically required by Division 01.
5. The reviewed submittals shall be converted into Operations & Maintenance Manuals at the completion of the project with additional information required. Refer to Division 01 for additional requirements.

1.15 CONTRACTOR COORDINATED SHOP DRAWINGS

A. The Contractor shall prepare Coordinated Shop Drawings for fabrication and installation of the systems. Coordinated Shop Drawings shall meet the following requirements at a minimum:
   1. Record the coordinated layout and installation of all piping, fixtures, HVAC equipment, ductwork, grilles, diffusers, fire sprinklers, lighting, audio/video systems, electrical services, and related components.
   2. Include all mechanical rooms and floor plans.
   3. Be keyed to the structural column grid and numbered in sequence.
B. Coordination and Conflict Resolution: Prior to completion of the Drawings, the Contractor shall coordinate the proposed installation, structural requirements, maintenance clearances, and minimum code required clearances, with the Owner's Representative and all other trades (including HVAC, Plumbing, Fire Protection, Electrical, and Structural Systems). In the event conflicts or interferences are identified, revise the layout as needed to resolve.
C. No equipment or material shall be fabricated, ordered, or installed until the General Contractor and Owner's Representative have approved the coordinated documents.
D. Shop Drawings (or electronic coordination models) shall be submitted on a floor-by-floor basis, in alignment with the building's construction schedule.
E. Preparation: Three-Dimensional Revit / BIM-Based Documents
   1. Provide a Revit model (or equivalent BIM data) showing all equipment and piping, including valves and fittings; dimension from column lines and indicate elevations (e.g., bottom of pipe above finished floor).
   2. Obtain and integrate BIM data from other trades (architectural, structural, HVAC, plumbing, electrical, fire alarm, low voltage, etc.) to ensure full coordination with other building systems.
   3. Incorporate all approved addenda items and change orders into the Revit model / BIM data.
   4. Provide necessary maintenance access clearances per manufacturer installation instructions and minimum code requirements.
   5. Distribute the Revit model and BIM input to all affected trades and coordinate additional adjustments as needed to avoid conflicts.
F. Conflict Notification: Advise the Owner's Representative in the event a conflict occurs in the location or connection of equipment. Contractor shall bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Owner's Representative of conflict.
G. Record Drawings: Final Coordination Drawings with all appropriate information added are to be submitted as Record Drawings at completion of project.

1.16 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "Project Record Documents." In addition to the requirements specified in Division 1, refer to specific sections for additional record documentation.

B. Record documents provided by the contractor will include redlines of the design architectural engineering drawings that comply with Energy Code Section 103.6. At a minimum the contractor will provide the following redlines for the following:
   1. Record documents will convey a record of the completed work if any work is removed from the project scope then redlines will indicate this.
   2. Redlines will include building envelope, mechanical, plumbing, electrical and control drawings red-lined, or redrawn, that show all changes to size, type and locations of components, equipment and assemblies.
   3. Record documents shall include the location and model number of each piece of equipment as installed.

1.17 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "Operating, Maintenance, and Warranty Data". Submit copies for review by Architect/Engineer. In addition to the requirements specified in Division 1, include the following information:
   1. Descriptive summary of function, normal system operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   4. Servicing instructions and lubrication charts and schedules.
   5. Warranty information for all mechanical items shall be included in one tabbed section.

1.18 SUMMARY OF PRODUCTS AND MATERIALS

A. This Section includes the following:
   1. Supports and anchors.
   2. Equipment and piping rails.
   3. Identification markers.
   4. Access doors and panels.
   5. Transition fittings
   6. Dielectric fittings
   7. Pipe sleeves
   8. Sleeve seals
   9. Escutcheons.
   10. Grout.
   11. Equipment and system-common requirements.

12. Painting.

1.19 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
C. Storage of materials and equipment shall not impede the work of other contracts.
D. Handling of equipment and products shall be according to manufacturers instructions and in compliance with the articles of their warranty.
E. Protect products from weather, unless product is slated for exterior installation. If outdoor storage is necessary, support products off the ground or pavement in watertight enclosures.

1.20 FIRE SAFETY PRECAUTIONS

A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phases of work.
B. At all times, access shall be maintained for fire department trucks to the building.
C. All welding brazing, cutting and sweating operations performed in vicinity of or accessible to combustible materials shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.
D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.
E. When necessary to do cutting, welding, brazing, sweating and similar work in vicinity of wood, in shafts, or vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire resistant blankets or similar approved coverings. In addition, a helper shall be stationed nearby with proper fire extinguishers (provided by the Contractor performing the work) to guard against sparks and fire.
F. Whenever combustible materials have been exposed to sparks, molten metal, hot slag or splatter, a person shall be kept at the place of work to make sure the smoldering fires have not been started. Whenever cutting or welding operations are carried on in a vertical pipe shaft, a person to act as a fireguard shall be employed to examine all floors below the point of cutting or welding. This fireguard shall be kept on duty after completion of work to guard against fires and shall examine each level after this time, prior to leaving. There shall be no exceptions to this requirement and failure to comply will be construed as negligence.

1.21 PERSONAL SAFETY REQUIREMENTS

A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions required in connection with his work, including regulations of the Occupational Safety and Health Administration (OSHA) and other governing agencies.

1.22 PERMITS, LICENSES AND FEES

A. The Contractor shall secure all permits and licenses, both temporary and permanent required for their work. The Contractor shall pay all fees and expenses required for the permits and licenses.
   1. The Contractor shall make all arrangements with each utility company and pay all service charges associated with new services or modifications to existing services.
   2. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.
   3. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.
   4. Comply with requirements of Division 00.

1.23 WARRANTY

A. Refer to general terms and conditions, as well as warranties and obligations defined in Division 1 of the specifications that provide basic warranty requirements for the entire project.
B. The warranties and corrective obligations provided under this section:
   1. Are in addition to, and not in lieu of, any other warranty, representation, covenant, duty or other obligation (including any corrective obligation) of the Contractor or Manufacturer,
   2. Have no relationship to the time when any warranty, representation, duty, covenant or other obligation of Contractor or Manufacturer may be enforced or any dispute resolution proceeding commenced and
   3. Are made by the Manufacturer to both the Contractor and the Owner and by the Contrator to Owner.
C. All equipment and systems shall be provided with a minimum one-year warranty, or longer, as defined in each subsequent specification section. Warranty shall include all parts, material, labor and travel.
D. Warranty Start Date: The start date for all warranty periods shall be defined as starting from the date of Substantial Completion which shall include the Certificate of Occupancy from the Authority Having Jurisdiction.
E. Refer to individual Specification sections for additional extended warranty requirements.
F. Provide complete warranty information for each item, to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
G. Nothing in any separate warranty or other document provided by Contractor or Manufacturer, or both, will apply to limit their liability or responsibility for damages arising out of or related to a breach of any warranty or corrective obligation.
H. Service during warranty period: Contractor shall provide maintenance as specified elsewhere during the 12-month warranty period.

1.24 GUARANTEE

A. The Contractor shall guarantee and service all workmanship and materials to be as represented by him and shall repair or replace, at no additional cost to the Owner, any part thereof which may become defective within the period of one (1) year, minimum, after the Certificate of Occupancy, ordinary wear and tear excepted.

B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in this work.

PART 2 - PRODUCTS

2.1 SUPPORTS AND ANCHORS

A. General: Comply with applicable codes pertaining to product materials and installation of supports and anchors, including, but not limited to, the following:
   1. UL and FM Compliance: Provide products, which are UL listed and FM approved.
   2. ASCE 7 (Latest Edition): American Society of Civil Engineers-Minimum Design Loads for Buildings and Other Structures.
   3. MSS Standard Compliance: Manufacturer's Standardization Society (MSS).
   4. SMACNA: Seismic Restraint Manual: Guidelines for Mechanical Systems.
   5. NFPA: Pamphlet number 13 and 14 for fire protection systems.
   6. Provide copper plated or plastic coated supports and attachment for copper piping systems. Field applied coatings or tape is unacceptable.

B. Horizontal Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated hangers and supports of one of the following MSS SP-58 types listed.
   1. Adjustable Steel Clevis Hangers: MSS Type 1.
   2. Adjustable Steel Swivel Band Hangers: MSS Type 10.
   3. U-Bolts: MSS Type 24.
   4. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
      a. Plate: Unguided type.
      b. Plate: Guided type.
      c. Plate: Hold-down clamp type.
   5. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast iron floor flange.
   6. Pipe Saddle Supports with U-Bolt: MSS Type 37, including steel pipe base support and cast iron floor flange.
   7. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast iron floor flange.
   8. Upper Attachment Side Beam Bracket: MSS Type 34
   9. Upper Attachment Side Beam Angle Bracket: MSS Type 34, UL listed and FM Approved.
   10. Pipe Guides: Provide factory-fabricated guides of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

C. Horizontal Cushioned Pipe Clamp: Where pipe hangers are called out to absorb vibration or shock install a piping clamp with thermoplastic elastomer insert. Cush-A-Clamp type by many manufacturers.

D. Vertical Piping Clamps: Provide factory-fabricated two-bolt vertical piping riser clamps, MSS Type 8 and or four-bolt riser clamps for heavy loads, MSS Type 42. Provide with 1” thick (minimum) neoprene pad on floor with 1/4" thick steel plate to distribute riser clamp weight to pad.

E. Hanger-Rod Attachments: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments of one of the following MSS types listed.

1. Steel Turnbuckles: MSS Type 13.
2. Steel Clevises: MSS Type 14.
3. Swivel Turnbuckles: MSS Type 15.
4. Malleable Iron Eye Sockets: MSS Type 16.
5. Steel Weldless Eye Nuts: MSS Type 17.

F. Building Attachments: Except as otherwise indicated by the Structural Engineering design, provide factory-fabricated building attachments of one of the following types listed.
   1. Concrete Inserts:
      a. MSS Type 18.
   2. Steel Brackets: One of the following for indicated loading:
      a. Light Duty: MSS Type 31.
      b. Medium Duty: MSS Type 32.
      c. Heavy Duty: MSS Type 33.
   3. Horizontal Travelers: MSS Type 58.
   4. Concrete Screw Anchors: For floor mounted attachments with maximum allowable pullout and shear force of 250 lbs. (1.1 kN) per anchor regardless of size.
   5. Powder-Driven Concrete Anchors:
      a. Only for existing concrete structures with minimum 4000 psi concrete compressive strength.
      b. Minimum embedment of 1” (25 mm).
      c. Maximum allowable load of 50 lbs (0.2 kN) per anchor.

G. Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping at hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with adjacent pipe insulation.
   1. Pipe Covering Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
   2. Insulation Protection Shields: MSS Type 40, 18" minimum, or of the length recommended by manufacturer to prevent crushing of insulation. High-density insulation insert lengths shall match or exceed shield length.
   3. Thermal Hanger Shields: Constructed of 360° insert of waterproofed calcium silicate (60 psi flexural strength minimum) encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation. Provide assembly of same thickness as adjoining insulation. Shield length shall match or exceed length of calcium silicate insert. Shield and insulation length shall be 4” for pipe diameters up to 2”, length shall be 6” for pipe sizes 2-1/2” to 6”, and 12” length (minimum) for sizes greater than 12” diameter. Alternate Shield: Polyisocyanurate Urethane with a minimum flexural strength of 60 psi, fully encased in SnappItz #360 PVC for pipe sizes to 6” diameter.
   4. Thermal Hanger Couplings: Constructed of high strength plastic coupling to retain tubing and joint insulation at clevis hangers and strut-mounted clamps.

H. Miscellaneous Materials:
   1. Metal Framing: Provide products complying with NEMA STD ML1.
   2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.

3. Cement Grout: Portland Cement (ASTM C150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C404, Size No. 2). Mix at a ratio of one-part cement to three-parts sand by volume, with minimum amount of water required for placement and hydration.
4. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required. Weld steel in accordance with AWS standards.
5. Pipe Brackets: Copper plated brackets and supports for various mounting options. Insulate brackets attached to metal studs with felt.

2.2 EQUIPMENT AND PIPING RAILS

A. Where equipment/pipe rails are not provided by other sections of Specification, provide prefabricated reinforced equipment rails as required for support of equipment and piping. Field built curbs are acceptable alternatives - provide detail of construction for review.

B. Standard equipment rail, unless otherwise noted, shall be constructed as follows:
1. Construct of heavy gauge galvanized steel with continuous welds on shell seams.
2. Provide internal reinforcing supports welded as required to meet application requirements.
3. Equipment rails to have raised 3" (minimum), 45° cant.
4. Equipment rails to have 1-1/2" x 1-1/2" wood nailer (minimum) and counterflashing.
5. Equipment rail height to be 6" (minimum) above roof deck.
6. Cant shall be raised to match roof insulation thickness.

C. Equipment rails to be constructed to meet equipment size and weight requirements. Provide tapered rails to match roof pitch where required. Coordinate with structural design and mechanical details for attachment through membrane.

2.3 IDENTIFICATION MARKERS

A. Mechanical Identification Materials: Provide products of categories and types required for each application as referenced in other Division 23 Sections. Where more than single type is specified for application, selection is installer's option, but provide single selection for each product category. Stencils, hand printed, painted, and felt pen markers are not acceptable.

B. Plastic Pipe Markers:
1. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially or fully cover the circumference of pipe, or insulated pipe, and to attach to pipe without fasteners or adhesive complying with ANSI A13.1. Minimum letter size shall be 1/2” high.
2. Pressure Sensitive Type: Provide pre-printed, permanent adhesive, color coded, pressure sensitive vinyl pipe markers, complying with ANSI A13.1. Secure both ends of markers with color coded adhesive vinyl tape.
3. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
4. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.
5. Nomenclature shall include service type and directional arrow as follows:
   a. Refrigerant: yellow background with black lettering.
   b. Other piping services: Comply with ANSI and ASME A13.1 standards.

c. Direction of water flow.

C. Plastic Duct Markers:
1. Provide duct labels to indicate the system and direction of flow. Submit a labeling product that is suitable for the surface to be labeled.
a. Pressure sensitive, 16” long by 2-1/4” high (minimum), 3 mil thick high gloss adhesive backed vinyl, 1-1/2” high letters, and color coded per ducted service.
2. Nomenclature shall include service type and directional arrow as follows:
a. Supply air green background with white lettering.
b. Return air: blue background with white lettering.
c. Relief air: blue background with white lettering.
d. Outside air: blue background with white lettering.
e. Exhaust air: blue background with white lettering.
f. Other air services: Comply with ANSI and ASME A13.1standards.
g. Direction of air flow.

D. Valve Tags:
1. Brass Valve Tags: Provide 1-1/2" diameter 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener. Fill tag engraving with black enamel.
2. Plastic Laminate Valve Tags (indoors only): Provide 3/32” thick engraved plastic laminate valve tags, with piping system abbreviations in 1/4" high letters and sequenced valve number 1/2" high, and with 5/32” hole for fasteners.
3. Valve Tag Fasteners: Provide solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

E. Access Panel Markers: Provide 1/16" thick (minimum) engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or device.

F. Plastic Equipment Signs:
1. Provide 4-1/2” x 6” (minimum) plastic laminate sign, ANSI A.13 color coded with engraved white core lettering. Minimum letter size shall be 1/2” high.
2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
3. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
a. Tag number
b. Equipment service.
c. Design capacity.
d. Other design parameters, such as pressure drop, entering and leaving conditions, rpm, etc.
4. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2”x11” bond paper, tabulate each equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

G. Underground-Type Plastic Line Markers: Provide 6" wide x 4 mils thick multi-ply tape, consisting of solid metallic foil core between 2 layers of plastic tape. Markers to be permanent, bright colored, continuous printed, intended for direct burial service.

2.4 ACCESS DOORS AND PANELS

A. Provide all access doors and panels to service equipment under this work, including those which must be installed, in finished architectural surfaces. Refer to other specification sections for specific access doors associated with ductwork and equipment.
B. Construction:
   1. Frame: 16-gauge steel (minimum).
   2. Door: 16-gauge steel (minimum) or two layers of 20-gauge steel (minimum) for double wall door construction.
   3. Hinge: 1" flange width, continuous piano hinge.
   4. Latching System: screwdriver latch, allen key latch or T-handle latch for non-public access areas. Cylinder key lock for public access areas. Cam latch for access to fire/life safety systems.
   5. Paint: white prime coated.
C. Size:
   1. Access doors shall be of a size to permit access and removal of equipment for servicing. Access door shall have same rating as the wall or ceiling in which it is mounted. Provide access panel for each trap primer, concealed valve, fire and combination fire/smoke dampers, volume dampers, and other equipment requiring access. Use no panel smaller than 12" x 12" for simple manual access, or smaller than 24" x 24" where personnel must pass through.
D. Architectural Coordination:
   1. Refer to Division 01 Architectural specifications and drawings for additional requirements for each surface. Contractor is to submit schedule of access panels for approval. Exact size, number and location of access panels are not shown on Plans.
   2. Included under this work is the responsibility for verifying the exact location and type of each access panel or door required to service equipment under this work and in the proper sequence to coordinate with construction schedule and with prior approval of the Owner’s Representative.
   3. Access doors in fire rated partitions and ceilings shall carry all label ratings as required to maintain the rating of the rated assembly.
   4. Submit markup of architectural plans showing size and location of access panels required for equipment access for approval by Owner’s Representative.

2.5 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
B. Plastic-to-Metal Transition Fittings: One-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
D. Plastic-to-Metal Transition Unions: MSS SP-107, four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
B. Insulating Material: Suitable for system fluid, pressure, and temperature.
C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 300 deg F.
D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
    1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
    2. Pressure Plates: Stainless steel. Include two for each sealing element.
    3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.9 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening. Provide brass material with polished chrome plated finish.

2.10 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.11 ELECTRICAL

A. General:
   1. All electrical material, equipment, and apparatus specified herein shall conform to the requirements of Division 26.
   2. Provide all motors for equipment specified herein. Provide motor starters, controllers, and other electrical apparatus and wiring which are required for the operation of the equipment specified herein.
   3. Set and align all motors and drives in equipment specified herein.
   4. Provide expanded metal or solid sheet metal guards on all V-belt drives to totally enclose the drive on all sides. Provide holes for tachometer readings. Support guards separately from rotating equipment.
   5. Provide for all rotating shafts, couplings, etc., a solid sheet metal, inverted “U” cover over the entire length of the exposed shaft and support separately from rotating equipment. Cover shall extend to below the bottom of the shaft and coupling, and shall meet the requirements of the State Industrial Safety Regulations.
   6. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings.
B. Quality Assurance:
   1. Electrical components and materials shall be UL or ETL listed/labeled as suitable for location and use.
C. Motors:
   1. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment Specifications.
   2. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
   3. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range. Unless otherwise noted on plans, all motors 3/4 HP and larger shall be rated for 3-phase operation above 200 volts. Unless otherwise noted on plans, all motors up to 1/2 HP shall be rated for 120-volt, single phase operation.
   4. Temperature Rating: Motor meets class B rise with class F insulation.
   5. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
   6. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design “B”, except “C” where required for high starting torque.
      a. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.
      b. VFD driven motors to be provided as inverter ready and equipped with a shaft grounding device.
      c. Bearings:

1) Ball or roller bearings with inner and outer shaft seals.
2) Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
3) Designed to resist thrust loading where belt drives or other drives product lateral or axial thrust in motor.
4) For fractional horsepower, light duty motors, sleeve type bearings are permitted.
5) Enclosure Type:
   a) Open drip-proof (ODP) motors for indoor use in clean air environments.
   b) Totally enclosed fan cooled (TEFC) motors for outdoor use and indoor application in dirty environments.
   c) Totally enclosed air over (TEAO) motors for motors in the airstream of cooling towers and fluid coolers.
   d) Guarded drip-proof motors where exposed to contact by employees or building occupants.
   e) Weather protected Type I for outdoor use, Type II where not housed.

d. Overload Protection: Built-in thermal overload protection where external overload protection is not provided and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
e. Noise Rating: “Quiet.”
f. Efficiency:
   1) Motors shall have a minimum efficiency per governing State or Federal codes, whichever is higher.
g. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

D. Starters and Electrical Devices:
1. Motor Starter Characteristics:
   a. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs.
   b. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.
2. Manual switches shall have pilot lights and all required switch positions for multi-speed motors. Overload Protection: Melting alloy or bi-metallic type thermal overload relays, sized according to actual operating current (field measured).
3. Magnetic Starters:
   a. Heavy duty, oil resistant, hand-off-auto (HOA), or as indicated, and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
   b. Trip-free thermal overload relays, each phase, sized according to actual operating current (field measured).
   c. Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division 23 Controls and HVAC Air Distribution sections.
   d. Built-in primary and secondary fused control circuit transformer, supplied from load side of equipment disconnect.
   e. Externally operated manual reset.
   f. Under-voltage release or protection for all motors over 20 hp.

4. Motor Connections: Liquid tight, flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Low Voltage Control Wiring:
   1. General: 14-gauge, Type THHN, color coded, installed in conduit.

F. Disconnect Switches:
   1. Fusible Switches: For equipment 1/2 HP or larger, provide fused, each phase; heavy duty; horsepower rated; spring loaded quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the “OPEN” position; arc quenchers; capacity and characteristics as indicated.
   2. Non-Fusible Switches: For equipment less than 1/2 horsepower, switch shall be horsepower rated; toggle switch type with thermal overload quantity of poles and voltage rating as required.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
   1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

D. Lead Containing Materials: The existing building may contain lead-containing materials, including lead paint. It is the Contractor’s responsibility to meet all governmental regulations when dealing with the disposing of lead containing materials.

3.2 EQUIPMENT AND SYSTEM INSTALLATION - COMMON REQUIREMENTS

A. Follow manufacturers' directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the Drawings or covered in these Specifications.
   1. If the contractor must deviate from the manufacturer's recommendations provide a letter from the manufacturer indicating the clearance to be provided is acceptable for scheduled performance and maintenance.
B. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
D. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
E. Install equipment to allow right of way for piping installed at required slope.
F. Install transition fittings where necessary to accommodate installed materials of construction.
G. Install dielectric fittings at all metallic joints of dissimilar metal.
H. Install chrome plated brass escutcheons for penetrations of walls ceilings, and floors that are not concealed above a ceiling.

3.3 SUPPORTS AND HANGERS

A. Prior to installation of hangers, supports, anchors, and associated work, installer shall meet at project site with the General Contractor, installer of each component of associated work, inspection and testing agency representatives, (if any), installers of other work with requirements specified.
B. Installation of Building Attachments: Install building attachments at required locations within concrete or on structural steel for proper piping support. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed. Fasten insert securely to forms. Where Gypcrete is indicated, install reinforcing bars through opening at top of inserts. Inserts and anchors shall be located no closer than 6" to any edge and no closer than 1" from any pre-tension cables or embedded steel and as required per manufacturer's instructions and Structural Engineer.
C. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including, but not limited to, proper placement of inserts, anchors, and other building structural attachments.
D. Install hangers, supports, rails, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers and rails where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
E. Install pipe supports (hangers, rails, etc.) within 12 inches of every change in piping direction (only one support required at each change in direction), end of pipe run or concentrated load, and within 36 inches of every major piece of equipment. Supports (hangers, rails, etc.) shall be installed on both

sides of flexible connections. Where flexible connection connects directly to a piece of equipment only one support is required.

F. Install hangers, rails, and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

G. Support sprinkler piping and gas independently of other piping.

H. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

I. Hanger spacing and rod sizes in compliance with Table 121.5 of ASME B31.1, ANSI/MSS SP-58 Table 4, and local mechanical code, but shall not exceed 12 feet for any pipe size. Comply with more restrictive requirements of local codes where those exceed the following minimum criteria.

J. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
   2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connecting equipment.
   3. Insulated Piping: Comply with the following installation requirements:
      a. Clamps: Attach clamps, including spacers, (if any), to piping with clamps projecting through insulation.
      b. Shields: Where low compressive strength insulation or vapor barriers are indicated on cold or chilled water piping, install shields or inserts.
      c. Saddles: Where insulation without vapor barrier is indicated install protection saddles.

K. Installation of Anchors:
   1. Install anchors at proper locations to prevent excessive stresses and to prevent transfer of loading and stresses to connected equipment.
   2. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure.
   3. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
   4. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends.

L. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

M. Equipment Supports:
1. Provide all concrete bases, unless otherwise furnished as work of Division 03. Furnish to Division 03 Contractor scaled layouts of all required bases, with dimensions of bases, and location to column centerlines. Furnish templates, anchor bolts, and accessories necessary for base construction. Coordinate size of concrete pads and placement of anchors bolts with structural design. Anchor bolts shall be placed to maintain 6”, minimum, or greater distance from concrete pad edges.
2. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks.

N. Adjusting:
1. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments.
2. Support Adjustment: Provide grout under supports to align piping and equipment to proper level and elevations.
3. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

O. Upper Building Attachments: Powder-actuated fasteners may be used where appropriate for construction materials to which hangers are being attached per the following:
1. Maximum allowable tension load shall not exceed 50 lbs. (0.2 kN) per attachment.
2. May only by used to supporting for ductwork up to two (2) square feet (0.2 m2) in cross sectional area and for control conduit clips.
3. May not be used for support of any piping, equipment, or ductwork greater than two (2) square feet (0.2 m2) in cross sectional area.
4. Use concrete inserts before placing concrete in new construction.
5. Install powder-actuated concrete fasteners after concrete is placed and completely cured to concrete compressive strength of 4000 psi or greater.
6. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
7. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
8. Do not use powder-actuated concrete fasteners for seismic restraints.

3.4 PENETRATIONS

A. All pipe and duct penetrations through rated and non-rated assemblies shall be sized to allow for compliance with structural integrity and fire ratings, as applicable. Penetrations of fire-resistance- rated assemblies shall be protected by an approved firestop system installed and tested in accordance with ASTM E814 or UL 1479. The system shall have an F rating/T rating of not less than the required rating of the floor or wall penetrated. Where sleeves are required, the sleeve size shall be in

stalled with the inside clear diameter providing clearances as required below. Coordinate the required opening sizes with the manufacturer of the fire protection products.

1. Uninsulated pipe penetrations through non-rated walls and floors: pipe penetration sizes shall be a 1” (minimum) to 2” (maximum) larger than the outside diameter of each uninsulated pipe.
2. Insulated pipes penetrations through non-rated walls and floors: pipe penetration sizes shall be a 1” (minimum) to 2” (maximum) larger than the outside diameter of each pipe, including insulation.
3. Uninsulated pipe penetrations through fire rated walls and floors, and through roof: penetration sizes shall be a 1/2” (minimum) to 1-1/2” (maximum) larger than the outside diameter of each uninsulated pipe to provide minimum 1/4” annular space between the outside of the pipe surface and assembly. Coordinate with specific manufacturer requirements and UL listing.
4. Insulated pipe penetrations through fire rated walls and floors, and through roof: pipe penetration sizes shall be a 1/2” (minimum) to 1-1/2” (maximum) larger than the outside diameter of each insulated pipe to provide minimum 1/4” annular space between the outside of the insulation surface and assembly. Coordinate with specific manufacturer requirements and UL listing.
5. Uninsulated pipe penetrations through foundation and basement walls: penetration sizes shall be larger than the outside diameter of each uninsulated pipe to allow adequate space for installation of mechanical link seals. Coordinate with specific manufacturer requirements.

3.5 ROOF CURBS

A. Install per manufacturer's instructions.
B. Coordinate with other trades so units are installed when roofing is being installed, as applicable.
C. Verify roof insulation thickness and adjust height of perimeter cant strips to accommodate insulation and roofing material installation.
D. Provide rigid insulation, minimum 1” thick, on exposed elements of roof curb.
E. Provide additional rigid insulation inside the roof curb perimeter secured to roof surface, around ductwork penetrations, to match the adjacent roof insulation levels (same R-value or greater).

3.6 EQUIPMENT RAILS

A. Install per manufacturer's instructions.
B. Coordinate with other trades so units are installed when roofing is being installed, as applicable.
C. Verify roof insulation thickness and adjust height of perimeter cant strips to accommodate insulation and roofing material installation.

3.7 IDENTIFICATION MARKERS

A. General: Where identification is to be applied to surfaces which require insulation, painting, or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
B. Piping System Identification:
   1. Install pipe markers on each system indicated to receive identification, and include arrows to show normal direction of flow.

2. Locate pipe markers as follows:
    a. Near each valve and control device.
    b. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
    c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
    d. At access doors, manholes, and similar access points which permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced horizontally at maximum spacing of 20' along each piping run, with minimum of one in each room.
    g. Vertically spaced at each story transversed.

C. Ductwork Identification: A minimum of every 50' for all ductwork, 12" or more in diameter or width, where ducts are concealed above accessible ceilings.

D. Mechanical Equipment Identification: Locate engraved plastic laminate signs on or near each major item of mechanical equipment and each operational device. Provide signs for the following:
1. Main control and operating valves, including safety devices.
2. Meters, gauges, thermometers, and similar units.
3. Cooling Tower and Pumps.
4. Fans.
5. Heat exchangers and similar equipment.
6. Balancing dampers and mixing boxes.
7. Packaged HVAC central-station and zone-type units.
8. Tanks and pressure vessels.
9. Strainers, filters, treatment systems and similar equipment.

E. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations. Equipment signs shall include an identification of the area or other equipment served by the equipment being labeled.

3.8 PIPE SLEEVE INSTALLATION

A. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    a. For pipes penetrating gypsum-board partitions: Schedule 40 steel pipe sleeves or steel sheet sleeves.
    b. For all penetrations other than gypsum board partitions: Cast iron sleeves or Schedule 40 steel sleeves.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Flashing" for flashing.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Sealants and Caulking" for materials and installation.

B. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install Schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

C. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Firestopping" for materials.

E. Verify final equipment locations for roughing-in.

F. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.9 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.10 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.11 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
C. Field Welding: Comply with AWS D1.1.

3.12 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.13 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.14 ELECTRICAL COORDINATION

A. Division 23 installers shall coordinate with Division 26 work to provide complete systems as required to operate all mechanical devices installed under this Division of work.
B. Installation of Electrical Connections: Furnish, install, and wire (except as may be otherwise indicated) all heating, ventilating, air conditioning, etc., motors and controls in accordance with the drawings and in accordance with equipment manufacturer’s written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA’s “Standard of Installation” to ensure that products fulfill requirements.

C. Division 23 has responsibilities for electrically powered mechanical equipment which is specified in Division 23 Specifications or scheduled on Division 23 Drawings as follows:
   1. Motors: Furnish and install all motors necessary for mechanical equipment.
   2. Magnetic Starters: Furnish all magnetic starters whether manually or automatically controlled which are necessary for mechanical equipment. Furnish these starters with all control relays or transformers necessary to interface with mechanical controls. If the starter is factory installed on a piece of Division 23 equipment, also furnish and install the power wiring between starter and motor.
   3. Variable Frequency Drives: Provide all VFD's associated with mechanical equipment. If the drive is installed on a piece of factory assembled equipment the wiring between motor and drive is to be provided as part of the factory equipment.
   4. Disconnects: Provide the disconnects which are part of factory wired Division 23 equipment. Factory wiring to include wiring between motor and disconnect or combination starter/disconnect.
   5. Controls: Division 23 Contractor (including the Controls subcontractor) is responsible for furnishing the following equipment in its entirety. This equipment includes but is not limited to the following:
      a. Additional control panels beyond what is identified on drawings shall be provided by the Controls contractor in order to provide a complete control system at no additional cost to Owner.
      b. Control relays necessary for controlling Division 23 equipment.
      c. Control transformers necessary for providing power to controls for Division 23 equipment.
      d. Line voltage thermostats.
      e. Low or non-load voltage control components.
      f. Remote bulb thermostats.
      g. Non-life safety related valve or damper actuators.
      h. Float switches.
      i. Solenoid valves.
      j. Switches.
      k. Refrigeration controls.
      l. Communications wiring and conduit between control devices and mechanical equipment.
      m. Raceway to support control cabling.
   6. Fire/Smoke Dampers: Division 23 is responsible for providing and physically installing the damper and for installing any required control interface wiring to Division 23 controls.
      a. Where fire/smoke dampers are part of an integrated smoke control system, Division 23 is responsible for providing dampers with necessary end switches for use by Division 28 in providing proof of closure.
      b. Where these dampers are not part of an integrated area wide smoke detection system, Division 23 is responsible for providing each fire/smoke damper with a dedicated duct detector installed per the requirements of the building code. If not integral with the damper assembly, the detector is to be installed in ductwork by Division 23 but wired to the damper controller by Division 26.

D. Division 26 Electrical Responsibilities:
   1. Controls Contractor shall initiate and coordinate a meeting with the Electrical Contractor and General Contractor to coordinate all controls component locations and wiring requirements prior to start of construction. All additional costs associated with lack of coordination shall be the responsibility of the Controls Contractor at no additional cost to the Owner.
   2. Additional power requirements, including conduit and wiring, for additional or relocated control panels and devices shall be coordinated and the responsibility of the BAS Controls Contractor at no additional cost to Owner.
   3. Motors: Provide power wiring for the motors from servicing panel to motor controller.
   4. Magnetic Starters: Except where magnetic starters are factory installed on Division 23 factory assembled equipment, Division 26 is to install magnetic starters furnished by Division 23 and install the necessary power wiring to the starter and from the starter to the motor. In the case of factory installed starters, Division 26 is to install the necessary power wiring from source panel/disconnect to the starter.
   5. Variable Frequency Drives: Provide the necessary power wiring to the VFD and from the VFD to the motor except in the case of factory installed VFD's where wiring between the motor and VFD is to be by Division 23.
   6. Disconnects: Provide all disconnects necessary for Division 23 mechanical equipment which are not provided as part of factory wired Division 23 equipment. Provide power wiring to all disconnects. In addition, provide power wiring between motor and disconnect when the disconnect is not factory installed.
   7. Controls: Division 26 is responsible for providing power to mechanical control panels and provide final power connection to Division 23 provided control transformers.
   8. Fire/Smoke Dampers: Division 26 is responsible for power wiring to each damper and as follows:
      a. Where these dampers are part of an integrated smoke control system Division 28 is responsible for providing the detectors and for all fire/smoke detection system wiring necessary to integrate dampers and related end switches into the system.
      b. Where these dampers are not part of an integrated area wide smoke detection system, Division 23 is responsible for providing each fire/smoke damper with a dedicated duct smoke detector installed per the requirements of the building code. If not integral with the damper assembly, the detector is to be installed by Division 23, but wired for damper control by Division 26.

E. Motors and Motor Control Equipment: Conform to the standards of the NEMA. Equip motors with magnetic or manual line starters with overload protection. Motor starters and line voltage controls shall be installed under Electrical Section but located and coordinated as required under this Section of the work. Starters shall be combination type with non-fusible disconnect switches. All single phase fractional horsepower motors shall have built-in overload protection.

END OF SECTION 23 05 00

SECTION 230548 - VIBRATION CONTROL OF HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this section.

1.2 WORK INCLUDED

A. Provide complete vibration control systems as shown or specified and in accordance with the requirements of the Contract Documents. Systems shall be complete with foundations, vibration isolation, and supports for rigidly supported equipment.

RELATED WORK SPECIFIED ELSEWHERE

B. Consult all other Section to determine the extent of work specified elsewhere but related to this Section. This work shall be properly coordinated to produce an installation satisfactory to the Owner. This work includes, but is not limited to the following:
   1. Fans
   2. Air Handling Equipment
   3. Ductwork
   4. Duct Insulation (External)
   5. Internal (Acoustical) Duct Insulation
   6. Pumps
   7. Piping
   8. Plumbing Fixtures
   9. Heating and Cooling Equipment
   10. Concrete Housekeeping Pads
   11. Noise and Vibration Control for Electrical Systems

1.3 CONTRACTOR'S RESPONSIBILITY

A. Verify the completeness of the isolation installation and the overall suitability of the equipment to meet the intent of this specification. Any additional equipment needed to meet the intent of this specification, even if not specifically mentioned herein or in the Contract Documents, shall be supplied by the Contractor without claim for additional payment.

B. Furnish and install seismic, wind, fire and flood resistance for all components specified in this Section in accordance with the requirements of the relevant portions of the applicable building code (IBC).

C. Performance or waiving of inspection, testing or surveillance for any portion of the work shall not relieve the Contractor of the responsibility to conform strictly with the Contract Documents.

D. In the event of a conflict between two or more requirements of this specification, submit a written Request for Clarification prior to furnishing or installing any equipment or systems.

1.4 MANUFACTURER'S RESPONSIBILITIES

A. Manufacturer of vibration isolation equipment shall have the following responsibilities:
   1. Provide vibration isolation systems as scheduled and specified.
   2. Guarantee specified isolation system deflection.
   3. Provide installation instructions, drawings and field supervision to ensure proper installation and performance.
   4. Determine all mounting sizes.
   5. Ensure that all equipment to be isolated has sufficient support structure to distribute equipment loads onto isolators. Provide additional support structure where required.
   6. Design seismic, wind, fire and flood resistance for all components specified in this Section in accordance with the requirements of the relevant portions of the applicable building code (IBC).

1.5 SUBMITTALS

A. Submit fully coordinated shop drawings for all vibration control equipment. These submittals shall state the acoustical performance of the products as described below.

B. Isolators: Submittal shall include drawings prepared by the isolation system manufacturer showing the construction of the isolation devices to be used, including project specific isolator selection.
   1. Submit vibration isolation system schedule indicating the following:
      a. Manufacturer, type, model number, size
      b. Static deflection of each isolation element
      c. Spring constant of each isolation element
      d. Estimated imposed load on each isolation element
      e. Spring o.d., free operating, and solid heights
      f. Design of supplementary bases
      g. Seismic restraints, including attachment calculations by the Seismic Restraint Manufacturer’s licensed Engineer substantiating the seismic restraints are furnished and installed in accordance with IBC and local building codes. A registered professional engineer having a PE from the same state as the project, or state of restraint manufacturer shall stamp all analyses, or as required by codes
      h. Layout of isolator hangers, mounts, and other elements shown on an outline of the isolated equipment, including complete details of attachment to load-bearing structure or supplementary framing
      i. Piping isolators shown and identified on piping layout drawings if required.
      j. Furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, and all required hanger bolts and other appurtenances necessary for the proper installation of vibration isolation equipment. Include drawings of all required seismic, wind, fire and flood resistance. All concrete foundations and supports (and required reinforcing and forms) will be furnished and installed by another trade

1.6 QUALITY ASSURANCE

A. It is the objective of this specification to control vibration due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork or conduit.

B. The installation of all vibration control systems shall be under the supervision of a manufacturer's representative.

C. All vibration isolation and seismic, wind, fire and flood resistance equipment and materials shall be provided by a single manufacturer. The following manufacturers are approved provided systems are in compliance with the specified design and performance requirements:
   1. Mason Industries, Inc.
   2. The VMC Group
   3. Kinetics Noise Control

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment provided for vibration isolation shall be new and manufactured specifically for the purpose intended.

2.2 VIBRATION ISOLATION SYSTEMS

A. GENERAL
   1. The static deflection of isolators shall be as given in the equipment schedule and specified below. The Vibration Isolation Schedule at the end of this section shall take precedence.
   2. All vibration isolators shall be selected in accordance with IBC, and all local building codes related to seismic, wind, fire and flood requirements.
   3. Vibration isolator sizes and layout shall be determined by the vibration isolator supplier.
   4. All vibration isolators shall have either known undeflected heights or calibration markings so that, after adjustment, static deflection may be verified.
   5. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer, and must be linear over a deflection range of not less than 50% above the design deflection.
   6. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than ±10%.
   7. All elastomeric mountings shall have Shore hardnesses of 30 to 60 ±5, or as specified herein, after minimum aging of 20 days or corresponding over-aging.
   8. Unless otherwise specified, steel spring isolation systems as described in the specifications shall utilize springs having diameter not less than 80% of the loaded operating height of the spring. Each spring isolator shall be designed so that the ends of the spring remain parallel during and after the spring installation. All isolators shall operate in the linear portion of their load versus deflection curve and have 50% excess capacity without becoming coil bound.
   9. All mounting systems exposed to weather and other corrosive environments shall be protected with factory corrosion resistance. All metal parts of mountings shall be provided

with a powder coat finish. Springs shall be powder coated, and shall have a minimum 1000 hour rating when tested in accordance with ASTMB-117. Nuts and bolts shall be cadmium plated, unless noted otherwise.

B. THRUST RESTRAINTS
1. Thrust restraints shall consist of a spring in series with an elastomeric pad. Restraint assembly shall be designed so it can be field adjusted to allow for a maximum of 3/8 inch movement at equipment start and stop. Restraint assembly shall be designed to sustain an overload force equal to 5 times the design force without failure. Attachment hardware is considered part of the restraint assembly if it is required for installation
2. Reference Section 3.02.A.2 for installation locations.
3. Thrust restraints shall be Mason Industries type WB or approved equal.

C. ISOLATOR TYPE NT
1. 3/8-inch thick neoprene sponge with adhesive on one side.
2. Kwik-Stik Gasket Tape or approved equal.

D. ISOLATOR TYPE NG
1. Vibration isolation grommets shall be elastomeric sleeves used to isolate hold-down bolts from equipment bases.
2. Mason model HG, or approved equal.

E. ISOLATOR TYPE WP
1. Type WP (Waffle Pads) shall be 5/16” thick elastomeric pads ribbed or waffled on both sides. The pads shall be manufactured with bridge bearing quality elastomeric material, and selected for a maximum durometer of 50 and designed for 15% strain. Where required, steel load-spreading plates shall be incorporated between the equipment and the elastomeric pad.
2. For equipment bolted to the structure, a vibration isolation grommet shall be installed under the bolt head between the steel washer and the base plate.
3. Mason Industries type W, or equal.

F. ISOLATOR TYPE SWP
1. Type SWP shall be a 3/4” thick waffle elastomeric pad manufactured with bridge bearing quality elastomeric material
2. For equipment bolted to the structure, a vibration isolation grommet shall be installed under the bolt head between the steel washer and the base plate.
3. Mason Industries model Super W, or equal.

G. ISOLATOR TYPE DDNM
1. Type DDNM (Double Deflection Elastomeric Mounts) shall be laterally stable, double deflecting, molded elastomeric isolators. All metal surfaces shall be covered with elastomeric material. The top and bottom surfaces shall be ribbed and bolt holes shall be provided in the base. The mounts shall have leveling bolts rigidly secured to the equipment.
2. The isolator shall be manufactured with bridge bearing quality elastomeric material, and selected for a maximum durometer of 50 and designed for 15% strain. DDNM mounts shall be selected for a static deflection of 3/8” unless otherwise specified.
3. Mason Industries type ND, or equal.

H. ISOLATOR TYPE DDNH
1. Type DDNH (Double Deflection Elastomeric Hangers) shall consist of a molded elastomeric isolating element in a steel hanger box. An elastomeric sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4” larger than the diameter of the hanger rod and permit the hanger rod to swing through a 30° arc. When installed, the hanger box shall be allowed to rotate through a full 360° without encountering any obstructions.
2. The isolator shall be manufactured with bridge bearing quality elastomer, and selected for a maximum durometer of 50 and designed for 15% strain.
3. Mason Industries type HD, or equal.

I. ISOLATOR TYPE BR
1. The mount shall consist of a ductile iron casting containing two separated and opposing molded elastomeric elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. Mount shall have a minimum static deflection of 0.2” and all directional seismic capability.
2. Mason Industries Type BR or equal.

J. ISOLATOR TYPE SPNM
1. Type SPNM (Spring and Elastomeric Mounts) shall have a free-standing and laterally stable steel spring without any housing. Springs shall be designed so that the ratio of the horizontal to vertical spring constant is between one and two. The spring diameter shall be not less than 80% of the compressed height of the spring at rated load. Loaded springs shall have a minimum additional travel to solid equal to 50% of the specified static deflection.
2. Isolator mounts shall be installed complete with 1/4” thick elastomeric pad between the isolator base plate and the supporting structure.
3. Mason Industries Type SLF, or equal.

K. ISOLATOR TYPE SPNH
1. Type SPNH (Spring and Elastomeric Hangers) shall consist of a steel spring in series with an elastomeric isolating element. The spring shall have a minimum additional travel to solid equal to 50% of the specified deflection. The elastomeric element shall have a static deflection of not less than 0.3” with a strain not exceeding 15%.
2. Spring diameter and hanger box hole size shall be large enough to permit the hanger rod to swing through a 30° arc. An elastomeric sleeve shall be provided where the lower hanger rod passes through the steel hanger box, such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 3/4” larger than the diameter of the hanger rod. When installed, the spring element shall not be cocked, and the hanger box shall be allowed to rotate through a full 360° arc without encountering any obstructions.
3. Mason Industries Type 30N, or equal.

L. ISOLATOR TYPE CSNM
1. Type CSNM (Constrained Spring and Elastomeric Mounts) shall be a housed spring and elastomeric mount that incorporates springs with built-in leveling device. CSNM mount shall incorporate resilient vertical restraints to prevent spring elongation when partial load is removed or when the unit is subjected to wind loading. Restraining bolts shall have an

elastomeric bushing between the bolt and the housing. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position mounts shall contain an internal elastomeric isolation pad.

2. A minimum clearance of 1” shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring operation. Limit stops shall provide minimum 1/4” clearance under normal operation, and an elastomeric washer shall be installed beneath the bolt head/ washer used to restrain the isolator.
3. Provide minimum 1/4” thick elastomeric acoustical base pad on underside of mount.
4. Mount shall be capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be identical.
5. Mason Industries Type SLR, or equal.

2.3 VIBRATION ISOLATION EQUIPMENT BASES

A. BASE TYPE CIB

1. Inertia base Type CIB (Concrete Inertia Base) shall have an integral rectangular structural steel form into which concrete is poured.
2. Perimeter members shall be beams of depth equal to 10% of the longest span of the base, but not more than 12” nor less than 6” deep. Forms shall include motor slide base and all reinforcing steel. Where anchor bolt locations fall in concrete, the reinforcing steel shall include drilled members with sleeves welded below the steel to accept the anchor bolts. Height saving steel brackets shall be used in all mounting locations.
3. When the concrete base is T-shaped, isolators shall be located under the projections as well as under the main body in order to prevent cantilever distortion.
4. The structural perimeter frame, mounting templates, height saving brackets, and spring system shall be provided as an assembly by the vibration control vendor.
5. Each inertia base (rectangular or "T" shape) shall include supports and base elbows for any suction and discharge connections to pumps. Base elbows shall be bolted and grouted to the inertia base.
6. Concrete inertia base shall be provided with a 2” minimum operating clearance between the base and housekeeping pads. The concrete inertia base shall be at least 6 inches wider than the pump frame.
7. Base shall be Mason Industries Type BMK or K, or equal.

B. BASE TYPE CMB

1. Base Type CMB (Curb Mounted Base) for roof-mounted equipment shall be a structural steel base mounted directly to the structure with an upper floating section on adjustable steel springs. The upper frame shall provide continuous support for the equipment. Steel springs shall rest on 1/4” minimum thickness elastomeric pads. All-directional elastomeric snubber bushings shall be minimum 1/4” thickness. All hardware shall be plated and the springs provided with a rust resistant finish.
2. Weatherproofing shall consist of a continuous galvanized flexible counterflashing nailed over the lower curb’s waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers to allow for adjustment or replacement of springs. Lower curbs shall have provision for 2” insulation.
3. Duct connections shall be made using a length of flexible duct dimensioned to match the equipment opening, using an elastomeric gasket to seal against the unit bottom.
4. Curb shall be Mason Industries Type RSC or equal.

C. BASE TYPE SCMB
1. Base type SCMB shall consist of an extruded aluminum top member that overlaps the bottom member to provide water runoff independent of the airtight seal. Aluminum members shall house electro-galvanized or powder coated springs selected for static deflection as given in the vibration isolation schedule at the end of this section. Travel to solid shall be 1.5” minimum. Spring diameters shall be no less than 0.8 of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 0.25” so as not to interfere with the spring action except in high winds. Manufacturer’s self-adhering closed cell sponge gasketing shall be used both above and below the base and a flexible EPDM connection shall seal the outside perimeter. Foam or other sliding or shear seals are not acceptable.
2. Curb shall be Mason Industries Type CMAB or equal.

D. BASE TYPE SB
1. Base type SB shall be a structural steel rectangular base with cross members where the longest beam dimension exceeds 6 feet, to prevent twisting.
2. Structural steel shall have a depth equal to 10% of the longest span between mounting locations, but not more than 12” nor less than 4” deep.
3. Use height-saving brackets in all mounting locations.

E. BASE TYPE RB – VERTICAL STEEL RODS
1. Base to consist of four vertical steel hanger rods attached to structure above. Rods are to be capable of carrying an equivalent of five time overload without failure or yielding. Unless otherwise specified, use hanger SPNH on all four hanger rods in series with the supported load.

2.4 FLEXIBLE CONNECTORS

A. FLEXIBLE DUCT CONNECTORS
1. FC-1:
a. Flexible sleeves for duct connections shall be fabricated from flexible, airtight, flame-retarded fabrics, coating, and adhesives complying with UL Standard 181 Class 1.
b. Extra-Wide Metal-Edged Connectors: Factory-fabricated with a strip of fabric 6” wide attached to 2 strips of 3” wide, 24-gauge galvanized sheet steel or 0.032-gauge aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition 2005, Figure 2-17.
c. Fabric: Glass fabric double coated with neoprene.
d. Minimum Weight: 26 oz per square yard
e. Minimum Tensile Strength: 480 lb per inch in the wrap and 360 lb per inch in the filling.
f. Durodyne “Neoprene”, or approved equal.
2. FC-2: High temperature Flexible Connector
a. Continuous Temperature Range: 1800o F
b. Fabric: Silica Fabric with one side silicone coated.
c. Minimum Weight: 36 oz per square yard
d. Minimum Tensile Strength: 480 lb per inch in the wrap and 300 lb per inch in the filling.
e. Sheet Metal Connectors Inc “Super Hi-Temp”, or approved equal.

B. FLEXIBLE PIPE CONNECTORS

1. FC-3: Spherical rubber expansion joint. Peroxide cured EPDM throughout with Kevlar tire cord reinforcement. The raised face rubber flanges must encase solid steel rings to prevent pull out. The connector shall be terminated at both ends with either a flange or threaded fitting. Connectors shall have a minimum burst pressure of 500 psi and a recommended maximum operating pressure that is greater than the design operation pressure at the temperature of the fluid. Control rods or cables should not be used unless specifically required by the manufacturer in writing.
   a. Spherical rubber expansion joints shall be Mason Safeflex, or approved equal.

2. FC-4: Where system pressure or contaminants dictate their use instead of EPDM flexible pipe connections, flexible metal hoses shall be used to isolate equipment from piping. Flexible metal hoses shall have stainless steel braid and carbon steel fittings. Sizes 3" (75mm) and larger shall be flanged. Smaller sizes shall have male nipples. Metal hoses length shall be a minimum of ten times the nominal pipe diameter. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.
   a. Flexible metal hoses shall be Mason type MN, or approved equal.
3. FC-5: Flexible pipe coupling provides allowances for controlled absorption of movement and dampens noise and vibration. Install in the 3 Victaulic flexible coupling arrangement as per the Manufacturer's recommendations.
   a. Victaulic Type 77 or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. All rotating or reciprocating equipment shall be mounted on or suspended from vibration isolators as specified herein or as shown on the drawings. Where a discrepancy between the drawings and this specification exists, the specification shall govern.

B. All rotating or reciprocating equipment mounted on vibration isolators shall be installed in accordance with the relevant requirements of IBC with respect to seismic, wind, fire and flood resistance.

C. Furnish and install vibration isolation grommets for hold-down bolts to prevent any metal to metal contact.

D. Piping, ductwork, conduit or mechanical equipment shall be supported from building structure, not hung from or supported on other equipment, pipes, or ductwork.

E. Vibration isolated equipment connected to water or other fluid piping shall be erected at correct operating heights prior to connection of piping. When the system is assembled and fluid is added, the isolators shall be adjusted to allow removal of temporary blocking and shims.

F. Elastomeric isolators that will be exposed to temperatures below 32° F shall be fabricated from natural rubber.

G. Install all springs such that the ends of springs remain parallel. All springs shall be installed with adjustment bolts.

H. Vibration isolators shall be selected to be non-resonant with equipment forcing frequencies or supporting structure natural frequencies.

I. Refer to Vibration Isolation Schedule at the end of this Section for specific vibration isolation requirements.

3.2 FAN ISOLATION

A. GENERAL
1. Fans and air handling units shall be leveled with the fans operating before the flexible connectors are attached.
2. Thrust restraints shall be installed on all fan heads, ceiling suspended fans, and air-handling equipment operating at 2 in. of water or more total static pressure. Thrust restraints shall incorporate the same static deflection as the unit isolators (as given in the Vibration Isolation Schedule at the end of this section). Install thrust restrains as near as possible to the centerline of thrust.
3. Drain pipes for air handling units shall be supported only from the isolated air handling unit frame. The condensate shall drip into a funnel that is supported from the floor or floor drain. A gap of at least 2” shall be maintained between the end of the air handling unit drain pipe and funnel or floor drain.

B. FLOOR MOUNTED PACKAGED AIR HANDLING UNITS
1. Where the unit to be mounted is not furnished with an integral structural frame or external lugs, or where the furnished unit has any severe overhangs, an additional structural frame shall be furnished and installed beneath the unit.
2. The motor shall be integrally mounted to the unit and shall be mounted on slide rails.

C. SUSPENDED FANS AND AIR HANDLING UNITS
1. Fans suspended from overhead structure shall be hung on vibration isolators as given in the Vibration Isolation Schedule at the end of this section.
2. Fans shall be suspended from above only if expressly noted as such on the drawings and schedules.

D. ELECTRICAL CONNECTIONS
1. Electrical connections to rotating and reciprocating equipment shall be made using flexible electrical conduit installed with slack.

3.3 PUMP ISOLATION

A. GENERAL
1. Flexible pipe connectors shall be installed on both sides of each pump between the pump and the inlet and discharge piping. Inlet and discharge piping shall be aligned with the pump prior to installation of flexible pipe connectors. Flexible pipe connectors shall not be used to correct equipment offsets. Flexible pipe connectors shall not support any of the vertical load of the pump or associated piping.

3.4 VIBRATION ISOLATION OF MECHANICAL SYSTEM PIPING

A. GENERAL
1. Where supplementary steel is required to support piping, the supplementary steel shall be sized so that maximum deflection between supports does not exceed 0.08 inches. Supplementary steel shall be supported from the building structure with vibration isolation mountings and hangers as described below. Piping shall be rigidly attached to the supplementary steel.
2. Where isolated piping 8” and larger is supported directly below exposed steel beams, attachment to the beam shall be made by means of welded channel beam attachments located directly under the web of the beam. For piping 6” and smaller beam clamps may be used in lieu of welding subject to approval of beam clamp selection.

B. PIPES CONNECTED TO EQUIPMENT ON SPRING ISOLATORS
1. Piping noted for vibration isolation in the Vibration Isolation Schedule below, except sprinkler piping, shall be suspended on or supported by Type SPNH or Type CSNM isolators. Provide vibration isolation anchors and guides as specified elsewhere in this specification.
a. Provide precompressed type isolators for all piping greater than 6 inches in diameter and all supplementary steel supports. The precompression shall be factory set at 75% of rated deflection.
2. Where noted in the Vibration Isolation Schedule, the first three isolators both upstream and downstream of equipment on springs shall have a static deflection equal to that of the equipment isolators, up to a maximum of 2”.

C. PIPES CONNECTED TO EQUIPMENT ON ELASTOMERIC ISOLATORS
1. Piping greater than 2” in diameter that is connected to machinery installed on elastomeric isolators only shall be either supported from the floor on Type DDNM mounts or suspended from the structure on Type DDNH hangers.
2. Piping with diameter 2” or less that is connected to machinery installed on elastomeric isolators only shall be isolated using external thermal insulation wraps at support points or acoustical clamps and/or hangers (AcoustoPlumb®, HoldRite® Silencer®, or equal).

D. PIPES WITH MULTIPLE CONNECTIONS
1. Where a pipe run connects multiple items of equipment in the mechanical room the pipe isolators for the entire run shall be chosen to suit the connected equipment of greatest static deflection.

E. FLEXIBLE PIPING CONNECTORS
1. Flexible pipe connectors shall be installed to connect piping attached to all equipment with vibration isolation supports.

F. PRESSURE REDUCING VALVES
1. Pressure reducing valves and associated piping shall be suspended by or supported on type DDNH or type DDNM isolators for the first three points of support upstream and down stream.

G. CONDENSER WATER PIPING
1. Isolate all condenser water piping running inside the building between cooling towers and pumps with type SPNH isolators for all suspended piping and Type CSNM for floor or roof

supported piping. All condenser water piping isolators shall have a minimum static deflection of 1 inch.

3.5 FIELD QUALITY

A. Contractor shall work in accordance with best trade practices, shall fabricate and install all items in accordance with manufacturer's recommendations and Architect's directions, and shall consult with trades doing adjoining work in order to provide an installation of first class quality.

3.6 ADJUSTMENT AND TESTING

A. SITE ACCESS
1. During installation of equipment, Contractor shall arrange for access as necessary for inspection of isolation and noise control equipment by Architect and his representatives.

B. CONTRACTOR'S REPORT
1. The vibration isolation vendor shall inspect and approve the installation of the vibration isolators and shall submit a report to the Owner that verifies that all of the isolation equipment has been properly installed and that the installation is in full conformance with the specification. The report shall record the vibration isolator identification and model or type. For isolators containing steel springs the report shall also record the size and uncompressed height, design static deflection and measured static deflection of the isolators provided.

C. CONSULTANT'S OBSERVATION
1. Notify the Architect in writing upon completing installation and adjustment for suitable operation of all work specified under this section. The letter shall certify that all work specified under this section is complete, operational and adjusted in every respect, and that all work is ready for the completion checkout.
2. For each inspection, Contractor shall perform such functions as are necessary for inspection of the equipment. Background noise level testing may be carried out upon request during late-night hours when ambient noise from outside is at a minimum and the site is otherwise not occupied and no work is under way. Contractor shall turn on and off any and all mechanical equipment during such background noise level testing.

3.7 GUARANTEE

A. If, in the actual installation, any equipment fails to meet the vibration control requirements specified herein, that equipment shall be corrected or replaced without claim for additional payment, inclusive of all labor and material costs. Such corrective measures shall be done within a time schedule specified by the Owner.

3.8 VIBRATION ISOLATION SCHEDULE

A. SCHEDULE:

Equipment	Isolator	Deflection in Inches	Base	Flexible Connector	Notes
Rooftop Package Unit					
RTU-R-1, 2	CSNM	2.0	-	FC-1	1, 2, 3

Equipment	Isolator	Deflection in Inches	Base	Flexible Connector	Notes
Heat Pump Water Heaters					
AWHP-R-1	CSNM	2.0	-	FC-3	1, 2, 3
Fans					
FN-1-1, 2, 3, 4	DDNH	0.3	RB	FC-1	1, 2, 3
FN-R-4, 5, 7	CSNM	1.0	-	FC-1	1, 2, 3
FN-R-6	CSNM	2.0	-	FC-1	1, 2, 3
Energy Recovery Ventilators					
ERV-2-2, ERV-RES	NG	-	-	-	1, 2, 4
ERV-1-1	DDNH	0.3	-	FC-1	1, 2, 3
ERV-2-1	SWP	0.1	-	FC-1	1, 2, 3
VRF Fan Coil Units (Indoor)					
Horizontal Ducted	DDNH	0.3	RB	FC-1	1, 2, 3
Ceiling Cassettes	NG	0.1	-	-	1, 2
VRF Condensing Units (Outdoor)					
CU-#-#	DDNM	0.3	-	-	1, 2, 5
Plumbing					
EWH-1-1	SWP	0.1	-	FC-3	1, 2, 3
DBP-1-1	DDNM	0.3	-	FC-3	1, 2, 3
IBP-R-1	NG	0.1	-	-	1, 2

B. NOTES:

1.	See Section: Seismic Anchorage and Restraints.
2.	See Mechanical and Structural Drawings.
3.	Install flexible duct/pipe/conduit connectors as applicable for all vibration isolated equipment.
4.	Install on neoprene isolation washer grommets at bolt connections.
5.	If units are located over bedrooms, install on springs sized for 1.0” static deflection.

END OF SECTION 230548

SECTION 230549 – SEISMIC CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Seismic restraint and support of piping, ductwork and mechanical equipment as required by code and as designed by a registered Professional Structural Engineer for each related nonstructural equipment restraint.
   2. Mechanical component supports and the means how they are attached to the mechanical component shall be designed for the forces and displacements determined in ASCE 7 Chapter 13. Such supports include structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the mechanical component.
   3. All ductwork designed to carry toxic, highly toxic, flammable gases or used for smoke control shall be seismically braced regardless of size or location.

1.2 DEFINITIONS

A. AHJ: Authority Having Jurisdiction.
B. ASCE: American Society of Civil Engineers.
C. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.
D. IBC: International Building Code with Amendments.
E. ICC-ES: ICC-Evaluation Service.
F. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.
G. Mechanical Attachments: Means by which components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.
H. Mechanical Supports: Those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.
I. Mechanical Components: Elements, including, but not limited to, pumps, air handling units, boilers, chillers, pipes, ductwork, and exhaust fans.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 230548: Vibration Control for HVAC.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide systems that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.
B. Structural Performance: Restraint devices and systems shall withstand the effects of locally defined gravity loads, seismic loads, dead loads, live loads, winds loads and stresses within limits and under conditions indicated per the local Building Code and ASCE 7. Coordinate all support structures and restraint systems with project registered professional Structural Engineer.
C. Special Inspections: Provide structural design and Special Inspections as required by Chapter 17 of the IBC, the Authority Having Jurisdiction, and as defined in the manufacturer installation instructions for each anchorage system. Per IBC Section 1705 all anchors post-installed in hardened concrete members shall have periodic Special Inspections. Special inspection agencies shall be independent of the design and construction companies and shall act as agents for the AHJ but contracted directly with the Owner or Owner's Representative.
D. Codes and Standards: Provide components conforming to the seismic load requirements of the latest addition of the local building code and the following:
    1. International Building Code with State Amendments
    2. ASCE 7 (Latest Edition) - Minimum Design Loads for Buildings and Other Structures
        a. Ductwork and piping requirements defined in Chapter 13 Seismic Design Requirements for nonstructural Components.
        b. Seismic Design Categories, B through F, are defined in Chapter 12, Table 12.6-1. Seismic Design Category B and C apply to all structures. While Seismic Design Categories D, E and F may apply to Category I and II buildings not exceeding two stories, light frame construction and/or structures not exceeding 160 in height.
        c. Nonstructural components in Seismic Design Category A are exempt from seismic design requirements.
    3. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems (Latest Edition.
        a. Seismic guidelines for ductwork and piping bracing as adopted by Authority Having Jurisdiction.
    4. ASHRAE – Practical Guide to Seismic Restraint (Latest Edition).
    5. Mason West Inc. - Seismic Restraint Guidelines (Latest Edition).
        a. For all suspended piping, suspended ductwork.

1.5 APPLICABILITY

A. Seismic restraints are required for nonstructural mechanical systems, but may not be required for the following conditions related to nonstructural components per ASCE 7 Section 13.1.4:
    1. Mechanical components in Seismic Design Category B facilities.
    2. Mechanical components in Seismic Design Category C facility if the component Importance Factor, Ip, is equal to 1.0.
    3. Mechanical components in Seismic Design Categories D, E, or F facilities where all of the following apply:
        a. The component Importance Factor, Ip, is equal to 1.0;
        b. The component is positively attached to the structure;

c. Flexible connections are provided between the component and associated ductwork, piping, and conduit; and any of the following applies:
   1) The component weighs 400 lbs. (1,780 N) or less and has a center of mass located four feet (1.22 m) or less above the adjacent floor level; or
   2) The component weighs 20 lbs. (89 N) or less; or
   3) The distributed ductwork or piping system weights 5 lbs./ft. (73 N/m) or less.

B. Provide seismic bracing at the following locations per SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems (Latest Edition):
   1. Piping:
      a. Transverse bracing shall be provided at 40 feet (12.2 m) maximum except where a lesser spacing is indicated in SMACNA tables.
      b. Longitudinal bracing shall be provided at 80 feet (24.4 m) maximum except where a lesser spacing is indicated in SMACNA tables. Anchor locations for thermal expansion may be used as longitudinal braces. Longitudinal braces must be capable of resisting the additional force induced by expansion and contraction.
   2. Ductwork:
      a. Transverse bracing shall be provided at 30 feet (9.2 m) maximum except where a lesser spacing is indicated in SMACNA tables.
      b. Longitudinal bracing shall be provided at 60 feet (18.4 m) maximum except where a lesser spacing is indicated in SMACNA tables.
   3. Equipment:
      a. All equipment weighing more than 400 lbs. (1,780 N) shall be seismically braced or attached directly to structure.
      b. All suspended mechanical components weighing more than 20 lbs. (89 N) shall be seismically braced, unless the following criteria applies for components up to 75 lbs.
      c. All equipment installed in-line with the duct system with a weight greater than 75 lbs. (334 N), such as fans, heat exchangers and humidifiers, must be supported and laterally braced independent of the duct system.

C. Seismic restraints may be omitted where the following conditions apply and as allowed by the local Authority Having Jurisdiction (AHJ):
   1. Ductwork supported by hangers and each hanger in the duct run is 12" (305 mm) or less in length from the duct support point to the supporting structure.
   2. Ductwork cross-sectional area is less than six (6) square feet (0.557 m2), round ductwork is 32 inches (0.8 m) in diameter or less, or weighs 17 lbs./ft. (248 N/m) or less.
   3. Pipes suspended by hangers 12" (305 mm) or less in length from the top of the pipe to the bottom of the supporting structure for the hanger. Where pipes are supported by trapeze, the trapeze shall be supported by hangers having a length of 12” (305 mm) or less.
   4. Pipe bracing is not required where the following conditions apply:
      a. For Seismic Design Category C where the Ip value is greater than 1.0 and pipe sizes are 2” (50 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).
      b. For Seismic Design Category D, E, or F where the Ip is greater than 1.0 and pipe sizes are 1” (25 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).
      c. For Seismic Design Category D, E, or F and where the Ip equals 1.0 and pipe sizes are 3” (80 mm) in diameter or less, and piping weighs less than 10 lbs./ft. (146 N/m).

D. Seismically restrained systems shall not move more than 2” when pushed and shall not impact the building structure or other nonstructural components.

1.6 PERFORMANCE REQUIREMENTS

A. Component Importance Factor and Risk Category:
   1. Ip=1.0: Standard Occupancies and components associated with Risk Category I, II, and III, including offices and schools.
   2. Additions, alterations, and repairs involving nonstructural mechanical components in structures designed in accordance with pre-1973 building codes may have a Component Importance Factor of Ip=1.0. However, components required to operate for life-safety purposes after an earthquake, including emergency and standby power systems, smoke removal system, smoke control system, stair and elevator pressurization systems, fire alarm panels and egress stairways shall have an Ip=1.5.

B. Building Seismic Design Category:
   1. The directions of application of seismic forces used in the design shall be those which will produce the most critical load effects. Seismic Design Categories are classified as B, C, D, E or F. Refer to Architectural and Structural Designs for project specific classification.

C. Mechanical Seismic Coefficients for Mechanical Components:
   1. Refer to ASCE 7 Table 13.6-1 for ap factor (component amplification factor) and Rp factor (component response modification factor) as required for each unique mechanical component.

1.7 SUBMITTALS

A. Product Data:
   1. Include rated load, rated deflection, and overload capacity for each device or system.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service or agency acceptable to authorities having jurisdiction.
      b. Annotate to indicate application of each product submitted and compliance with requirements.
   3. Submit seismic brace product details from the Mason West Seismic Restraint Guidelines detailing compliance with the specifications.
   4. Where products from the Mason West Seismic Restraint Guidelines cannot be used, special details must be submitted for approval.

B. Seismic Restraint Calculations
   1. Seismic restraint calculations must be provided for all connections to the structure.
   2. Calculations must be stamped by a registered professional Structural Engineer.
   3. Where seismic restraint sizes, spacing and anchorage are included in the Mason West Seismic Guidelines no further calculations are required.

1.8 ENGINEERED PIPING SYSTEMS

A. Where the piping system design indicated on the plans utilizes Mason Industries, Inc. - Mason West, Inc. seismic restraint components, vibration isolators, guides, anchors, expansion compensators and flexible connectors the following requirements apply:
   1. Mason Industries, Inc. - Mason West, Inc. products must be installed as shown.
   2. If product substitutions or design changes are made the contractor must provide certified design of the piping system and meet the following conditions:
      a. Certification must be provided by a registered professional Structural Engineer.
      b. Certification shall include a statement that all systems have been checked for loads and stresses and that no excessive loads or stresses exist.
      c. Forces on all anchors, guides, supports, and restraints must not exceed those shown in the original design unless the structure is checked for the larger loads at no cost to the owner.

B. Where the piping system design is not indicated on the drawings the design is delegated to the contractor with the following requirements for piping certification and analysis:
   1. The supports, anchors, guides and seismic braces for systems with significant thermal motion including steam, condensate, high temperature hot water and heating hot water systems must be designed for combined gravity, seismic, pressure and thermal loads.
   2. Small diameter pipes (2” diameter and smaller) may not require analysis as determined by the project registered professional Structural Engineer.
   3. The results of the analysis shall include reactions at restraints and anchors, maximum pipe displacements and a code compliant report indicating maximum pipe stresses.
   4. Where required, seismic restraint components, vibration isolators, guides, anchors, expansion compensators and flexible connectors manufactured by Mason Industries, Inc. and Mason West, Inc. shall be incorporated into the design of the systems.
   5. The analysis and design must be performed by a Structural Engineer with 5 years of experience in this field.

1.9 MANUFACTURER AND CONTRACTOR RESPONSIBILITIES

A. All seismic restraints shall be designed by a registered professional Structural Engineer.
B. Seismic restraint layouts for piping and ductwork shall be added to the contractor’s shop drawings and shall include:
   1. The number, size and location of seismic braces.
   2. Maximum support loads and seismic loads at the seismic brace locations.
   3. Reference to specific details or pages from the Mason West Seismic Restraint Guidelines.
C. Submit seismic restraint layout drawings and special details for approval of the project registered professional Structural Engineer per the requirements listed in the Mason West Seismic Restraint Guidelines.
D. Seismic restraint layout drawings shall bear the stamp and signature of the registered professional Structural Engineer who designed the layout of the braces.

1.10 LOADS ON STRUCTURE

A. The responsibility of determining allowable loads on the structure is the sole responsibility of the project registered professional Structural Engineer.
B. Maximum support loads and seismic brace loads on the structure must be less than the maximum allowable loads defined by the project registered professional Structural Engineer, as shown on the plans.
C. Where maximum loads are not listed on the plans or the maximum allowable loads cannot be met, any additional support steel required to reduce support and seismic bracing loads on the structure shall be designed by the project registered professional Structural Engineer.
D. Mechanical component supports and the means how they are attached to the component shall be designed for the forces and displacements determined in ASCI 7 Section 13.3.1 and 13.3.2. Such supports include structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the mechanical component.
E. Mechanical supports are those members, assemblies of members, or manufactured elements, including braces, frames, legs, lugs, snubbers, hangers, saddles, or struts, and associated fasteners that transmit loads between nonstructural components and their attachments to the structure.
F. Mechanical attachments are the means how components or supports of nonstructural components are secured or connected to the seismic force-resisting system of the structure. Such attachments include anchor bolts, welded connections, and mechanical fasteners.

1.11 WARRANTY

A. Provide minimum one-year warranty from date of Substantial Completion, including all parts, material, labor and travel.
B. Refer to Section 230500 for additional warranty and Substantial Completion requirements.

PART 2 - PRODUCTS

2.1 INTENT

A. All seismic restraints described in this section shall be the product of a single manufacturer.
B. Refer to Section 230500 for additional guidelines for applicable supports and anchors.
C. Mason Industries products are the basis of these specifications; products of other manufacturers may be submitted for review provided their systems strictly comply with the specifications. Manufacturers: Mason Industries, Hilti Inc., B-Line/Tolco (Eaton), Anvil, Superstrut, or equal.

2.2 SEISMIC SWAY BRACING

A. Seismic sway braces shall consist of galvanized steel aircraft cables, steel angles or steel struts.
B. Cable braces shall be designed to resist seismic tension loads and steel braces shall be designed to resist both tension and compression loads. Brace end connections shall be steel assemblies that swivel to the final installation angle.
C. Cable brace assemblies shall have published strength and stiffness ratings based on testing per FM-1950 standards.

D. Angle or strut bracket assemblies shall be FM Approved except as noted below.
E. Steel angles or struts, when required, shall be clamped to the threaded hanger rods at the seismic sway brace locations utilizing a minimum of two ductile iron clamps.
F. Cable and universal swivel sway brace bracket attachment assemblies shall be Mason Industries #SCB or #SCBH, or equal.
G. Solid and swivel brace bracket assemblies shall be Mason Industries #Type SSB or #SSBS, or equal.
H. Rod clamps shall be Mason Industries #SRC or #UCC, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SEISMIC RESTRAINT SYSTEMS

A. Contractor's Statement of Responsibility: Each contractor responsible for installing a Designated Seismic System or any seismic resisting component must submit a statement of responsibility prior to the commencement of work to include acknowledgment of awareness of the need for Special Inspections.
B. All seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.
C. Installation of seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.
D. No connections between the piping or ductwork and the building structure shall be made that degrades the seismic restraint system herein specified.
E. Any conflicts with other trades due to inadequate space or other unforeseen conditions should be brought to the attention of the Owner's Representative prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

END OF SECTION

SECTION 230549 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals:
   1. Certified TAB reports.
   2. Documentation of work performed per ASHRAE 62.1, Section 7.2.2 - Air Balancing.
   3. Documentation of work performed per ASHRAE/IESNA 90.1, Section 6.7.2.3 - System Balancing.
B. TAB Firm Qualifications: AABC, NEBB or TABB certified.
C. TAB Report Forms: Standard TAB contractor's forms approved by Architect.
D. Perform TAB after leakage and pressure tests on air distribution or hydronic systems have been satisfactorily completed.

1.2 SUMMARY

A. The installing contractors shall have specific responsibilities relating to demonstrating the equipment and systems provided have been installed and function per the contract specifications. These responsibilities are as follows:
B. Contractors shall provide all motors, sheaves, belts, ladders, etc. as required by the balancer and commissioning agent to accomplish work.
C. The Contractors shall submit start up and test reports to the Architect for approval prior to the commencement of work on this phase of the project. These report documents shall (at a minimum) include (but not be limited to) the following data entries:
   1. Project equipment mark
   2. Manufacturer
   3. Model Number
   4. Fuel type and delivery pressure
   5. High and low limit set points on economizers
   6. Area served and unit location
   7. Rated and actual capacity (BTUH, CFM, GPM, kW)
   8. Rated and actual electrical data (Volts, Phase, Cycles) on all systems and individual components within systems (i.e. compressors, evaporator and compressor fans in packaged AC units)
   9. Electrical consumption data (rated FLA, actual FLA)
   10. Rated and actual total, return and supply static pressures
   11. Rated and actual motor and blower RPM's
   12. Motor HP, Frame and Service factor
   13. Discharge Air, Mixed Air Temperatures
   14. Condenser Air temperatures and differentials
   15. Air terminal CFM's

16. Numbered air terminals
17. Method of control

D. It is the Contractor's specific responsibility to complete their respective start-up and checkout procedures, and to ensure the complete readiness of equipment and systems, prior to the start of the balancing phase of the testing and balancing process.
E. Balancing to be done by certified balancing technicians.
F. TAB reports shall be forwarded to the Architect for review and comment.
G. The Contractor shall be responsible for providing qualified representatives, material, equipment, tools, etc., required within the scope of their specialty, to facilitate successfully completing the systems testing and balancing. This contractor shall budget and provide sufficient time and qualified personnel to participate on-site in this process until the process is successfully completed and all deficiencies have been corrected or otherwise resolved. The Architect will issue a certificate of completion at which time the TAB phase of work shall be deemed complete.
H. Specified training on related systems and equipment operation and maintenance shall only commence after final testing and balancing and Commissioning (Cx) is successfully completed, and systems are verified by the Architect to be 100 percent functional.

1.3 PRE-BALANCING CHECKLIST FORMS

A. The Contractor shall be responsible for maintaining and completing copies of equipment start up checklist forms. Checklist forms shall be signed and returned to the Architect and the CB upon completion of all listed items.
B. The checklist forms are not intended to form the final start, test and balance report to the owner. They are to be used by the TAB and Cx Agent to verify that equipment has been started and is ready for testing by that agency.

1.4 SCOPE OF WORK

A. See mechanical drawings for a complete list of all systems that require testing, adjusting, and balancing including project specific special balancing requirements.
B. Mechanical Contractor to provide all requirements testing, adjusting, and balancing as required by the Energy Code and other applicable sustainability standards.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

A. the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
B. Examine the approved submittals for HVAC systems and equipment.
C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
D. Examine system and equipment installations and verify that field ty-control testing, cleaning, and adjusting specified in individual Sections have been performed.
E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

F. Examine terminal units, such as variable-air-volume boxes and constant airflow regulators (CAR), and verify that they are accessible and their controls are connected and functioning.
G. Examine automatic temperature system components to verify the following:
   1. Dampers, valves, and other controlled devices are operated by the intended controller.
   2. Dampers and valves are in the position indicated by the controller.
   3. Integrity of dampers and valves for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes and variable-air- volume terminals.
   4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
   5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   6. Sensors are located to sense only the intended conditions.
   7. Description of operation for control modes is according to the Contract Documents.
   8. Controller set points are set at indicated values.
   9. Interlocked systems are operating.
   10. Changeover from heating to cooling mode occurs according to indicated values.
H. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in appropriate testing standards and in this Section.
B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
D. Take and report testing and balancing measurements in inch-pound IP units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare schematic diagrams of systems' “as-built” duct layouts.
B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
C. Verify that motor starters are equipped with properly sized thermal protection.
D. Check for airflow blockages.
E. Check condensate drains for proper connections and functioning.
F. Check for proper sealing of air-handling unit components.
G. Check for proper sealing of air duct system.
H. Comply with Energy Code Section C408.2.2.1 requirements for fans with variable speed or ECM drives
I. Ensure all required filtration is installed at beginning of test.

3.4 TOLERANCES FOR BALANCING AIR SYSTEMS

A. Set HVAC system airflow rates within the following tolerances:
   1. Supply, Return, and Equipment with Fans: Plus or minus 10 percent.

3.5 GENERAL PROCEDURES FOR BALANCING WATER SYSTEMS

A. Not applicable for this project.

3.6 TOLERANCES FOR BALANCING WATER SYSTEMS

A. Not applicable for this project.

3.7 FINAL TESTING, ADJUSTING, AND BALANCING REPORT

A. Final reports shall be neatly completed and provided in a clear and easily readable condition.
B. In every case where a Contractor is unable to comply with an item as listed on the checklist, the Contractor shall immediately notify the TAB and Cx agents in writing as to the reasons for non-compliance.
C. In addition to completion of the final report, Contractors may be required to actively demonstrate compliance with all specified operational criteria as required during the Testing and Balancing and C
D. During the Testing and Balancing and Cx, once issues have been identified and reported as Contractor related deficiencies the Contractor shall be required to correct these issues in a timely manner. The Contractor shall then report all corrections to the TAB or Cx agent in writing.

END OF SECTION

SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC services:
B. Indoor, supply and outdoor air (intake and exhaust).
C. Indoor, return and supply located in unconditioned space.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells.
    1. Block Insulation: ASTM C 552, Type I.
    2. Special-Shaped Insulation: ASTM C 552, Type III.
    3. Board Insulation: ASTM C 552, Type IV.
    4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
E. resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I.
F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. Provide insulation with factory-applied ASJ.
G. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft.or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF- 19565C, Type II.
B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 permat 43-mildry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

2.5 SEALANTS

A. Joint Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F.
   4. Color: White or gray.
B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: White.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 6.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Width: 2 inches.
   2. Thickness: 6 mils.
   3. Adhesion: 64 ounces force/inch in width.
   4. Elongation: 500 percent.
   5. Tensile Strength: 18 lbf/inch in width.
D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Width: 2 inches
   2. Thickness: 3.7 mils.
   3. Adhesion: 100 ounces force/inch in width.
   4. Elongation: 5 percent.
   5. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
H. Install insulation with least number of joints practical.
I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
    1. Install insulation continuously through hangers and around anchor attachments.
    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
N. For above-ambient services, do not install insulation to the following:
    1. Vibration-control devices.
    2. Testing agency labels and stamps.
    3. Nameplates and data plates.
    4. Manholes.
    5. Handholes.
    6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
    1. Seal penetrations with flashing sealant.
    2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
    3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
    4. Seal jacket to roof flashing with flashing sealant.
B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
    1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions except for the top surface of horizontal rectangular ducts.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure

laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg Fat 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6- inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 DUCT AND PLENUM INSULATION SCHEDULE

A. Ducts, shafts, and plenums conveying outside air shall comply with Energy Code, see plans for specific system and assembly requirements.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

END OF SECTION

SECTION 230719 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Refrigerant suction and hot-gas piping, indoors and outdoors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
C. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells.
    1. Block Insulation: ASTM C 552, Type I.
    2. Special-Shaped Insulation: ASTM C 552, Type III.
    3. Board Insulation: ASTM C 552, Type IV.
    4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
E. resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I.
F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. Provide insulation with factory-applied ASJ.
G. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft.or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less.
H. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 1-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF- 19565C, Type II.
B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 permat 43-mildry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.

2.5 SEALANTS

A. Joint Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F.
   4. Color: White or gray.
B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: White.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 6.5 mils.
   3. Adhesion: 90 ounces force/inch in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch in width.
   6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Width: 2 inches.
   2. Thickness: 6 mils.
   3. Adhesion: 64 ounces force/inch in width.
   4. Elongation: 500 percent.
   5. Tensile Strength: 18 lbf/inch in width.
D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   1. Width: 2 inches
   2. Thickness: 3.7 mils.
   3. Adhesion: 100 ounces force/inch in width.
   4. Elongation: 5 percent.
   5. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
H. Install insulation with least number of joints practical.
I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
    1. Install insulation continuously through hangers and around anchor attachments.
    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
N. For above-ambient services, do not install insulation to the following:
    1. Vibration-control devices.
    2. Testing agency labels and stamps.
    3. Nameplates and data plates.
    4. Manholes.
    5. Handholes.
    6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
    1. Seal penetrations with flashing sealant.
    2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
    3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
    4. Seal jacket to roof flashing with flashing sealant.
B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
    1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 HVAC PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Insulation shall comply with Energy Code. Provide insulation per manufacturer's requirements for all refrigerant piping and fittings, specialties, and related components, unless indicated on plans.
B. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall comply with Energy Code. Provide insulation per manufacturer's requirements for all refrigerant tubing and fittings, specialties, and related components, unless indicated on plans.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

END OF SECTION

SECTION 230902 – VARIABLE FREQUENCY DRIVES (VFDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish complete and operational VFD systems as shown on the plans. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
   1. Variable frequency drives (VFDs), with or without bypass, as scheduled on drawings.
   2. Controls and control connections.
   3. Electrical power connections.

1.2 RELATED DOCUMENTS

A. Section 230500: Common Work Results for HVAC
B. Section 230593: Testing, Adjusting and Balancing
C. Division 26: Coordination of interface items between the Mechanical equipment and controls and the Electrical Work specified in Division 26.

1.3 SUBMITTALS

A. Product Data: Include dimensions and elevations, complete product data listing all included features, electrical rating for each VFD, matched to each piece of driven equipment, and fault current rating.
B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.
C. Wiring Diagrams: Power, signal, and control wiring.
   1. Line/load connection points.
   2. Main input and inverter input disconnect switches.
   3. Fusing/circuit breakers.
   4. Auxiliary control transformer.
   5. Local/remote circuit.
   6. Hand-off-auto circuit.
   7. Safety interlock, run permissive, and drive initiated external circuits.
   8. Analog inputs and outputs.
   9. Pilot lights.
   10. Each wire on the wiring diagram shall be labeled with a distinct wire identifier.
D. VFD panel face diagram indicating the location of the main and inverter disconnect switches, local/remote and H-O-A switches, VFD/bypass switch, pilot lights, digital display, keypad, programmable carrier frequency limitations (4-5 kHz or 2-14 kHz) and any other face mounted device, along with the panel face labeling.
E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. VFD shall comply with NFPA 90 (National Electrical Code), IEEE 519, UL 508, and FCC compliance for Radio Frequency Interference (RFI) and Electro-Mechanical Interference (EMI).
B. Unit shall be UL listed, as an entire assembly, and bear the UL label.
C. All circuit boards shall be completely tested and burned-in prior to assembly into the completed VFD.
D. Factory test complete VFD to ANSI/UL Standard 508. Functionally test all options, perform dynamometer test at full load, cycle load and speed during factory test.

1.5 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.
B. Special Warranty: Manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ABB ACH 550 or ULH, or equal by Danfoss, Allen-Bradley, Emerson, Schneider Electric (Square D), Toshiba, or Yaskawa.

2.2 GENERAL

A. Furnish a complete VFD as scheduled on the plans. Refer to plans for locations of variable speed controllers. Each fan or pump motor shall have a dedicated VFD unit. All standard and optional features shall be included within the VFD enclosure unless otherwise specified. The VFD enclosure shall be provided to match the environment requirements where the VFD will be mounted and operated. Provide NEMA/UL rated enclosure as required for environment.
B. The adjustable frequency controller shall convert three-phase, 60 Hz utility power to adjustable voltage and frequency, three-phase, AC power for stepless motor speed control from 10% to 100% of the motor's 60 Hz speed.
C. The VFD shall provide full rated output from a line of ±10% of nominal voltage. The VFD shall continue to operate without faulting from a line of +30% to -35% of nominal voltage. Overload rating of VFD shall be 110% of normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute. VFDs shall be capable of continuous full load operation in the following environmental conditions:
   1. -15 to 40° C (5 to 104°F) ambient temperature. Operation to 50° C (122°F) shall be allowed with a 10% reduction from VFD full load current.
   2. Altitude 0 to 3300 feet above sea level. Operation to 6600 shall be allowed with a 10% reduction from VFD full load current.
   3. Humidity less than 95%, non-condensing.

D. The VFD shall include a converter and an inverter section. The converter section shall convert fixed frequency and voltage AC utility power to a DC voltage. Drive shall utilize a single surface mount micro-processor.
E. The VFD shall be of the pulse width modulation (PWM) type. VFDs shall be provided with an advanced flux vector frequency control to limit noise at drive and motor.
F. Drive manufacturer or sales representative shall evaluate electrical system of the project. Any additional protective equipment such as line filters, reactors or input isolation transformers required to prevent interference from drive with other electrical equipment in the building shall be included as part of the bid. No additional expense shall be incurred by Owner for provision or installation of these devices if required for electrical system operation after drive has been purchased. Units shall include factory mounted input line reactors.
G. The VFD maximum output current rating shall be 110% of the motor nameplate full load current. VFD shall be able to start into a rotating load in either direction without trip.
H. The VFD and options shall be tested to ASNI/EIA Standard 508 and listed by a nationally recognized testing agency such as UL or ETL.
I. The VFD and options shall comply with the applicable requirements of the latest standards of ANSI, IEEE, and the National Electrical Code.
J. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in ANSI/IEEE Standard 519.
K. The drive efficiency shall be 97% (minimum) and have a fundamental power factor of 0.98 at all speeds.

2.3 BASIC FEATURES

A. The VFD shall be housed in a NEMA enclosure appropriate to the mounting location.
   1. NEMA 12 enclosure shall be used indoors in dusty locations, plenum mechanical rooms, penthouses, or air stream mounting.
   2. NEMA 3R is required for all outdoor locations exposed to falling rain, snow or ice or to indoor locations subject to falling water.
   3. If NEMA 1 enclosure is suitable it shall be vented through cabinet and equipped with an integral cooling fan with thermostat control, and arranged so that units can be mounted back to back on a frame and/or side to side on a wall. Venting fans shall be supplied in enclosure if required. If a different NEMA enclosure is indicated the enclosure shall provide means of maintaining the drive at temperature acceptable to the drive manufacturer in exterior ambient temperatures. Enclosure shall be complete with no requirements for low voltage wiring. Factory mounted main circuit breaker disconnect shall be included.
B. All circuit boards shall be coated to protect against corrosion. Control boards shall be conformal coated to at least IEC 60721-3c2.
C. All VFDs shall have the same HMI/keypad, with backlit digital display, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs. It shall incorporate “Bumpless transfer” of speed reference when switching between “Hand” and “Auto” modes. HMI/keypad shall include password protection against parameter changes.

D. The HMI/keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting. The display shall be in complete English words for programming and fault diagnostics (alphanumeric codes only are not acceptable.)
E. The HMI/keypad shall utilize pre-programmed application macros or templates specifically designed to facilitate start-up. The Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user savable programs to allow the user to save custom settings.
F. HMI/keypad operating values shall be capable of being displayed in engineering units for sub-metering purposes [i.e. GPH, KW, Motor Amps, Frequency, Speed, Torque, etc.]. A minimum of three operating values shall be displayed at all times.
G. VFD shall include built in coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase & phase to ground), capacitor clamp, 1600 PIV Diode Bridge and internal chokes.
H. VFDs shall have 5% impedance AC reactors or internal dual 5% DC chokes to reduce harmonics to the power line and as protection from AC line transients. VFD’s with only one DC choke shall have OEM add AC UL 508 listed and approved Chokes or line reactors.
I. VFD shall automatically mitigate harmonics throughout the effective load range using Swinging chokes or other devices designed to lower harmonics when VFD is at partial loads.
J. VFD’s shall include Ferrite Core EMI/RFI/Common mode filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2).
K. The input current rating of the VFD shall not be greater than the output current rating. VFD’s with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.122
L. VFD shall have its own standardized control board that is the same for all drive sizes, with all communications and I/O terminals on it, and standard BAS communications protocols to include ModBus RTU; Johnson Controls N2; Siemens Building Technologies FLN (P1); and BACnet MS/TP. All diagnostic warning and fault information shall be transmittable over serial communications. With Remote fault reset if programmed. Options available for: Ethernet IP, BACnet IP, ControlNet, DeviceNet, Lonworks, ModBus TCP and Profibus. All protocols shall be “certified” by the governing authority.
M. Two (2) programmable analog inputs shall accept 0-10VDC or 4-20 ma signals.
N. Two (2) programmable analog outputs 0-20ma or 4-20 ma signals. Outputs proportionally programmable for: Motor Current, Power, Speed, Torque, (kW) and other data.
O. Minimum of six (6) programmable digital inputs for interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.
P. Minimum of two (2) programmable, Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. Rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts.
Q. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others.

R. The VFD shall have Pass thru I/O- to allow the BAS to monitor and control the VFD/ bypass or its analog and digital outputs via communications. This control shall be independent of any VFD function and may be used to control or monitor any other device.

S. The VFD shall include multiple “two zone” PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4-20mA, 0-10V, and/or communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for “two zone” control. The PID set points shall be adjustable from the VFD keypad, analog inputs, or over the communications bus.

T. The VFD shall have cooling fans that are designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when

U. required, based on the temperature and run command to the drive. VFD protection shall be based on thermal sensing and not cooling fan operation.

V. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with a 10-year minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. VFD programming shall be held in non-volatile memory and is not dependent on battery power.

W. Drive options shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

2.4 PROGRAMMABLE ADJUSTMENTS

A. Three (3) programmable critical frequency lockout ranges [aka Skip or resonant] to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.

B. The VFD shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates.

C. Two independent adjustable acceleration and deceleration ramp times, adjustable from 1 to 1800 seconds, initial setting at 60 seconds

D. VFD shall include a motor flux optimization and noise smoothing circuits that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.

E. VFD shall provide built in programmable loss-of-load (broken belt / broken coupling) option to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.

F. VFD shall have programmable “Sleep” and “Wake up” functions to allow the drive to be started and stopped from the level of a process feedback signal.

G. VFD to have two PID controls built in for VFD or other uses. PID controllers have ability for “two zone” control. PID set points adjustable from the VFD keypad, analog inputs or BAS

H. If the input reference is lost, the VFD shall be programmable to: (1) stop and display a fault, (2) run at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) go to a backup control system wired to the VFD. As well as cause a warning to be

issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and / or over the communication bus.

I. VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time and time between attempts shall be programmable. VFD shall be initially set to perform at least five (5) restarts after a power outage, drive fault or external fault before requiring manual reset. After ten minutes of runtime, the restart attempts return to zero. The VFD shall display a countdown timer when auto restart is being attempted, or incorporate programming to select number of restarts, number of faults per time period, and time between restarts.

J. VFD shall be capable of starting into a coasting load (flying start or forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage.

K. VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire / smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.

2.5 PROTECTIVE FEATURES

A. A minimum of Class 20 I2t electronic motor overload protection for single motor applications shall be provided. Overload protection shall automatically compensate for changes in motor speed.

B. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain language. Codes are not acceptable.

C. Protect VFD from input phase loss. The VFD should be able to protect itself from damage and indicate the phase loss condition. During an input phase loss condition, the VFD shall be able to be programmed to either trip off while displaying an alarm, issue a warning while running at reduced output capacity, or issue a warning while running at full commanded speed. This function is independent of which input power phase is lost.

D. Protect from under voltage. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output, without faulting, with an input voltage as low as 70% of the nominal voltage.

E. Protect from over voltage. The VFD shall continue to operate without faulting with a momentary input voltage as high as 130% of the nominal voltage.

F. The VFD shall incorporate a programmable motor preheat feature to keep the motor warm and prevent condensation build up in the motor when it is stopped in a damp environment by providing the motor stator with a controlled level of current.

G. VFD shall include a "signal loss detection" algorithm with adjustable time delay to sense the loss of an analog input signal. It shall also include a programmable time delay to eliminate nuisance signal loss indications. The functions after detection shall be programmable.

H. VFD shall function normally when the keypad is removed while the VFD is running. No warnings or alarms shall be issued as a result of removing the keypad.
I. VFD shall catch a rotating motor operating forward or reverse up to full speed without VFD fault or component damage.
J. Selectable over-voltage control shall be provided to protect the drive from power regenerated by the motor while maintaining control of the driven load.
K. VFD shall include current sensors on all three output phases to accurately measure motor current, protect the VFD from output short circuits, output ground faults, and act as a motor overload. If an output phase loss is detected, the VFD will trip off and identify which of the output phases is low or lost.
L. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. It shall also be possible to program the VFD so that it reduces its output current limit value if the VFD's temperature becomes too high.
M. In order to ensure operation during periods of overload, it must be possible to program the VFD to automatically reduce its output current to a programmed value during periods of excessive load. This allows the VFD to continue to run the load without tripping.
N. The VFD shall have temperature controlled cooling fan(s) for quiet operation, minimized losses, and increased fan life. At low loads or low ambient temperatures, the fan(s) may be off even when the VFD is running.
O. The VFD shall store in memory the last 10 alarms. A description of the alarm, and the date and time of the alarm shall be recorded.
P. When used with a pumping system, the VFD shall be able to detect no-flow situations, dry pump conditions, and operation off the end of the pump curve. It shall be programmable to take appropriate protective action when one of the above situations is detected.

2.6 BYPASS (PRESSURIZAION FANS AND PUMPS ONLY)

A. Bypasses shall be a complete assembly UL 508 listed, furnished and mounted by the OEM as defined on the VFD schedule. All bypasses shall have a service Disconnect switch with two (2) contactor operation. They shall also have a UL rating of SCCR of 100,000 Amps.
    1. Factory wired and tested system with door interlocked, padlockable circuit breaker, output contactor, bypass contactor, and fast acting Drive Isolation input fuses. UL Listed motor electronic overload protection Class 10, 20, or 30 (programmable) shall be included in both drive and bypass modes.
    2. The drive and bypass package shall be Seismic certified and labeled to IBC 2012:
    3. Rating of 1.5 is required and based upon actual shake table test defined by ICC AC-156.
    4. AHJ preapproval as needed.
    5. Bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair/replacement. Bypass can be controlled by inputs, locally or by communications.
    6. Bypass designs must allow qualified person to work on or remove bypassed VFD for service and allow bypass to continue to run system. Only approved per NEC 430.103 service disconnect switch with two (2) contactors should be used. Three contactor or

"isolation contactors" are not an acceptable alternative to fuses and are not an NEC recognized disconnecting device for LOTO.

7. Bypass shall have its own standardized control board that is the same for all drive sizes, with all communications and I/O terminals on it. The keypad and two line (minimum), 20 character LCD display to control or program unit, read status and reset faults. Bypass shall have preset macros with user programmable options. As well as let user select whether the system shall automatically transfer from drive to bypass mode on the following drive fault conditions: Over current, Over voltage, Under voltage or Loss of analog input.
8. Bypass shall have its own built in communications protocols that include ModBus RTU; Johnson Controls N2; Siemens Building Technologies FLN(P1); and BACnet MS/TP. All bypass diagnostic warning and fault information shall be transmitted over the communications. With Remote bypass fault reset if programmed. Options available for Lonworks, ControlNet and DeviceNet.
9. Bypass shall have Pass-Through analog and digital Inputs and Outputs that are capable of being monitored and/or controlled via serial communications for the drive or other devices.
10. Bypass shall have a proof of flow and broken belt adjustable motor current sensing circuit for bypass and VFD modes, condition shall be indicated on keypad display or over the BAS.
11. Bypass shall have six 24VDC digital inputs on its own separate terminal strip and incorporate an internally sourced 24VDC 250 mA power supply for use by itself or others to power external devices and not require an external control power source.
12. The bypass shall include a supervisory control mode. In bypass mode it shall monitor the value of the VFD's analog input (feedback). This feedback is used to control the bypass contactor on and off to maintain hysteresis control over applications such as cooling towers and booster pumps.
13. The user shall be able to select text to be displayed on the keypad when an external safety opens. Such as "FireStat", "FreezStat", "Over pressure" and "Low suction". The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.
14. Bypass shall meet requirements of SEMI F47-0706 for voltage sag immunity and maintain positive contactor control with a +30%, -35% tolerance of nominal voltage. This feature is designed to avoid contactor coil failure during brown out/low line conditions and allow for single-phase operation in VFD mode. Designs that will not allow single-phase operation in VFD mode and meet F47 are not acceptable.
15. Single phase Motor protection bypass must be able to detect a single phase condition IF VFD is running and prevent transfer as well as detect single phase power condition if it occurs while running or trying to start in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication locally and to BAS if programmed. Bypass systems not incorporating single-phase protection in bypass mode are not acceptable.
16. Earth or ground fault motor protection bypass system must be able to detect earth or ground fault if VFD is running and prevent transfer as well as detect if a ground fault condition occurs while running or trying to start in bypass, disengage the motor in a controlled fashion, and give a clear message of earth or ground fault locally and to BAS if

programmed. Bypass systems not incorporating earth or ground fault protection in bypass mode are not acceptable.

17. The bypass control shall include a programmable time delay bypass start with keypad indication of time delay. A Form C relay output commands the VAV boxes to open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 to 120 seconds.
18. Smoke Control Override Mode (Override 1): The bypass shall include a dedicated digital input that will transfer the motor from VFD mode to Bypass mode upon receipt of a dry contact closure from the Fire/Smoke Control System. The Smoke Control Override Mode action is not programmable and will always function as described in the bypass User's Manual documentation. In this mode, the system will ignore low priority safeties and acknowledge high priority safeties. All keypad control, serial communications control, and normal customer start / stop control inputs will be disregarded. This Smoke Control Mode shall be designed to meet the intent of UL864/UUKL.
19. Fireman's Override Mode (Override 2) – the bypass shall include a second, programmable override input which will allow the user to configure the unit to acknowledge some digital inputs, all digital inputs, ignore digital inputs or any combination of the above. This programmability allows the user to program the bypass unit to react in whatever manner the local Authority Having Jurisdiction (AHJ) requires. The Override 2 action may be programmed for "Run-to-Destruction". The user may also force the unit into Override 2 via the serial communications link.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unit installation, including mounting, supports, and wiring to motor, shall be by the Electrical Trades, in compliance with Division 26. Coordinate with the Mechanical Trades and the Control Trades, as required.

B. Install the VFD as close as possible to the motor. The load side power cables to the motor shall be kept as short as possible and shall not be run in the same conduit as the line side power cables. Control wiring shall be in separate conduit from power wiring. Where applicable, control wires from the motor disconnect early break contacts may be installed with the motor power wiring.

C. Provide "shaft grounding" since modern AC or DC variable speed motors develop an electrical potential between the shaft and the frame of the motor. It has been found that shaft-to-frame voltages above three (3) volts generally cause current flow across the bearings. When current flows across a bearing, metal is transferred causing frosting, pitting, and fluting of the bearing races resulting in premature failure of the bearings. Grounding the shaft to the frame provides a path for the current to flow around the bearings eliminating the bearing damage caused by shaft potentials. Therefore, all installed VFD's shall include a shaft grounding brush as manufactured by "Shaft Grounding Systems, Inc." (SGS) on all fan and pump motors. The products manufactured by SGS contain only stable materials and are not believed to constitute a hazardous material as defined under the Office of Safety and Health Act (OSHA) regulations. Specifically developed proprietary carbon compounds are used by SGS to ensure sustained

performance. At present, the brush wear life expectancy is from 3 to 5 years based upon data obtained from running these brushes for over two (2) years in continuous industrial applications. In systems designed for wet or severe environment applications, the brush contact area shall be sealed to keep contaminants from entering the shaft grounding system. The shaft grounding system shall be designed to reduce shaft voltage levels to less than the three (3) volts typically required for current to pass through bearings. Shaft voltages without a shaft grounding system typically range from 3 to 30 volts, or higher.

D. Protect the unit from dirt, dust, water, and physical damage prior to and during construction. If the inside of the unit becomes dirty or dusty before acceptance by the Owner, it shall be thoroughly cleaned by the unit manufacturer at the contractor's expense.

3.2 QUALITY ASSURANCE

A. Upon completion of manufacturing, each VFD unit shall be inspected and load tested prior to shipment. The Owner's representative may be present for factory-acceptance tests. Tests to be conducted shall include but are not limited to simulating system logic. All associated costs for said tests shall be included in the manufacturers bid. Certification that the factory inspections and load tests have been successfully performed shall be submitted to the Owner after completion of the tests.

3.3 CHECK, TEST AND START

A. After installation of the system at the site a field acceptance test shall be performed by the Mechanical trades in conjunction with the manufacturer of the drive equipment, who will provide the services of a factory trained and certified technician to supervise the check, test and start.

B. The mechanical contractor shall notify the Owner's representative five (5) days prior to the start-up procedure.

C. The field acceptance test shall consist of a repeat of the factory test. Functional tests shall demonstrate satisfactory operation of all interlocks, alarms, and normal operational sequences. The drive manufacturer shall use suitable test equipment to locate and correct all malfunctions. Repeated failure of any component will cause the test to be terminated and restarted when the equipment has been fixed. Harmonic distortion tests shall be run on the drives and the bus to determine the voltage and current distortion. IEEE 519-1992 standards shall be used as the guide to test results. Measurements shall be made utilizing a Dranetz analyzer or a BMI analyzer capable of indicating snapshots of the current and voltage distortions. Measurements shall include phase to phase, phase to neutral, and neutral to ground. The test shall be run the full range of the drive operation. The graphs of the test results shall be submitted for speed values of 60%, 80%, and 100%. Also, test shall be done with no units running, then one unit, then two units, etc. Tests shall be conducted by a qualified technician acceptable to the Owner. Included in the scope of this specification shall be an allowance for a factory-trained service engineer, other than sales representatives, to inspect, perform final adjustments and operational checks, perform functional checks, and prepare a final report for record purposes. A minimum of one day shall be allowed for this start-up service.

D. The "Capacity Test" to insure that energy use is minimized, the HVAC system must be balanced at design conditions at the lowest possible static pressure (SP). This requires that the lowest

possible SP be found at the sensor that will allow full design flow at the Terminal Air Unit (TAU) most difficult to satisfy. This system minimum SP found is what the VFD should control to. To accomplish this verify that the TAU on the critical leg has its damper 90% or more open when all TAU's taking off upstream of the static pressure sensor are in full cooling. The "Capacity Test" to minimize energy usage in the hydronic system, it must be balanced at design conditions at the lowest differential pressure (DP) possible. This requires that the lowest possible DP at the sensor be found that will allow the delivery of design flow through the valve most difficult to satisfy. This system minimum DP found is what the VFD should control to. This is accomplished by changing the temperature setpoint for all zones to 55ºF for cooling or 85ºF for heating coils, causing all AHU coil valves to be calling for full cooling or heating, as applicable. Each coil's flow is then measured against the design flow. The coil that is receiving the lowest the lowest fraction of design is identified. The current DP at the controlling sensor is noted. A calculation is made, giving the DP required at the sensor to allow the identified most critical coil to meet its design flow.

E. The Mechanical trades shall submit a "Certificate of Proper Installation" to the Owner confirming that all equipment was inspected, operation checked, and installation approved in writing by the manufacturer's representative.
F. UNDER NO CIRCUMSTANCES ARE ANY PORTIONS OF THE VARIABLE FREQUENCY DRIVE SYSTEM TO BE ENERGIZED WITHOUT AUTHORIZATION FROM THE MANUFACTURER'S REPRESENTATIVE.

3.4 TRAINING

A. Conduct a minimum of four (4) hours training for maintenance staff on operation, programming, and service of VFD's. Training shall be conducted by a factory trained service technician.
B. Training shall not be performed until system is operational and functional and two (2) weeks after receiving approved job specific technical manuals.

END OF SECTION

SECTION 232300 – REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Refrigerant pipes and fittings.
   2. Refrigerant piping valves and specialties.
   3. Refrigerants

1.2 REFERENCES

A. International Mechanical Code
   1. Chapter 11 of 2021 Seattle Mechanical Code in accordance with the Code Alternate
B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 15-2022 with Approved Addenda - Safety Standard for Mechanical Refrigeration.
C. American Society of Mechanical Engineers:
   1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
   3. ASME B31.5 - Refrigeration Piping.
D. ASTM International:
   1. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   2. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).
   3. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
   4. ASTM B1003 – Standard Specification for Seamless Copper Tube for Line Sets.
   5. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
E. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
   2. AWS D1.1 - Structural Welding Code - Steel.
F. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
   2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
   3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
   4. Underwriters Laboratories Inc.:

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.
B. Shop Drawings:
   1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.
B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
B. Perform Work in accordance with ASME B31.5 code for installation of refrigerant piping systems.
C. Perform Work in accordance with ASHRAE 15.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.8 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A, R-454B, R-32:
   1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
   2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
   3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).
B. ACR rated copper is the only approved refrigerant pipe material for use with Single-zone air conditioning products. ACR rated tubing is the only type that ships with yellow caps. Approved tubing will be marked “R32 RATED” or “R454B RATED” along the length of the tube. Drawn temper (rigid) ACR copper tubing is available in sizes 3/8 through 2-1/8 inches (ASTM B 280, clean, dry, and capped). Annealed temper (soft) ACR copper tubing is available in sizes 1/4 through 2-1/8 inches (ASTM B 280, clean, dry, and capped).
C. The WA state Department of Energy (DOE) and the Environmental Protection Agency (EPA) require equipment to utilize refrigerants with < 700 GWP based on equipment type and installation/refrigeration charge date. Refrigerant type selected will comply with DOE and EPA requirements.
D. Refrigerant piping shall be installed per 2021 SMC chapter 11 as approved in code modification, see drawings for more details.
E. Do not use pre-charged refrigerant lines more than 50 feet in length.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B88, Type K or L; or ASTM B280, Type ACR.
B. Wrought-Copper Fittings and Unions: ASME B16.22.
C. Solder Filler Metals: ASTM B32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
D. Flux: Stay-Silv white brazing flux by J.W. Harris Co or silver solder flux by Handy & Harmon.
E. Brazing Filler Metals: AWS A5.8.
    1. Copper to Copper Connections:
        a. AWS Classification BCuP-4 Copper Phosphorus (6% silver).
        b. AWS Classification BCuP-5 Copper Phosphorus (15% silver).
    2. Copper to Brass or Copper to Steel Connections
        a. AWS Classification BAg-5 Silver (45% silver)
    3. Do not use rods containing Cadmium.
F. Manufacturers: Mueller Streamline, Nibco, Grinnell, Elkhart, or equal.

2.3 FLEXIBLE CONNECTORS

A. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
B. End Connections: Socket ends.
C. Offset Performance: Capable of minimum 3/4 inch (20 mm) misalignment in minimum 7 inch (180 mm) long assembly.
D. Working Pressure Rating: Factory test at minimum 450 psig (3100 kPa).
E. Maximum Operating Temperature: 250°F (121°C).
F. Manufacturers: Metraflex #RAF or equal.

2.4 VALVES AND SPECIALTIES

A. Service Valves:
    1. Body: Forged brass with brass cap including key end to remove core.
    2. Core: Removable ball-type check valve with stainless-steel spring.
    3. Seat: Polytetrafluoroethylene.
    4. End Connections: Copper spring.
    5. Working Pressure Rating: 500 psig (3450 kPa).
    6. Manufacturers: Apollo Valves (Conbraco), Henry, Mueller, Superior, Virginia, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide and install refrigerant piping, fittings, valves and devices as required by equipment manufacturer and as shown on the Drawings.
B. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary.
    1. No soft solder (tin, lead, antimony) connections will be allowed in system.
    2. Braze valve, sight glass, and flexible connections.

3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

C. Insulate all suction and hot gas lines. Insulate liquid lines where pipe may be in close contact to humans.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
B. Install flexible connectors at refrigerant piping connection to all equipment (coils, condensers, and/or compressors) as required by the manufacturer and where necessary to prevent vibration from transferring into the building structure and to minimize vibration and audible noise in occupied spaces.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
B. Install refrigerant piping according to ASHRAE 15.
C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
F. Install piping adjacent to machines to allow service and maintenance.
G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.
I. Select system components with pressure rating equal to or greater than system operating pressure.
J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.
L. Install refrigerant piping in protective chaseway where installed belowground.
M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
N. Before installation of steel refrigerant piping, clean pipe and fittings using the following procedures:
    1. Shot blast the interior of piping.
    2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.

3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

O. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

P. Install sleeves and escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 HANGERS AND SUPPORTS

A. Install the following pipe attachments:
1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
2. Spring hangers to support vertical runs.
3. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

B. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. Up to NPS 5/8”(DN 18): Maximum span, 60” (1500 mm); minimum rod, 3/8” (9.5 mm).
2. Greater than 5/8” up to NPS 1-1/8” (DN 25): Maximum span, 72” (1800 mm); minimum rod, 3/8” (9.5 mm).
3. Greater than 1-1/8” up to NPS 2” (DN50): Maximum span, 96” (2400 mm); minimum rod, 3/8” (9.5 mm).

C. Support multifloor vertical runs at each floor.

3.5 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5, ASHRAE 15-2022, 2021 Seattle Mechanical Code Section 1110.1, and manufacturer installation requirements.

B. Perform the following tests and inspections:
1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
4. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:
B. Install core in filter dryers after leak test but before evacuation.
C. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
D. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
E. Charge system with a new filter-dryer core in charging line.

END OF SECTION

SECTION 233000 – HVAC AIR DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rigid Ductwork.
   2. Flexible Ductwork.
   3. Sealants, Adhesives and Tapes.
   4. Diffusers, Grilles, and Registers.
   5. Ductwork Specialties.
   6. Flexible Connections.
   7. Duct Access Panels and Doors.
   8. Backdraft and Relief Dampers.
   9. Constant Volume Regulator.
   10. Combination Fire and Smoke Dampers.
   11. Fire Smoke Dampers.
   12. Control Dampers.
   13. Dampers.
   14. Louvers.
   15. Flashings.
   16. Bird Screens.
   17. Sound Traps.
   18. Constant Airflow Regulators.

B. Related Sections:
   1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings:
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Elevation of top of ducts.
   3. Penetrations through fire-rated and other partitions.
   4. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
   5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.
C. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
D. Special fittings.
E. Manual volume damper installations.
F. Control-damper installations.
G. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
H. Wiring Diagrams: For power, signal, and control wiring.
I. For sound traps, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-

support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G90.
   2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Grease Ducts as noted on plans
   1. Factory-built grease ducts listed and labeled per UL 1978 shall have no requirement beyond that from the listing agency. Otherwise, materials must be one of the following:
      a. Galvanized Steel with min 16 gage
      b. Stainless Steel with min 18 gage

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
   2. Tape Width: 4 inches.
   3. Sealant: Modified styrene acrylic.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   7. Service: Indoor and outdoor.
   8. Service Temperature: Minus 40 to plus 200 deg F.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   3. Shore A Hardness: Minimum 20.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
   8. Service: Indoor or outdoor.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.5 FLEXIBLE DUCTWORK

A. Flexible one-inch thick (minimum) insulated round ductwork, Class 0 or Class 1, may be utilized for final connections to each air outlet and inlet, unless shown otherwise on the plans. Duct shall have a minimum R-4.2 for ductwork enclosed in conditioned spaces and R-8.0 for ductwork installed in unconditioned spaces. Maximum length of flexible ductwork in each low pressure branch shall not exceed five (5’) feet and maximum flexible connector lengths shall not exceed five (5’) feet.

B. All connections shall utilize welded conical tees, aluminum conical fitting, or manufacturer high efficiency branch take-offs. Spin-in type or other types of butt tees, bullhead tees or straight taps ARE NOT permitted.

C. Dampers regulators shall include end bearings as manufactured by DuraDyne, Ventlok or equal.

D. Flexible ductwork for low pressure systems with positive static pressure up to 2” w.g. positive pressure and negative pressured up to 1/2" w.g. suitable for both terminal unit connection and diffuser/grilles. Flexible ductwork fittings may be used at seismic expansion joints and to accommodate vertical drift between building levels. Fabrication shall include a multiple laminate of aluminized polyester/mylar, fiberglass insulation, and polyester, mechanically locked to galvanized steel helix without adhesives, exterior fiberglass insulation and fire retardant polyester/mylar outer jacket.

E. Flexible Duct Clamps: Stainless steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes up to 18 inches to match duct size.

F. Flexible dryer vent hose for exposed connection between dryer outlet connection and rigid exhaust ductwork. Duct shall be constructed with heavy duty aluminized fabric bonded to galvanized steel helix wire for tear, puncture and fire resistance. Listed per UL 2158A Clothes Dryer Transition Duct. Maximum eight foot length. Manufacturer: Thermaflex #DV or equal.

2.6 DIFFUSERS, GRILLES AND REGISTERS

A. All diffusers, grilles, and registers shall be selected to provide proper air distribution for the intended occupant application. All supply air devices shall be selected to provide a maximum air velocity of 50 fpm at three feet above the floor, unless otherwise noted. Manufacturer's representative shall carefully review Architectural and Mechanical drawings and ensure diffuser/grille/register selections will provide proper air distribution at NC 25 or less. Manufacturer at no additional expense to the Owner shall replace diffusers, grilles, and registers not providing proper distribution or excessive noise at scheduled airflow.

B. All frames shall be selected to fit the ceiling type. Verify with Architectural Drawing. Each diffuser, grille and register shall be individually capable of balancing via duct mounted balancing dampers or attached opposed blade dampers. Provide unit opposed blade damper where individual duct mounted balancing dampers are not provided.

C. Refer to schedule on drawings for sizes, capacities and patterns.

D. Manufacturers: Titus, Krueger, Price, Metal Aire, Nailor, Anemostat, Carnes, Tuttle&Bailey, or equal.

2.7 DUCTWORK SPECIALTIES

A. General: Where specifically called for, materials for use in fabricating ductwork specialties shall be identical to that used to fabricate ductwork. See drawings and Part 3, Execution for schedule.

B. Flexible Connections (Indoor Applications):
   1. Provide flexible connectors at the discharge and inlet of fans, air handlers, rotating mechanical equipment, and where shown on the Drawings for proper vibration isolation.
   2. Neoprene (polychloroprene) impregnated glass cloth with 24-gauge (minimum) galvanized metal frame. Hypalon, teflon or silicone coated fabrics may be acceptable.
   3. Shall be airtight, watertight and fire retardant.
   4. Minimum density of 30 oz. per sq. yard.
   5. Temperature range: -40°F to 200°F
   6. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723/ASTM E84.
   7. Neoprene-only connectors are not allowed.
   8. Minimum dimensions shall be 3" metal, 3" fabric, 3" metal up to maximum dimensions of 4” metal, 6” fabric, 4” metal as required by application.

C. Flexible Connections (Outdoor Applications):
   1. Provide flexible connectors at the discharge and inlet of fans, air handlers, rotating mechanical equipment, and where shown on the Drawings for proper vibration isolation.
   2. Hypalon (chlorosulfurated polyethylene) impregnated glass cloth with 24-gauge (minimum) galvanized metal frame.
   3. Shall be airtight, watertight and fire retardant. Resistant to sunlight, ozone and weather.
   4. Minimum density of 26 oz. per sq. yard.

5. Temperature range: -50°F to 275°F
6. Surface-Burning Characteristics: Non-combustible as tested per UL 701. Or, maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723/ASTM E84.
7. Minimum dimensions shall be 3" metal, 3" fabric, 3" metal up to maximum dimensions of 4” metal, 6” fabric, 4” metal as required by application.
8. Provide flexible cloth insulating blanket to encase flexible connections to maintain ductwork insulation integrity as follows:
    a. Jacket shall be UV and ozone resistant with Velcro attachment.
    b. Service Operating Temperature: 0-350°F.
    c. Jacket and Liner: silicon or teflon impregnated fiberglass or mineral wool cloth.
    d. Insulation: Aerogel, 2” thick (minimum) or R-8 equivalent (minimum), and thicker as required by local energy code.
    e. Fastening: 2” Nomex Velcro or 1” straps and stainless steel D-rings.
    f. Thread: Kevlar/stainless steel thread.

D. Volume and Splitter Dampers: Galvanized sheet metal blade and frame with Ventfabrics Inc., Ventlok operating hardware. For accessible dampers, provide #641 self -locking dial regulators and #644 self-locking dial regulators for insulated ductwork, #637 square end bearing, and #635 spring end bearing, as applicable. For inaccessible dampers, provide #666 or #677 concealed locking damper regulator with bearings as above. For static pressures above 3"wg, provide #640 HiVel dial regulator and #609 HiVel end bearing for accessible dampers. Regulators shall extend to and through ceiling with neatly installed hardware at the finished ceiling. For inaccessible dampers requiring adjustment through diffusers use Young Regulator, Bowden cable control system.

E. Multi-louver Volume Dampers: 16-gauge galvanized steel frame. Opposed, 6" wide, 16-gauge galvanized steel blades. Concealed linkage in frame. Ruskin #CD35/OBD or equal.

F. Ducts Through Roof: Unsupported duct penetration through a roof, without roof curbs, shall be 16-gauge (minimum), flashed and counterflashed, and provided with storm collars to secure a watertight construction.

G. Bird Screens: 19-gauge (0.91 mm) galvanized after weld wire mesh (minimum gauge), 1/2" x 1/2” openings (maximum) set in a galvanized steel frame. Or, 23-gauge (0.57 mm) galvanized after weld wire mesh (maximum gauge), 3/8" x 3/8” openings (minimum) set in a galvanized steel frame. Verify minimum requirements per local code.

H. Seismic Duct Connector (Indoors): Provide flexible connector at penetrations between two structural elements where the structural design has designated allowable seismic or settlement movement. Flexible EPDM elastomeric fabric bonded to a 1/4" steel perimeter flange on each end. EPDM shall be rated for maximum temperature of 250°F and 3 psi maximum. Connector shall be rated to meet or exceed structural design requirements with a minimum of 3” for axial compression, 3” axial extension, and 3” lateral deflection. Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723/ASTM E84.

I. Hanging Cables with Adjustable Fastener: Wire rope hangers for maximum point loads not exceeding 100 lbs. (45 Kg) for supporting rigid galvanized ductwork not exceeding 18” (450 mm) diameter, and suspended diffusers/grilles/terminal units. Alternate to metal strap options per SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1. Wire Rope: High tensile steel wire rope, to ASTM 1023/1023M, class A zinc coating; 7 by 7 or 7 by 19 cross-sectional construction; having a tensile strength of 256,000 psi (1,770 N per sq. mm); lengths, diameters, and wire construction to accommodate design loads and as indicated on Construction Shop Drawings.
2. Adjustable Fastener: Mild steel (type EN1A), bright zinc plated, one-channel body; encasing a series of Type 302 stainless-steel springs with serrated self-locking grade 40 chrome steel balls, adjustable by means of an integrated mechanism, capable of accommodating load of 100 lbs. (45 kg) (maximum per hanger).

2.8 ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct." Access doors shall be insulated hollow core double construction. Access doors in exhaust ducts shall be of same, or heavier, gauge material as duct in which installed.
B. Casing Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 9-16, "Casing Access Doors." Access doors shall be
C. insulated hollow core double construction of same, or heavier, gauge material as duct in which installed.
D. Minimum door size shall be 12" by 12" for simple manual access and up to 24" by 24" where personnel must pass through infrequently. Provide 20" x 54" (minimum) door for access to filters and more frequent maintenance.
E. Maximum door leakage shall not exceed 10 cfm/sq.ft. at maximum operating pressure. Doors larger than four sq.ft. in area shall open against pressure.
F. Doors:
    1. Double wall, rectangular.
    2. Galvanized sheet metal with insulation fill and gauge thickness as indicated for duct pressure class. Minimum 1” insulation thickness for doors up to 24” tall and 2” thick insulation for larger door assemblies as required per energy code. Insulation not required in exhaust duct access doors as allowed by local code.
    3. Vision panel shall be provided on doors 24” x 60” and larger.
    4. Fabricate doors airtight and suitable for duct pressure and air leakage class.
    5. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets for doors up to 24” tall. For larger doors provide 1-1/2" by 1/8" flat stock or 14-gauge angle frame.
    6. Gaskets: Closed cell neoprene rubber, 1” x 1/4" (minimum).
G. Hinges and Latches:
    1. Access doors up to 14 by 14 inches (300 x 300 mm) square: Two hinges or continuous piano hinge and one sash lock. Doors shall not be removable.
    2. Access doors up to 16 by 24 inches (400 by 600 mm) square: Two hinges or continuous piano hinge and two sash locks (minimum). Doors shall not be removable.
    3. Access doors up to 24 by 48 inches (600 by 1200 mm): Three hinges or continuous piano hinge and two compression latches (minimum) with outside and inside handles.
    4. Access doors larger than 24 by 48 inches (600 by 1200 mm): Four hinges or continuous piano hinge and two compression latches (minimum) with outside and inside handles.

2.9 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Description: Gravity balanced.
B. Maximum Air Velocity: 800 fpm
C. Maximum System Pressure: 1-inch wg
D. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.
E. Blades: Multiple single-piece blades, ma mum 6-inchwidth, noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
F. Blade Action: Parallel.
G. Blade Seals: Neoprene, mechanically locked.
H. Return Spring: Adjustable tension.
I. Accessories:
J. Adjustment device to permit setting for varying differential static pressure.
K. Counterweights and spring-assist kits for vertical airflow installations.
L. Chain pulls.
M. Screen Mounting: Rear mounted.
N. Screen Material: Galvanized steel
O. Screen Type: Bird.
P. 90-degree stops.

2.10 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Greenheck Fan Corporation.
   2. McGill AirFlow LLC.
   3. Nailor Industries Inc.
   4. Ruskin Company.
   5. Young Regulator Company.
B. Frames:
   1. Angle shaped.
   2. 0.094-inch thick, galvanized sheet steel.
   3. Mitered and welded corners.
C. Blades:
   1. Multiple blade with ma mum blade width of 6 inches.
   2. Opposed-blade design.
   3. Galvanized-steel.
   4. 0.064-inch thick.
   5. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
D. Blade Assembly: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
   1. Operating Temperature Range: From minus 40 to plus 200 deg F
E. Bearings:
   1. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

2. Thrust bearings at each end of every blade.

2.11 FIRE DAMPERS

A. Type: Dynamic; rated and labeled according to UL 555 by an NRTL
B. Fire Rating: 3 hours (for transformer vault makeup air).
C. Heat-Responsive Device: Replaceable, 165 def F rated, fusible links OR Electric resettable link and switch package, factory installed, 165 deg F rated.
D. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
E. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application.
   1. Minimum Thickness: thickness and length to suit application.
   2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
F. Mounting Orientation: Vertical or horizontal as indicated.
G. Blades: Roll-formed, interlocking, galvanized sheet steel.
H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

2.12 COMBINATION FIRE SMOKE DAMPERS

A. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL
B. Fire Rating: 1-1/2 hours
C. Smoke Detector: Factory wired for single-point connection.
D. Heat-Responsive Device: Electric resettable link and switch package, factory installed, 165 deg F rated.
E. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
F. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application.
   1. Minimum Thickness: thickness and length to suit application.
   2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
G. Mounting Orientation: Vertical or horizontal as indicated.
H. Blades: Roll-formed, interlocking, galvanized sheet steel.
I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
J. Leakage: Class I or Class II.
K. Rated pressure and velocity to exceed design airflow conditions.
L. Damper Motors: Two-position action.
M. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
3. Spring-Return Motors: E ip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbd and breakaway torque rating of 150 in. lbf.
4. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
5. Nonspring-Return Motors: For dampers larger than 25 s ft. size motor for running tor rating of 150 in. fand breakaway torque rating of 300 in.
6. Electrical Connection: 115 V, single phase, 60 Hz

2.13 SOUND TRAPS

A. Manufacturers: Price, Vibro-acoustics, or approved equipment.
B. Galvanized steel casing with slip connections. Construction to meet application requirements of SMACNA Duct Construction Standards, ASHRAE 62.1, UL181, ASTM C1071, NPFA 90A, and NFPA 90B.
C. Size and performance as scheduled on plans.
D. Acoustical to review and approve selected attenuator and associated shop drawings.

2.14 CONSTANT AIRFLOW REGULATORS

A. Constant Airflow Regulators are modulating orifices that automatically regulate supply, return or exhaust airflows in duct systems to constant levels. The passive control element responds to duct pressure and requires no electric or pneumatic sensors or controls. The device shall compensate for changes in duct pressure caused by thermal stack effect, building pressure, dust-clogged filters, etc. The device shall solely operate on duct pressure and require no external power supply.
B. Constant Airflow Regulators shall be capable of maintaining constant airflow within +/- 10% of scheduled flow rates (15% for units 50 CFM or less), within the operating range of 0.2 to 0.8 in. wg (50 to 200 Pa) differential pressure, or 0.6 to 2.4 in. wg on high-pressure models, or 0.1 to 0.42 in. wg on low-pressure models. Each regulator shall be pre-set and factory calibrated, requiring no field adjustment to the airflows as indicated on the schedule, and shall be rated for use in air temperatures ranging from -25° to 140°F (-32° to 60°C.)
C. The active control element is an aerofoil. The aero-wing damper lifts in response to increasing static pressure. This operation regulates the free-area opening through the control, resulting in maintenance of velocity and specific airflow set points.
D. Regulators shall be provided as an assembly consisting of a steel or UL ABS plastic body housed within a round sleeve for mounting in round duct. Each round sleeve must be fitted with a lip gasket to ensure perimeter air tightness with the interior surface of the duct. All regulators must be classified per UL 2043 and carry the UL mark indicating compliance. All Constant Airflow Regulators will require no maintenance and must be warranted for a period of no less than five years. Constant Airflow Regulators shall be installed in tight ducting systems in accordance with all applicable codes and manufacturer’s instructions

E. American Aldes Ventilation #Series CAR-3 or equal.

2.15 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct- insulation thickness.
B. Adhesives: High strength, ick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
C. Install round ducts in maximum practical lengths.
D. Install ducts with fewest possible joints.
E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
H. Install ducts with a clearance of 1/2 inch (minimum), plus allowance for insulation thickness.
I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.
L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT ACCESSORY INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's “HVAC Duct Construction Standards - Metal and Flexible” for metal ducts and in NAIMA AH116, “Fibrous Glass Duct Construction Standards”, for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
C. Install volume dampers at points on supply, return, and exhaust systems where branches e end from larger ducts and as far away from air terminal as possible. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
D. Set dampers to fully open position before testing, adjusting, and balancing.
E. Install test holes at fan inlets and outlets and elsewhere as indicated.
F. Install fire/smoke dampers according to UL listing.
G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
    1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
H. Install access doors with swing against duct static pressure.
I. Access Door Sizes:
    1. One-Hand or Inspection Access: 8 by 5 inches.
    2. Two-Hand Access: 12 by 6 inches.
    3. Head and Hand Access: 18 by 10 inches.
J. Install flexible connectors to connect ducts to equipment.
K. Connect diffusers to ducts directly, or with ma 72-inch lengths of flexible duct clamped or strapped in place (when shown on plans).
L. Connect flexible ducts to metals ducts with draw bands or adhesive plus sheet metal screws.
M. Install duct test holes where required for testing and balancing purposes.
N. Install roof-mounted, duct accessories on equipment supports specified in Section 077200 Accessories".

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:
    1. Operate dampers to verify full range of movement.
    2. Inspect locations of access doors and verify that purpose of access door can be performed.
    3. Operate fire/smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
    4. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 233400 – HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Centrifugal roof ventilators.
   2. Ceiling-mounted ventilators.
   3. In-line centrifugal fans.
   4. Axial Fans.
   5. Small Cabinet Fans (Ceiling Mounted and Inline)

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include rated capacities, furnished specialties, and accessories for each fan.
   2. Certified fan performance curves with system operating conditions indicated, including fan total and static efficiencies.
   3. Certified fan sound-power ratings.
   4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   5. Material thickness and finishes, including color charts.
   6. Dampers, including housings, linkages, and operators.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.
   3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
   4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Belts: Two sets for each belt-driven unit.

1.5 PERFORMANCE REQUIREMENTS

A. Capacities and performance shall be as specified in the mechanical schedules.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.
   3. Or approved equivalent.
B. Housing: one-piece, aluminum base with venturi inlet cone.
   1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
D. Acoustics: Refer to Acoustical Report and Equipment Schedules
E. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Rated for 140deg F (min) airstream temperature.

2.2 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.
   3. Or approved equivalent.
B. Housing: Galvanized steel, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
E. Acoustics: See schedule
F. Accessories:
   1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
   2. Companion Flanges: For inlet and outlet duct connections.

3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

2.3 AXIAL FANS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Greenheck Fan Corporation.
   2. Loren Cook Company.
   3. Or approved equivalent.
B. Inline fans shall be of the direct drive a type with cast aluminum airfoil propellers.
C. The casing shall be constructed of continuously welded steel and include integral punched inlet and outlet flanges to prevent air leakage.
D. Motor support brackets shall be welded to fan casing.
E. Blades shall be airfoil design. Hub and blades shall be a high strength cast aluminum alloy. Blade pitch shall be manually adjustable without removing from the fan casing.
F. Rotors to be statically and dynamically balanced. A tapered lock bushing shall be used to mount the propeller to the motor shaft.
G. Fan performance shall be based on tests conducted in accordance to AMCA 210 (meets BS848 part 1), licensed to bear the AMCA Air Performance Seal in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.

2.4 SMALL CABINET FANS (CEILING MOUNTED AND INLINE CABINET)

A. Ceiling mounted exhaust fans:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Greenheck Fan Corporation.
      b. Panasonic.
      c. Loren Cook Company.
      d. Or approved equivalent.
   2. General: Provide centrifugal direct drive type ceiling exhaust fan. The fan wheel(s) shall be of the forward curved centrifugal type and dynamically balanced.
   3. Noise Data: Provide sone or octave band noise values at the required air delivery.
      a. 0.3 sones at 80 cfm to 112 cfm
   4. Fan Housing: The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 1/2- inch acoustical insulation. The outlet duct collar shall include a backdraft damper on all sizes and shall be spring loaded on larger units above 200 cfm.
      a. Integral backdraft damper shall be totally chatterproof with no metal-to-metal contact.
      b. Entire fan, motor and wheel assembly shall be easily removable without disturbing the housing.
      c. Outlet shall be adaptable for horizontal or vertical discharge.

5. Motor speeds shall not exceed 1100 RPM and all fan motors shall be suitably grounded and mounted on rubber-in-shear vibration isolators.
6. Grille: For 300 cfm and smaller fans the grille shall be constructed of high impact polystyrene and for larger sizes the grille shall be constructed of aluminum. Grilles shall be non-yellowing.
7. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators.
8. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be UL/cUL Listed.
9. Provide the fan with the following required additional features:
    a. UL263/UL555C housing and damper assembly.

B. Duct mounted cabinet fan:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Greenheck Fan Corporation.
    b. Panasonic.
    c. Loren Cook Company.
    d. Or approved equivalent.
2. General: Provide centrifugal direct drive type fan. The fan wheel(s) shall be of the centrifugal type and dynamically balanced.
3. Noise Data: Provide sone or octave band noise values at the required air delivery.
4. Fan Housing: The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 1/2-inch acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper on all sizes and shall be spring loaded on larger units above 200 cfm.
    a. Integral backdraft damper shall be totally chatterproof with no metal-to-metal contact.
    b. Entire fan, motor and wheel assembly shall be easily removable without disturbing the housing.
    c. Outlet shall be adaptable for horizontal or vertical discharge.
5. Motor speeds shall not exceed 1100 RPM and all fan motors shall be suitably grounded and mounted on rubber-in-shear vibration isolators.
6. The access for wiring shall be external. The motor disconnect shall be internal and of the plug-in type. The motor shall be mounted on vibration isolators.
7. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be UL/cUL Listed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate motor starters with Division 26 and controls contractor.
B. Install in accordance with manufacturer's instructions.

C. Examine site to verify if site is ready to receive work. Provide layout drawings of air handlers and fan locations to electrical installer.
D. Install unit on vibration isolators.
E. Install 3" flexible duct connection at inlets and outlets of units.
F. Control installers shall install all wiring associated with control signals into the fan starters.
G. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 26 work
H. Exhaust fans servicing risers with subducts shall operate continuously and shall be connected to backup generator power supply or other uninterruptible backup power as required by the Building Code and NFPA. Coordinate with Division 26 work.

3.2 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four-hours travel from the job site.

END OF SECTION

SECTION 237000 – CENTRAL HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
   1. Packaged, Outdoor, Central-Station Air-Handling Units (Rooftop Units)
   2. Indoor Packaged Air-to-Air Energy Recovery Ventilators

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: RTUs shall withstand the effects of earthquake motions and wind determined according to the latest version of ASCE 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 DEFINITIONS

A. ERV: Energy Recovery Ventilator unit.
B. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
C. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
D. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
E. Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
F. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 ACTION SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical
B. characteristics and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Fan-curves: Computer generated fan curves for each fan shall be submitted with specific design operation point noted.
   2. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.
B. Warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. ARI Compliance:
   1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
   2. Comply with ARI 270 for testing and rating sound performance for RTUs.
   3. Comply with ARI 1060 for testing and capacity ratings for ERVs.
B. ASHRAE Compliance:
   1. Comply with ASHRAE 15 for refrigerant system safety.
   2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
   3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
E. UL Compliance: Comply with UL 1995.
F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors bolted shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.
B. Follow Installation, Operation and Maintenance manual instructions

1.9 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.
B. Parts Warranty: Manufacturer shall provide a limited “parts only" warranty for a period of 24 months from the date of original equipment shipment from the factory. Warranty shall cover

material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

C. Startup Repair Program: Manufacturer shall provide startup repair for a period of 12 months from the date of original equipment shipment from the factory. Program shall cover labor for materials and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for installation, operation and maintenance have been followed. Program excludes labor associated with routine maintenance, such as belt and air filter replacement.

D. Compressor Warranty: Compressors shall carry a 5-year non-prorated warranty, from the date of original equipment shipment from the factory.

PART 2 - PRODUCTS

2.1 PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS (ROOFTOP UNITS)

A. Manufacturers:
   1. Products shall be provided by the following approved manufacturers:
      a. AAON
      b. Trane
   2. Products from other manufacturer's that meet the requirements in this specification document may be considered if the contractor provides a substitution request to the Engineer of Record and the Architect with product documentation compliant with the submittals outlined in part 1 in addition to a written statement detailing the potential benefits of such a substitute to the project.

B. Construction
   1. General Fabrication Requirements: All cabinet walls, access doors, and roof shall be of formed and reinforced double-wall, impact resistant, rigid polyurethane insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
      a. Air Leakage:
         1) Cabinet leakage shall not exceed 1 of total airflow when tested at 3 times the minimum external static pressure provided in ASHRI Standard 210/240.
         2) Panel deflection shall not exceed L/240 ratio at 125 of design static pressure, at a maximum of 8 inches of positive or negative static pressure. Deflection shall be measured at the midpoint of the panel height and width.
         3) Piping and electrical conduits through cabinet panels shall include sealing to reduce air leakage.
      b. Drainage:
         1) Roof of the air tunnel shall be sloped to provide complete drainage.
         2) The cabinet shall have rain break overhangs above access doors.
      c. Lifting Lugs: Unit shall include lifting lugs on the top of the unit.

2. Exterior Casing Material: G90 Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
    a. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when teste din a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedures.
3. Inner Casing Material: G90 Galvanized steel.
4. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
    a. Materials: ASTM C 1071, Type I.
    b. Performance: Unit insulation shall have a minimum thermal resistance R-value of 13.
    c. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
    d. Liner Adhesive: Comply with ASTM C 916, Type I.
5. Condensate Drain Pans: Formed sections of 304 stainless-steel sheet.
    a. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight. Pan shall be double sloped.
    b. Drain Connections: Threaded nipple
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Accessibility: Access to filters, dampers, cooling coil, heater, compressor, electrical, and control components shall be through hinged access doors.
    a. Handles: Quarter turn, lockable.
    b. Hinges: Full length stainless steel hinges shall be included on the doors.
8. Openings: Unit shall be provided with left side horizontal discharge and return air openings. All openings through the unit shall have upturned flanges of at least ½ inch around the opening.

C. Fans
1. Direct-Driven Supply-Air Fans: Backward curved, unhoused plenum supply fans; with permanently lubricated, ECM motor resiliently mounted in the fan inlet. Blowers and motors shall be dynamically balanced.
2. Direct-Driven Exhaust Fans: Axial flow exhaust fans with permanently lubricated, ECM motor resiliently mounted in the fan inlet. Fan shall be sized for 100
3. Direct-Driven Condensor Fans: Condensor fans shall be a vertical discharge, axial flow, direct drive type with permanently lubricated ECM motor resiliently mounted in the fan inlet.
    a. Condenser fan housing shall be fabricated of composite material and include an optimized orifice with inlet guide vanes.
    b. Condenser fan blades shall be serrated and aerodynamically designed for high efficiency and reduced sound levels.
    c. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35 F.
4. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in

Section 230549 "Seismic Controls for HVAC" when fan-mounted frame and RTU-mounted frame are anchored to building structure.

5. Fan Motor: Fan motor shall be a high efficiency electrically commutated motor that complies with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

D. Coils
   1. Supply-Air Refrigerant Coil:
      a. Aluminum-plate fin and seamless copper tube with aluminum end casings.
      b. Fins shall be mechanically bonded to the tubes and aluminum end casings.
      c. Polymer strip shall prevent all copper coil from contacting steel coil frame.
      d. Coil Split: Interlaced. Coil shall be helium hydrogen or helium leak tested.
      e. Coil shall be furnished with factory installed electronic expansion valves.
   2. Heat Pump Outdoor Coil
      a. Heat pump outdoor coil shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
         1) Coils shall be designed for a minimum of 10 F of refrigerant sub-cooling.
         2) Coils shall be hydrogen or helium leak tested.
   3. Electric-Resistance Heating: Unit shall include an electric heating coil located in the reheat position downstream of the cooling coil.
      a. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.
      b. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage.
      c. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Electric heater shall have full modulation capacity controlled by an SCR. A 0-10 VDC heating control signal shall be field provided to control the amount of heating.

E. Refrigerant Circuit Components
   1. Number of Refrigerant Circuits: One
   2. Compressor: Hermetic variable capacity scroll compressor mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief.
      a. Compressor shall be capable of modulation from 10-100
      b. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation.
   3. Refrigeration Specialties:
      a. Refrigerant: R-32 or R-454B.
      b. Expansion valve with replaceable thermostatic element.
      c. Factory installed refrigerant filter/dryer with check valve, reversing valve, accumulator, and thermal expansion valves on both the indoor and outdoor coils. Reversing valve shall energize during the heat pump cooling mode of operation
      d. Manual-reset high-pressure safety switch.
      e. Automatic-reset low-pressure safety switch.
      f. Minimum off-time relay.
      g. Automatic-reset compressor motor thermal overload.

h. Brass service valves installed in compressor suction and liquid lines.
i. Liquid line sight glass.
j. Suction and discharge compressor isolation valves.

F. Air Filtration
1. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
2. Unit shall include 4 inch thick, pleated panel filters with an ASHRAE efficiency MERV rating of 8, upstream of the cooling coil.
3. Unit shall include a clogged filter switch.
4. Unit shall include a Magnehelic gauge mounted in the controls compartment.

G. Dampers
1. Outdoor-Air Damper: Linked damper blades, for 0 to 100 percent outdoor air, with motorized damper filter.
2. Outdoor- and Return-Air Economizer Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.
a. Damper Motor: Barometric, modulating with adjustable minimum position.
b. Relief-Air Damper: Motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood with rain lip.
c. Assembly shall be constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals.
d. Damper blades shall be gear driven and designed to have no more than 15 CFM of leakage per square foot of damper area when subjected to 2 inches w.g. air pressure differential across the damper.
e. Economizer shall be furnished with a California Energy Commission Certified Title 24 Fault Detection and Diagnostic package. Economizer assembly shall carry a 4 year parts warranty from the date of the original equipment shipment from the factory.
f. Unit shall include an outside airflow measuring station and airflow signal processor that communicates directly with the factory provided control systems, or can be used with customer provided controls with a 0-10 VDC output signal.

H. Electrical Power Connection
1. Provide for single connection of power to unit with a factory installed and factory wired non-fused disconnect switch accessible from outside the unit, and a control-circuit transformer with built-in overcurrent protection.
2. Unit shall have a 5kAIC SCCR.

I. Controls
1. Control equipment and sequence of operation are specified in Section 23 0993 "Sequence of Operations for HVAC DDC."
2. Basic Unit Controls:
a. Control-voltage transformer.
b. Wall-mounted thermostat or sensor with the following features:
1) Heat-cool-off switch.
2) Fan on-auto switch.

3) Fan-speed switch.
4) Automatic changeover.
5) Adjustable deadband.
6) Concealed set point.
7) Concealed indication.
8) Degree F indication.
9) Unoccupied-period-override push button.
10) Data entry and access port to input temperature set points, occupied and unoccupied periods, and output room temperature, supply-air temperature, operating mode, and status.

c. Remote Wall-Mounted Annunciator Panel for Each Unit:
1) Lights to indicate power on, cooling, heating, fan running, filter dirty, and unit alarm or failure.
2) DDC controller or programmable timer and interface with HVAC instrumentation and control system.
3) Digital display of outdoor-air temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.

d. Electronic Controller:

e. Controller shall have volatile-memory backup.

f. Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of two programmable periods per day. See 23 0993 for scheduling.

g. Supply Fan Operation:
1) Occupied Periods: Run fan continuously.
2) Unoccupied Periods: Fan to run a minimum outdoor air setting

h. Refrigerant Circuit Operation:
1) Cycle or stage compressors to match compressor output to cooling load to maintain room temperature. Cycle condenser fans to maintain maximum hot-gas pressure.

i. Electric-Heating-Coil Operation:
1) Operate supplemental electric heating coil with compressor for heating with outdoor temperature below 30 deg F.

j. Fixed Minimum Outdoor-Air Damper Operation:
1) Minimum outdoor air setting per schedule and monitored by Airflow monitoring controller.

k. Economizer Outdoor-Air Damper Operation:
1) Occupied Periods: Open to fixed minimum intake, and maximum 100 percent of the fan capacity to comply with ASHRAE Cycle II. Controller shall permit air-side economizer operation when outdoor air is less than 60 deg F. During economizer cycle operation, lock out cooling.

l. Outdoor-Airflow Monitor: Accuracy maximum plus or minus 5 percent within 15 and 100 percent of total outdoor air. Monitor microprocessor shall adjust for temperature.

J. Accessories

1. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
2. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
3. Coil guards of painted, galvanized-steel wire.
4. Hail guards of galvanized steel, painted to match casing.
5. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

K. Capacities and Characteristics
1. Capacities and characteristics shall be compliant with the requirements stated in the equipment schedules on the project plan documents.

2.2 INDOOR PACKAGED AIR-TO-AIR ENERGY RECOVERY VENTILATORS

A. Manufacturers:
1. Mitsubishi Lossnay
2. Renewaire
3. LG
4. Panasonic
5. Lifebreath
6. Approved equivalent

B. General
1. ERV indoor units are factory assembled and provided with an internally mounted control circuit board, exhaust fan, supply fan, air to air heat exchanger.
2. Direct driven fans with brushless motors and permanently sealed bearings.
3. Horizontally ceiling hung
4. Floor mount

C. Casing
1. The metal casing is designed to mount concealed above a finished ceiling.
2. Supply fan discharge and exhaust fan inlet (return air) are horizontal.
3. The case is provided with hanger brackets designed to support the unit weight on for corners. Hanger brackets have pre-punched holes designed to accept field supplied, all-thread rod hangers.

D. Efficiency:
1. Comply with the scheduled minimum sensible and latent efficiencies.
2. Comply with scheduled fan efficiency ratings.

E. Acoustical: Refer to acoustical report and equipment schedules.

F. Accessories:
1. Provide controls and sensors as scheduled. Setup equipment as specified in Description of Operations on plans.
2. Include all integral filtration as scheduled. All other filtration requirements addressed in plans and in Section 233000

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:
   1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration Controls for HVAC" and Section 230549 "Seismic Controls for HVAC".
B. Roof Curb: Install on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Or ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
C. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
D. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
   1. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "HVAC Air Distribution."
E. Suspended Units: Suspend and brace units from structural with threaded steel rods and spring or elastometric hangers. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration Controls for HVAC".
F. Install units with clearances for service and maintenance.
G. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
B. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
C. Tests and Inspections:
   1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
   2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Remove and replace malfunctioning units and retest as specified above.

3.3 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.
B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

END OF SECTION

SECTION 238100 – DECENTRALIZED UNITARY HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 01, and shall include, but not necessarily be limited to, the following:
   1. Split-system air-conditioning and heat-pump units

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
C. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a certified testing agency, and marked for intended location and application.
B. ASHRAE Compliance:
   1. Fabricate and label refrigeration system to comply with ASHRAE 15, Safety Standard for Refrigeration Systems.

1.5 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.
B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SPLIT SYSTEM HEAT PUMPS

A. Furnish materials in accordance with Mechanical Code, ASHRAE 15, and Standards.
B. Product Description: Split system consisting of air handling unit and condensing unit including cabinet, evaporator fan, refrigerant cooling coil, compressor, refrigeration circuit, condenser, electric heating coil, air filters, controls, air handling unit accessories, condensing unit accessories, and refrigeration specialties.

C. See schedules for Manufacturer Basis of Design.
D. Manufacturers:
   1. Trane Mitsubishi
   2. LG.
   3. Daikin.
   4. Or approved equal

2.2 OUTDOOR HEAT PUMP UNIT

A. General: Factory assembled and tested air cooled condensing units, consisting of casing, compressors, condensers, coils, condenser fans and motors, and unit controls. Unit shall be by the same manufacturer as the indoor units.
B. Unit Casings: Exposed casing surfaces constructed of galvanized steel with manufacturer's standard baked enamel finish. Designed for outdoor installation and complete with weather protection for components and controls, and complete with removable panels for required access to compressors, controls, condenser fans, motors, and drives.
C. Compressor: Single refrigeration circuit with rotary or hermetic reciprocating type compressors, resiliently mounted, with positive lubrication, and internal motor overload protection. Provide factory mounted crankcase heater on all compressors.
D. Condenser Coil: Constructed of copper tubing mechanically bonded to aluminum fins, factory leak and pressure tested. Coil fins shall have a factory applied corrosion resistant coating, tested in accordance with ASTM B-117.
E. Controls: Furnish operating and safety controls including high and low pressure safety switches. Control transformer. Furnish magnetic contactors for compressor and condenser fan motors.
F. Condenser Fans and Drives: Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Permanently lubricated ball bearing type motors with built-in thermal overload protection.
G. Sound Rating: The outdoor unit shall have a tested sound rating no higher than 58 dB(A) tested per KSA0701.
H. Refrigerant piping: The system shall have a single refrigerant circuit and use R-454B refrigerant. All refrigerant lines from the outdoor unit to the indoor unit shall be field insulated separately and shall not exceed 164 feet in length. Confirm length based on equipment submittals.
I. Install refrigerant stop valves where required in system to meeting ASHRAE 15, Mechanical Code, and manufacturer requirements.
J. The outdoor unit shall be capable of operating in heating mode down to 5°F and up to 75°F from 23°F to 75°F; ambient wet bulb without additional low ambient controls
K. The outdoor unit shall be capable of operating in cooling mode down to 14°F and up to 115°F ambient dry bulb
L. The Washington State Department of Ecology and the Environmental Protection Agency (EPA) require equipment to utilize refrigerants with < 700 GWP based on equipment type and installation/refrigeration charge date. Refrigerant selected will comply with Department of Ecology and EPA requirements.
M. Basis of Design from Trane Mitsubishi is R-454B

2.3 INDOOR WALL-MOUNTED INDOOR UNIT

A. General
   1. Wall-mounted indoor units shall protrude from the wall no more than 10 inches.
   2. Shall be installed with heat pump outdoor unit of the same capacity and from the same manufacturer.
   3. The indoor unit shall have a tested sound rating no higher than 49 dB(A) tested per KSA0701.
   4. The indoor unit shall communicate with the outdoor unit via 24VDC control wiring.

B. Indoor Unit:
   1. The indoor unit shall be factory assembled, wired, and run tested.
   2. The indoor unit shall be factory wired and piped with its own control circuit board, fan and motor
   3. The indoor unit shall have self-diagnostic and auto-restart functions.
   4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

C. Condensate Drain:
   1. A condensate pan overflow moisture detector will be provided and wired to disable the fan coil on condensate overflow to satisfy Mechanical Code requirements. Utilize Resource Conservation technologies AG-9300-LG Condensate overflow safety switch or equivalent mounted in secondary drain connection. Provide Aspen Pumps Mini Aqua condensate pump if necessary for drainage.

D. Unit Cabinet:
   1. The unit casing shall have a pearl white finish.
   2. Multi directional refrigerant piping up to four (4) directions shall be standard.
   3. Multi directional drain piping up to two (2) directions shall be standard.
   4. The indoor unit casing shall have integral sensor to read wireless handheld remote controller as standard from the factory.

E. Filter:
   1. Return air shall be filtered with a factory supplied removable, washable filter.
   2. Shall be furnished as standard with a factory installed plasma filter with no additional external power supply required.

F. Fan:
   1. The indoor fan shall be an assembly with one cross flow fan direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced.
   3. Motor shall have permanently lubricated bearings.
   4. In cooling mode, the indoor fan shall have the following settings; Low, Med, High, Power Cool and Auto.
   5. In heating mode, the indoor fan shall have the following settings; Low, Med, High, and Auto.
   6. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
   7. A chaos algorithm shall be provided that simultaneously and randomly changes the fan speed and discharge flow direction simulating a natural outdoor breeze.

8. For indoor unit, a manually adjustable guide vane shall be factory installed allowing the ability to control the direction of airflow from side to side.
9. A motorized sweeping guide vane shall be factory installed allowing the ability to control the direction of airflow from side to side.
10. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

G. Coil:
1. The indoor unit coil shall be nonferrous with stamped louvered fins on copper tubing for maximum efficiency.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. The coils shall be pressure tested at the factory.
4. A non-metallic condensate drain pan shall be factory installed below the coil.
5. All refrigerant lines to the indoor unit shall be field insulated.

H. Capacity:
1. Supply Air: Corrected to 500 feet altitude.
2. Supply Fan: As shown on drawings.
3. Cooling Capacity: As shown on drawings.
4. Electric Heating: As shown on drawings.

I. Electrical Characteristics and Components:
1. Electrical Characteristics: As shown on drawings.
2. Disconnect Switch: Factory mounted, non-fused type, interlocked with access door, accessible from outside unit, with power lockout capability.

J. Accessories:
1. Refrigerant leak detection for A2L refrigerants shall be integral to the units and include factory controls to comply with the UL/CSA 60335-2-40 for unit listing.

2.4 INDOOR CEILING CONCEALED HORIZONTAL DUCTED UNIT

A. General:
1. Ceiling concealed horizontal ducted indoor units shall be suspended from the structure above with isolation in accordance with the Seismic Tiedown and Isolation Schedule.
2. Shall be designed for use with R-454B refrigerant.
3. Shall be installed with heat pump outdoor unit of the same capacity and from the same manufacturer.
4. Unit performance shall meet or exceed scheduled capacity at the scheduled conditions.

B. Indoor Unit:
1. The indoor unit shall be factory assembled, wired and run tested.
2. The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.
3. The indoor unit shall have:
   a. Self-diagnostic function
   b. Auto restart function
4. Indoor unit refrigerant circuit shall be filled with a dry nitrogen gas charge from the factory.

C. Filter:

1. Unit shall be provided with separate angled filter rack. Refer to schedules.

D. Fan:
1. The indoor fan shall be an assembly with one or two direct drive fans.
2. The indoor fan shall be statically and dynamically balanced.
3. Motor shall have permanently lubricated bearings.
4. In both cooling and heating modes, the indoor fan shall have a minimum of three fan speeds.
5. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

E. Coil:
1. The indoor unit coil shall be aluminum with louvered fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. The coils shall be pressure tested at the factory.
4. A condensate drain pan shall be factory installed below the coil.
5. All refrigerant lines to the indoor units shall be field insulated.

F. Condensate Pump:
1. See schedules on drawings for condensate pump requirements.

G. Controls:
1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system and communicate with the outdoor unit over the manufacturer's system control protocol.

H. Capacity:
1. Supply Air: Corrected to 500 feet altitude.
2. Supply Fan: As shown on drawings.
3. Cooling Capacity: As shown on drawings.
4. Electric Heating: As shown on drawings.

I. Electrical Characteristics and Components:
1. Electrical Characteristics: As shown on drawings.
2. Disconnect Switch: Factory mounted, non-fused type, interlocked with access door, accessible from outside unit, with power lockout capability.

J. Accessories:
1. Refrigerant leak detection for A2L refrigerants shall be integral to the units and include factory controls to comply with the UL/CSA 60335-2-40 for unit listing.

2.5 CONTROLS

A. See Description of Operations for details.

B. Thermostat shall comply with be Energy Code requirements for Heat Pump Controls: Unitary air cooled heat pumps shall include microprocessor controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means (e.g., LED indicators). Heat pumps equipped with supplementary heaters shall be installed with controls that prevent supplemental heater operation above 40°F.

C. Thermostat shall comply with Energy Code requirements for Temperature Controls: Heat pumps equipped with internal electric resistance heaters shall have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and setback recovery. Supplemental heater operation is permitted during outdoor coil defrost cycles.
D. Thermostat shall comply with be Energy Code requirements for Temperature Controls: Controls on systems required to have economizers and serving single zones shall have multiple cooling stage capability and that activate the economizer when appropriate as the first stage of cooling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify level surface for mounting unit is ready for unit installation.
B. Verify wall bracket is installed mounting outdoor units prior to mounting.
C. Verify roof structural, flashing, and waterproofing elements are installed and dimensions are as required for mounting outdoor units prior to mounting.

3.2 INSTALLATION - OUTDOOR UNIT

A. Install outdoor units on isolators in accordance with Seismic Tiedown and Isolation Schedule on mechanical drawings.
B. Install units in accordance with details on mechanical drawings and manufacturer installation instructions.
C. Install refrigerant piping from indoor unit to outdoor unit. Install refrigerant specialties furnished with unit including refrigerant stop valves.
D. Evacuate refrigerant piping and install initial charge of refrigerant.
E. Install electrical devices furnished loose for field mounting.
F. Install control wiring between indoor fan coil unit, outdoor unit, and field installed accessories.
G. Install connection to electrical power wiring.
H. Identification: Provide phenolic equipment tags identifying all pieces of equipment.
I. Install work in accordance with Mechanical Code, ASHRAE 15, and UL Listing.

3.3 INSTALLATION - INDOOR UNIT

A. Install indoor units on isolators in accordance with Seismic Tiedown and Isolation Schedule on mechanical drawings.
B. Install units in accordance with details on mechanical drawings and manufacturer installation instructions.
C. Install refrigerant piping from indoor unit to outdoor unit. Install refrigerant specialties furnished with unit.
D. Install condensate drainage piping per mechanical drawings and Mechanical Code requirements.
E. Evacuate refrigerant piping and install initial charge of refrigerant.
F. Install electrical devices furnished loose for field mounting.
G. Install control wiring between indoor fan coil unit, outdoor unit, and field installed accessories.
H. Install connection to electrical power wiring.
I. Identification: Provide phenolic equipment tags identifying all pieces of equipment.

J. Install work in accordance with Mechanical Code, ASHRAE 15, and UL Listing.

3.4 INSTALLATION – CONTROLS

A. Set control of equipment based on room controller space temperature rather than default return air temperature.
B. Set control of fans to cycle on cooling and heating load or as required by Description of Operations.
C. If applicable, setup Ethernet access via local area network. Coordinate setup for remote access with IT.
D. Setup output of error message notification via email, coordinate with owner for address. Include output of additional control input alarms.
E. Designate indoor units with unit tag and room/space name.
F. Setup occupied and unoccupied space temperature schedules with 2-hour interval occupied sweep and second unoccupied temperature sweep. Coordinate schedules with Owner.
G. Provide graphical floor plans for central controller display. Show locations of fan coils on plan with equipment tag

3.5 MANUFACTURER'S FIELD SERVICES

A. Furnish initial start-up and shutdown during first year of operation, including routine servicing and checkout.
B. Setup and confirm refrigerant leak detection in fan coils per manufacturer startup requirements.
C. Setup and confirm refrigerant stop valve operation per manufacturer startup requirements.

3.6 CLEANING

A. Vacuum clean coils and inside of unit cabinet.
B. Install temporary filters during construction period. Replace with permanent filters at Substantial Completion.

3.7 DEMONSTRATION

A. Demonstrate air handling unit operation and maintenance.
B. Demonstrate starting, maintenance, and operation of condensing unit including low ambient temperature operation.
C. Demonstrate operation of refrigerant leak detection and stop valves.

3.8 PROTECTION OF FINISHED WORK

A. Do not operate air handling units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
B. Equipment shall not be used for temporary heating or ventilation prior to substantial completion without written approval by Owner.

END OF SECTION

SECTION 238239 – ELECTRIC HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
B. Shop Drawings:
   1. Include plans, elevations, sections, and details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include details of anchorages and attachments to structure and to supported equipment.
   4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
   5. Wiring Diagrams: Power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wall and ceiling unit heaters to include in emergency, operation, and maintenance manuals.

1.4 WARRANTY

A. Refer to Section 230500 for Warranty and Substantial Completion requirements for work covered under this section.

PART 2 - PRODUCTS

2.1 ELECTRIC UNIT HEATER

A. Manufacturers
   1. King
   2. Dimplex
   3. Berko (Marley)
   4. Approved equivalent
B. General
   1. Factory fabricated fan coil units with electric heating coil of the size, type configuration and capacity as scheduled on the drawings.
C. Controls

1. Refer to plans and equipment schedules for control mounting and requirements.

D. Unit Casing

1. Unit shall be constructed of formed cold-rolled steel with internal insulation. Insulation shall be attached with adhesive with all exposed edges coated to prevent erosion. All exposed metal inside and out shall be finished with at least one coat of enamel.
2. Color shall be factory applied as approved by Architect or Engineer.

E. Fan Assembly

1. Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.
2. Motor shall be permanently lubricated.

F. Unit Suspension

1. Manufacturer to provide factory welded mounting brackets and clips for suspension of units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Examine site to verify if site is ready to receive work.
C. Install unit supported by brackets provided by manufacturer.
D. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 26 work.

END OF SECTION

SECTION 260001 – ELECTRICAL PE STAMP COVERSHEET

DIVISIONS 260000 TO 264300

SPECIFICATIONS PREPARED BY:
DELTA E CONSULTING
PO BOX 16785
SEATTLE, WA 98116
206-690-2260

ELECTRICAL ENGINEER: ANDREW BLACKWELL

DATE OF SIGNATURE: PRELIMINARY

END OF SECTION

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 PROJECT DESCRIPTION AND TEAM

A. Multifamily mid-rise apartment building Seattle, WA.
   1. Project includes commercial retail spaces that will be delivered as core and shell spaces for the initial buildout.
   2. See architectural drawings for a complete description of building areas, building height, building occupancies and uses, residential Group R-2 dwelling unit count, amenities, parking garage, and other building features.

B. See Architectural Code Basis “G” Drawing Sheets for further information on the code basis for the project, Note: Detailed “G” Drawing Sheets were not yet available for this schematic design drawing set.

C. Project Team:
   1. See architectural drawings for details on project team and contact information.
   2. Owner: SCIDpda/Friends of Little Saigon
   3. Architect: GGLO
   4. General Contractor: BNBuilders

1.2 PROJECT INTRODUCTION

A. Delta E Consulting is the Engineer of Record for the Mechanical, Electrical and Plumbing Systems. See MEP drawings and Division 22, 23, and 26 Specifications for contract document. The set will be utilized for bidding and selection of the MEP subcontractors. There will be an Issued for Construction (IFC) set that is issued after the subcontractors are selected.

B. This section aims to outline the approach for project design and delivery, upon which contractors are expected to prepare a bid for preconstruction and construction services. For additional information about the project requirements for bidding and contractor selection refer to the owner or general contractor request for proposal (RFP) document. If there are discrepancies between the RFP and the specifications/drawings please notify the owner or general contractor so that these can be resolved prior to the bid or contractor selection date.

C. All tasks covered in this section must adhere to the standards set forth in the General Conditions, Supplemental Conditions, Special Conditions, and Division 01 – General Requirements, including the fire

D. Discrepancies among drawings, this specification section, and other specification sections will not serve as a basis for determining project or cost exemptions. Decisions on exemptions due to document discrepancies will be determined based on the engineer of record's official responses to bid clarification inquiries or Requests For Information (RFIs).

1.3 DESCRIPTION OF BID DOCUMENTS

A. Specifications:
   1. Specifications, in general, describe quality and character of materials and equipment.
B. Drawings:
   1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and details of installation.
   2. Before proceeding with work check and verify all dimensions.
   3. Assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
   4. Make adjustments that may be necessary or requested, to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
   5. If any part of Specifications or Drawings appears unclear or contradictory, apply to the Owner's Representative for interpretation and decision as early as possible, including during bidding period.

1.4 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Project Commissioning: See the Division 019100 Specification and drawings for details on the project commissioning requirements to meet Energy Code, project Sustainability, and owner requirements.
C. Equipment Controls and Description of Operations: See plumbing drawings for details on the plumbing equipment controls and sequencing of equipment.

1.5 DEFINITIONS & ABBREVIATIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.6 CODES & STANDARDS

A. As required by the Building Code and jurisdictional requirements the Contractor is responsible for meeting all code, standard, and jurisdictional requirements not explicitly detailed in these specifications or drawings, but which may be reasonably inferred or implied from the nature of

the project, must be provided as part of the contract. Contractor is responsible for requesting further information or clarifications in regard to meeting applicable jurisdictional requirements, code and standards if they find the contract documents do not clearly describe the project scope or intended means for code compliance.

B. All excavation work must comply with all provisions of state laws including notification to all owners of underground utilities at least 48 business day hours, but not more than 10 business days, before commencing an excavation.

C. All accessible electrical work shall comply with the Americans with Disabilities Act (ADA)and local amendments.

D. Electrical equipment, electrical devices and wiring shall conform to the latest standards of NFPA 70. All materials and equipment covered under the UL Testing Laboratory Service must be certified by the Underwriters Laboratories for their intended use and bear the UL mark. ETL or CSA marks may also be used if they are accepted by the Authorities Having Jurisdiction (AHJs).

E. Electrical equipment and systems shall comply with Energy Code requirements.

F. Equipment Short-Circuit Current Ratings (SCCR): The SCCR on unit nameplates must equal or exceed the AIC rating of the panel serving the equipment. All small package equipment must have a listing for a minimum of 5,000 AIC. Larger packaged equipment are required to be listed for at least 64,000 AIC, unless otherwise specified. The final SCCR is determined based on the Electric Contractor coordination study.

G. Perform all tests required by governing authorities and required by the contract documents. Provide written reports on all tests.

H. The following codes and standards apply to the design of the project:

CODES & STANDARDS ABBREVIATION LEGEND	
ABBREVIATION	**PROJECT SPECIFIC CODE REFERENCE**
ENERGY CODE	2021 SEATTLE ENERGY CODE FOR COMMERCIAL BUILDINGS (SEC-C)
BUILDING CODE	2021 SEATTLE BUILDING CODE WITH WASHINGTON STATE AMENDMENTS
ACCESSIBILITY CODE	2021 SEATTLE BUILDING CODE AND ICC A117.1-2009
SEISMIC CODE	ASCE 7-2016 AS REFERENCED BY 2021 SEATTLE BUILDING CODE
FIRE CODE	2021 SEATTLE FIRE CODE
MECHANICAL CODE	2021 SEATTLE MECHANICAL CODE
FUEL GAS CODE	2021 SEATTLE FUEL GAS CODE 2021 NATIONAL FUEL GAS CODE (NFPA 54) 2020 LIQUEFIED PETROLEUM GAS CODE (NFPA 58)
PLUMBING CODE	2021 SEATTLE PLUMBING CODE
BOILER CODE	2024 SEATTLE BOILER CODE
ELECTRICAL CODE	2023 NATIONAL ELECTRICAL CODE WITH 2023 SEATTLE AMENDMENTS (NFPA 70)
ELEVATOR CODE	ASME A17.1-2019 SAFEY CODE FOR ELEVATORS AND ESCALATORS WITH WASHINGTON STATE AMENDMENTS
NFPA STANDARDS	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS AS REFERENCED BY THE CODES ABOVE
SUSTAINABILITY	ESDS V4, WITH THE FOLLOWING CREDITS UNDER V3.0.1: 5.1A, 5.2A AND 7.5.

GENERAL NOTES:

DELTA E CONSULTING: TEMPLATE REV DATE: REVISED FOR PROJECT

A. WHERE DRAWINGS AND SPECIFICATIONS REFER TO THE "BUILDING CODE" (FOR EXAMPLE) THIS REFERS TO THE PROJECT SPECIFIC CODE LISTED IN THE TABLE ABOVE. SEE CODES & STANDARDS BASIS OF DESIGN IN THE DRAWINGS FOR FURTHER DETAILS REGARDING THE APPLICABLE CODE SUCH AS EFFECTIVE DATE, ETC.

1.7 SCOPE OF WORK

A. See electrical drawings for an outline of the specific scope of work and plumbing systems for this project.
B. Specifications may include additional typical systems that may not be utilized for this specific project. Where system types or equipment types are not utilized for this specific project the contractor is not required to submit on these components.
C. Energy Code Compliance
   1. See project drawings and specifications for details on project energy code compliance.
   2. Energy code compliance is utilizing the prescriptive path in accordance with Energy Code Section C401.2 Item 1.
D. Sustainability Protocol Compliance
   1. Project is required to comply with ESDS v4 protocol. See project drawings and specifications for details on requirements.

1.8 PROJECT PRICING ALTERNATES

A. See owner or general contractor request for proposal (RFP) for a complete list of project pricing alternates (deductive or additive) that are required to be priced as part of the project milestone budgeting or contractor selection process.
B. See Table below for a list of project pricing alternates that have been identified for this project:

Alternate #	Pricing Alternate Description	MEP Impacts
ALT-01	**Base:** None Alternate: None	Divisions 22, 23, 26

1.9 INTERPRETATION OF PLANS

A. In general, the Drawings are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements.
B. Drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail of construction. All work shall be constructed from field measurements taken at the site. This shall include all rises, drops and offsets necessary to avoid structural members or equipment and materials installed by other trades. The contractor shall coordinate equipment and material layout before construction. No additional costs will be allowed for conduit fabrications without field verification of available space. If it is found, before installation, that a more convenient, suitable or workable arrangement of any or all phases of construction would result by altering the arrangement indicated on the Drawings, the architect/engineer may require the contractor to change the arrangement of their work without additional cost to the owner.
C. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.
D. The drawings and specifications are intended to supplement each other. Any items shown on the drawings and not mentioned in the specifications, or vice versa, shall be executed the same as if mentioned and shown.

E. The greatest quantity or more expensive work shall govern where there is a conflict noted anywhere on the drawings and/or specifications.

1.10 QUALITY ASSURANCE

A. Provide equipment and materials which conform to the standards effective as of the date of the Contract Documents as promulgated by the following bodies:
   1. Underwriters' Laboratories (UL).
   2. National Electrical Manufacturers' Association (NEMA).
   3. Electrical Testing Laboratories (ETL).
   4. American National Standards Institute (ANSI).
   5. Insulated Cable Engineers Association (ICEA).
   6. State Fire Marshal (SFM).
   7. National Electrical Code (NEC).

1.11 COORDINATION

A. Coordinate equipment and materials installation with all other building components.
B. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing without impacting adjacent equipment or piping. This work shall include furnishing access doors required for install by others.
C. Joints and fittings shall not be located in inaccessible locations such as wall, floor and roof penetrations.
D. Refer to the acoustical specifications for additional installation requirements.
E. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
F. Coordinate the cutting and patching of building components to accommodate the installation of equipment and materials. Cutting, patching, and painting is by others.
G. All cutting or drilling of joists must adhere to requirements provided by the Structural Engineer.
H. Materials within plenums shall be noncombustible or shall be listed and labeled as having a flame spread index of not more than 25 and a smoke-developed index of 50 or less when tested in accordance with ASTM E84 (NFPA 255) or UL-2043.
I. All fire stopping of through penetrations and membrane penetrations is by the installing Contractor

1.12 PRODUCT SUBSTITUTIONS

A. Equipment manufacturer’s where indicated on the drawings are the basis for design. The contractor accepts responsibility for all design implications when providing approved equipment other than the design basis.
B. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics than the basis of design may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. Required electrical modifications must be approved by the Electrical Engineer and be provided at

no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

C. Dimensional and Weight Changes: Equipment with dimensions or weight different than the basis of design may be furnished provided such proposed equipment is approved in writing. The contractor is responsible for verifying proposed equipment maintains the design intent for access and serviceability and reserves space for future equipment where required. Cost implications to other trades are the responsibility of the contractor.

1.13 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified (refer to Division 01).
   1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
   2. RFIs shall address single questions and related issues only.
   3. All RFIs shall be thoroughly reviewed and approved by the General Contractor and/or Construction Manager for accuracy and need for information required before submittal to the Owner’s Design Representative.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. General RFI requirements:
      a. All information required by RFI’s in accordance with Division 01 specifications
      b. Project name.
      c. Date.
      d. Name of Contractor.
      e. RFI number, numbered sequentially and unique.
      f. RFI subject.
      g. Specification Section number and title and related paragraphs, as appropriate.
   2. Specific RFI detail:
      a. Drawing number and detail references, as appropriate.
      b. Field dimensions and conditions, as appropriate.
      c. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
      d. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      e. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Engineer’s Action: Engineer will review each RFI, determine action required, and respond. Allow a minimum ten business days for Engineer's response for each RFI, plus additional time for Architect and General Contractor to review and forward. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.
   1. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.

2. The following Contractor-generated RFIs will be returned without action:
    a. Incomplete RFIs or inaccurately prepared RFIs.
    b. RFIs submitted without indication of review and approval for submission by General Contractor or Construction Manager.
    c. RFIs addressing multiple unrelated issues.
    d. Requests for approval of submittals or shop drawings.
    e. Requests for approval of product substitutions.
    f. Requests for approval of Contractor's means and methods.
    g. Requests for adjustments in the Construction Cost Sum or Contract Time.
    h. Requests for interpretation of Engineer's actions on submittals unless review comments indicate an RFI is required to clarify the contract documents.

1.14 SUBMITTALS

A. Provide submittals for all materials and equipment in accordance with Division 01 specification requirements.
B. Provide a list of all required submittal and timeline for submission and approval for owner and design consultant review.
C. Submittals and Shop Drawings:
    1. Submit electronic copies of manufacturer's submittal sheets in one (1) coordinated package per Specification Division. Multiple submissions will not be accepted without prior approval of the Owner’s Representative. Organize submittal sheets in sequential order aligned with matching specification section numbers.
    2. Submittals to include at a minimum the following information in addition to the requirements required by the drawings and specifications:
        a. General Information:
            1) Project name and location
            2) Architect company name and Engineer of Record Company Name
            3) Contractor name(s) and contact information
            4) Local vendor name and contact information
            5) Manufacturer name and contact information
            6) Applicable Energy Code Cycle project is permitted under. See “Codes and Standards” Section for details.
        b. Schedule of all materials and equipment included in the submittal:
            1) Electronic bookmarks will be provided to each product or equipment (by type or tag) listed in the Submittal Section Schedule.
            2) Where electronic bookmarks are not provided submittal will be returned rejected and will not be reviewed until electronic bookmarks are added.
        c. Energy Code and Sustainability Protocol Compliance:
            1) Include all equipment efficiency required by the Energy Code
            2) Include all information required by the project specific sustainability standard where applicable.
        d. Parts:
            1) Indicate in submittal of all equipment parts ship loose or ship separately that require assembly by the contractor.

2) Provide a list of all spare parts that will be provided and when they will be provided.

e. Startup: Description of responsible party for equipment startup. Where equipment startup is required by a manufacturer representative it shall be included. Provide a description of any all startup services provided by the material and equipment manufacturer.

f. Warranty:

1) Base warranty: Provide detailed description of material or equipment warranty including all items warranties are contingent upon.

2) Optional warranty: Provide a detailed description of optional warranties that need owner review and approval where required by the drawings or specifications.

3. Provide electronic copies of contractor coordinated shop drawings prepared to show details of the proposed installation. Copies of contract design drawings submitted to demonstrate shop drawing compliance will not be accepted.
4. Paper submittals will only be acceptable if specifically required by Division 01.
5. The reviewed submittals shall be converted into Operations & Maintenance Manuals at the completion of the project with additional information required. Refer to Division 01 for additional requirements.

1.15 CONTRACTOR COORDINATED SHOP DRAWINGS

A. The Contractor shall prepare Coordinated Shop Drawings for fabrication and installation of the systems. Coordinated Shop Drawings shall meet the following requirements at a minimum:
   1. Record the coordinated layout and installation of all piping, fixtures, HVAC equipment, ductwork, grilles, diffusers, fire sprinklers, lighting, audio/video systems, electrical services, and related components.
   2. Include all mechanical rooms and floor plans.
   3. Be keyed to the structural column grid and numbered in sequence.

B. Coordination and Conflict Resolution: Prior to completion of the Drawings, the Contractor shall coordinate the proposed installation, structural requirements, maintenance clearances, and minimum code required clearances, with the Owner's Representative and all other trades (including HVAC, Plumbing, Fire Protection, Electrical, and Structural Systems). In the event conflicts or interferences are identified, revise the layout as needed to resolve.

C. No equipment or material shall be fabricated, ordered, or installed until the General Contractor and Owner's Representative have approved the coordinated documents.

D. Shop Drawings (or electronic coordination models) shall be submitted on a floor-by-floor basis, in alignment with the building's construction schedule.

E. Preparation: Three-Dimensional Revit / BIM-Based Documents
   1. Provide a Revit model (or equivalent BIM data) showing all equipment and piping, including valves and fittings; dimension from column lines and indicate elevations (e.g., bottom of pipe above finished floor).
   2. Obtain and integrate BIM data from other trades (architectural, structural, HVAC, plumbing, electrical, fire alarm, low voltage, etc.) to ensure full coordination with other building systems.

3. Incorporate all approved addenda items and change orders into the Revit model / BIM data.
4. Provide necessary maintenance access clearances per manufacturer installation instructions and minimum code requirements.
5. Distribute the Revit model and BIM input to all affected trades and coordinate additional adjustments as needed to avoid conflicts.

F. Conflict Notification: Advise the Owner's Representative in the event a conflict occurs in the location or connection of equipment. Contractor shall bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Owner's Representative of conflict.

1.16 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "Project Record Documents." In addition to the requirements specified in Division 1, refer to specific sections for additional record documentation.
B. Record documents provided by the contractor will include redlines of the design architectural engineering drawings that comply with Energy Code Section 103.6. At a minimum the contractor will provide the following redlines for the following:
1. Record documents will convey a record of the completed work if any work is removed from the project scope then redlines will indicate this.
2. Redlines will include building envelope, mechanical, plumbing, electrical and control drawings red-lined, or redrawn, that show all changes to size, type and locations of components, equipment and assemblies.
3. Record documents shall include the location and model number of each piece of equipment as installed.

1.17 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "Operating, Maintenance, and Warranty Data". Submit copies for review by Architect/Engineer. In addition to the requirements specified in Division 1, include the following information:
1. Descriptive summary of function, normal system operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Warranty information for all mechanical items shall be included in one tabbed section.

1.18 SUMMARY OF PRODUCTS AND MATERIALS

A. This Section includes the following:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Grout.
4. Common electrical installation requirements.

1.19 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
C. Storage of materials and equipment shall not impede the work of other contracts.
D. Handling of equipment and products shall be according to manufacturers instructions and in compliance with the articles of their warranty.
E. Protect products from weather, unless product is slated for exterior installation. If outdoor storage is necessary, support products off the ground or pavement in watertight enclosures.

1.20 FIRE SAFETY PRECAUTIONS

A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phases of work.
B. At all times, access shall be maintained for fire department trucks to the building.
C. All welding brazing, cutting and sweating operations performed in vicinity of or accessible to combustible materials shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.
D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.
E. When necessary to do cutting, welding, brazing, sweating and similar work in vicinity of wood, in shafts, or vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire resistant blankets or similar approved coverings. In addition, a helper shall be stationed nearby with proper fire extinguishers (provided by the Contractor performing the work) to guard against sparks and fire.
F. Whenever combustible materials have been exposed to sparks, molten metal, hot slag or splatter, a person shall be kept at the place of work to make sure the smoldering fires have not been started. Whenever cutting or welding operations are carried on in a vertical pipe shaft, a person to act as a fireguard shall be employed to examine all floors below the point of cutting or welding. This fireguard shall be kept on duty after completion of work to guard against fires and shall examine each level after this time, prior to leaving. There shall be no exceptions to this requirement and failure to comply will be construed as negligence.

1.21 PERSONAL SAFETY REQUIREMENTS

A. The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions required in connection with his work, including regulations of the Occupational Safety and Health Administration (OSHA) and other governing agencies.

1.22 PERMITS, LICENSES AND FEES

A. The Contractor shall secure all permits and licenses, both temporary and permanent required for their work. The Contractor shall pay all fees and expenses required for the permits and licenses.
   1. The Contractor shall make all arrangements with each utility company and pay all service charges associated with new services or modifications to existing services.
   2. The Contractor shall request inspections as required by regulating agencies and/or regulations. The Contractor shall pay all charges for inspections.
   3. Contractor shall furnish the Owner with a certificate of final inspection and approval by enforcement authorities.
   4. Comply with requirements of Division 00.

1.23 WARRANTY

A. Refer to general terms and conditions, as well as warranties and obligations defined in Division 1 of the specifications that provide basic warranty requirements for the entire project.
B. The warranties and corrective obligations provided under this section:
   1. Are in addition to, and not in lieu of, any other warranty, representation, covenant, duty or other obligation (including any corrective obligation) of the Contractor or Manufacturer,
   2. Have no relationship to the time when any warranty, representation, duty, covenant or other obligation of Contractor or Manufacturer may be enforced or any dispute resolution proceeding commenced and
   3. Are made by the Manufacturer to both the Contractor and the Owner and by the Contrator to Owner.
C. All equipment and systems shall be provided with a minimum one-year warranty, or longer, as defined in each subsequent specification section. Warranty shall include all parts, material, labor and travel.
D. Warranty Start Date: The start date for all warranty periods shall be defined as starting from the date of Substantial Completion which shall include the Certificate of Occupancy from the Authority Having Jurisdiction.
E. Refer to individual Specification sections for additional extended warranty requirements.
F. Provide complete warranty information for each item, to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers and procedures for filing a claim and obtaining warranty services.
G. Nothing in any separate warranty or other document provided by Contractor or Manufacturer, or both, will apply to limit their liability or responsibility for damages arising out of or related to a breach of any warranty or corrective obligation.
H. Service during warranty period: Contractor shall provide maintenance as specified elsewhere during the 12-month warranty period.

1.24 GUARANTEE

A. The Contractor shall guarantee and service all workmanship and materials to be as represented by him and shall repair or replace, at no additional cost to the Owner, any part thereof which may become defective within the period of one (1) year, minimum, after the Certificate of Occupancy, ordinary wear and tear excepted.
B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in this work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment General Requirements:
    1. All items of materials in each category of equipment shall be of one manufacturer.
    2. Groups of items having same or similar function shall be by single manufacturer to facilitate maintenance and service.
    3. Compatible with space allocated. Modifications necessary to adjust items to space limitations shall be at Contractor's expense.
    4. Conform with conditions shown and specified. Coordinate with other trades for best possible assembly of completed work.
    5. Install fully operating without objectionable noise or vibration.
B. Access Doors:
    1. Furnish under this Division where shown, required by regulatory agencies, and for access to all concealed electrical items requiring access. Access doors shall be in accordance with requirements of Division 08. Doors in this Division, Division 08, and Division 15 shall be from the same manufacturer for identical appearance and keying. Furnish fire rated doors where required. Deliver access doors for installation under Division 08. Mark each access door to accurately establish its location.
C. Firestopping and Smokestopping: Provide in accordance with Division 07.
    1. Provide fire stopping where wiring, conduit, or cable tray penetrates fire wall or floor.
    2. Provide smoke stopping where wiring, conduit, or cable tray penetrates smoke barrier.

2.2 SLEEVES

A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.3 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
B. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
C. Design Mix: 5000-psi, 28-day compressive strength.
D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 ELECTRICAL DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
B. Where areas of existing facilities are indicated to be demolished or remodeled, visit site to determine scope of work. Relocate electric and signal system equipment, and reroute or replace conduit and wiring as required to conform with new use of the area and maintain operation of adjacent areas.
C. Disconnect, demolish, and remove electrical systems, equipment, and components indicated to be removed.
    1. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    2. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    3. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
D. Lead Containing Materials: The existing building may contain lead-containing materials, including lead paint. It is the Contractor’s responsibility to meet all governmental regulations when dealing with the disposing of lead containing materials.

3.2 EQUIPMENT AND SYSTEM INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
D. Follow manufacturer's directions in all cases where manufacturers of articles used furnish directions covering points not shown or specified.
E. Accurately set and level equipment with supports neatly placed and properly fastened. No allowance of any kind will be made for negligence on the part of the Contractor to foresee means of bringing in and installing equipment in position inside the building.
F. Conduit System:
    1. Work into complete integrated arrangement with like elements. Make work neat and finished appearing.
    2. Run concealed, except where shown otherwise. Where exposed run parallel with walls or structural elements with vertical runs plumb, horizontal runs level; groups racked together neatly with bends parallel and uniformly spaced.
    3. Flash and counterflash all penetrations through roof in accordance with requirements of Division 07 and as shown.
G. Provide hangers, supports, anchors and chases as required for installation of Electrical Work.

H. Excavating and Backfilling: In accordance with requirements of Division 02. Provide all necessary shoring, sheeting, and pumping as part of Work of this Division.

I. Concrete: In accordance with requirements of Division 3.

J. Interface with other products:

1. For purposes of clarity and legibility, Drawings are essentially diagrammatic to the extent that many offsets, bends, special fittings, and exact locations of items are not indicated, unless specifically dimensioned. Exact routing of wiring, and locations of outlets, panels, and other items shall be governed by structural conditions or obstructions. Contractor shall make use of data in Contract Documents. In addition, Architect reserves right, at no increase in Contract Sum, to make any reasonable change in location of electrical items exposed at ceilings or on partitions to group them in orderly relationships or to increase their utility. Verify requirements in this regard prior to roughing-in.
2. Take dimensions, location of doors, partitions, and similar features from Architectural Drawings. Verify at the Site under this Division. Consult Architectural Drawings for exact location of outlets, and other items to center with architectural features. Coordinate location of all ceiling mounted items with Division 09.

3.3 PIPE SLEEVE INSTALLATION

A. Install sleeves for conduit passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and conduit. Use the following sleeve materials:
   a. For conduit penetrating gypsum-board partitions: Schedule 40 steel pipe sleeves or steel sheet sleeves.
   b. For all penetrations other than gypsum board partitions: Cast iron or schedule 40 steel sleeves.
   c. Stack Sleeve Fittings: For conduit penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Flashing" for flashing.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Sealants and Caulking" for materials and installation.

B. Aboveground, Exterior-Wall Conduit Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between conduit and sleeve for installing mechanical sleeve seals.

1. Install Schedule 40 galvanized steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for conduit material and size. Position conduit in center of sleeve. Assemble mechanical sleeve seals and install in annular space between conduit and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

C. Underground, Exterior-Wall Conduit Penetrations: Install cast-iron "wall pipes" for sleeves. Seal conduit penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between conduit and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for conduit material and size. Position conduit in center of sleeve. Assemble mechanical sleeve seals and install in annular space between conduit and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at conduit penetrations. Seal conduit penetrations with firestop materials. Refer to Division 07 Section "Firestopping" for materials.

3.4 PAINTING

A. Painting, except as specified herein or indicated otherwise, shall be done under another Division. The Subcontractor shall cooperate with the other Division Subcontractors to determine the size of equipment, the sizes and lengths of conduit, etc., to be painted.

B. Equipment furnished under this Division shall be factory finished. If the factory finish is damaged during shipment, storage, installation, etc., it shall be repainted by the Subcontractor subject to the Engineer's approval. Touchup painting is acceptable only for minor finish damage.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.
   6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Clean surfaces that will come into contact with grout.
B. Provide forms as required for placement of grout.
C. Avoid air entrapment during placement of grout.
D. Place grout, completely filling equipment bases.
E. Place grout on concrete bases and provide smooth bearing surface for equipment.
F. Place grout around anchors.
G. Cure placed grout.

END OF SECTION

SECTION 260519 – LOW-VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Conductors and Cables rated 600V and less.
   2. Connectors, splices, and terminations rated 600V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Product Schedule: Indicate type, use, location, and termination locations.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES RATED 600V AND LESS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. American Insulate Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.
   6. Or approved equal.
B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Copper and Aluminum Conductors: Comply with NEMA WC 70.
D. Conductor Insulation: Comply with NEMA WC 70. Drawing basis of design uses Types THHN and THWN cables. Contractor shall modify conduit size as required for any other insulation.
E. Multiconductor Cable: Comply with NEMA WC 70 for Metal-Clad Cable, Type MC, and Mineral-Insulated, Metal-Sheathed cable, Type MI with ground wire.

2.2 CONNECTORS, SPLICES, AND TERMINATIONS RATED 600V AND LESS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: UL listed and labeled factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
1. Material: Copper or Aluminum.
2. Type: Two-hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders smaller than No. 1 AWG; Copper or Aluminum for feeders No. 1 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN, single conductors in raceway.
B. Exposed Feeders: Type THHN/THWN, single conductors in raceway.
C. Fire Pump Feeders: Mineral-insulated, metal-sheathed cable, Type MI or conductors in conduit encased in a minimum of 2 inches of concrete.
D. Feeders concealed in ceilings, walls, partitions, and crawlspaces: Type THHN/THWN, single conductors in raceway or Metal-clad cable, Type MC.

E. Feeders concealed in concrete, below slabs-on-grade, and underground: Type THHN/THWN, single conductors in raceway.
F. Exposed branch circuits, including in crawlspaces: Type THHN/THWN, single conductors in raceway.
G. Branch circuits concealed in ceilings, walls, and partitions: Type THHN/THWN, single conductors in raceway or Metal-clad cable, Type MC.
H. Branch circuits concealed in concrete, below slabs-on-grade, and underground: Type THHN/THWN, single conductors in raceway.
I. Class 1 control circuits: Type THHN/THWN, single conductors in raceway.
J. Class 2 control circuits: Type THHN/THWN, single conductors in raceway; power-limited cable, concealed in building finishes; power-limited tray cable, in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 “Raceways and Boxes” prior to pulling conductors and cables.
C. Use manufacturer-approved pulling compound of lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer’s recommended maximum pulling tensions and sidewall pressure values.
D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
F. Support cables according to Section 26 05 29 “Hangers and Supports.”
G. Complete cable tray systems installation according to Section 26 05 36 “Cable Trays” prior to installing conductors and cables.
H. Identify and color-code conductors and cables according to Section 26 05 53 “Identification for Electrical Systems.”

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B.
B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
    1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
C. Wiring at outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 “Identification for Electrical Systems.”

3.6 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 “Sleaves and Sleave Seals.”

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 “Penetration Firestopping.”

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:
    1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
    2. Infrared Scanning: Ater substantial completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
        a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
        b. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
    3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    4. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 260526 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes methods and material for grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Other Informational Submittals: Plans showing dimensions as-built locations of grounding features specified in Part 3 “Field Quality Control” Article, including the following:
   1. Test wells.
   2. Ground rods.
   3. Ground rings.
   4. Grounding arrangements and connections for separately derived systems.
   5. Grounding for sensitive electronic equipment.
C. Field quality-control test reports.
D. Operation and Maintenance Dat: For grounding to include the following in emergency, operation, and maintenance manuals.
   1. Instructions for periodic testing and inspection of grounding features at test wells based on NETA MTS.
      a. Tests shall determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
      b. Include recommended testing intervals and maximum values.

1.4 QUALITY ASSURANCE

A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authorities having jurisdiction, and marked for intended use.
B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600V unless otherwise required by applicable code or the authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B3.
   2. Stranded Conductors: ASTM B8.
   3. Tinned Conductors: ASTM B33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
C. Grounding Bus: Rectangular bars of annealed copper, 1/4 inch by 2 inch in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to the authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.
C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar. Provide exothermic where shown on drawings and where extending main service ground.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch in diameter by 10 feet long.
   1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long, or UL approved mechanical ground rod connector.
   2. Backfill Material: Electrode manufacturer’s recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.
   1. Bury at least 24 inches below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection,

with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus on insulated spacers 1 inch minimum from wall, 6 inches above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

E. Conductor Terminations and Connections:
   1. Pipe and equipment grounding conductor terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   4. Single-phase motor and appliance branch circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Armored and metal-clad cable runs.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

E. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

F. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

G. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

H. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a non-metallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

I. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
   1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor in 1/4 inch by 2 inch by 12 inch ground bus.
   2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

J. Metal and Wood Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulted equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
   2. For grounding electrode systems, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rode driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 “Underground Ducts and Raceways,” and shall be at least 12 inches deep, with cover.
   1. Test Wells: install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each above ground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
   1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
   2. Bury ground ring not less than 24 inches from building foundation.

I. Ufer Ground (Concrete-Encased Grounding Electrode) Fabricate to NFPA 70; use a minimum of 20 feet of bare copper conductor no smaller than No. 4 AWG.
   1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
   2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.5 LABELING

A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
   1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connection with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistant level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make test at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.
4. Prepare dimensioned drawings locating each test well, ground rod, and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity 500 to 1000kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000kVA: 3 ohms.
4. Power Distribution Units or Panelboards Service Electronic Equipment: 3 ohms.

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify project manager promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529 – HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.
   2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.
B. IMC: Intermediate metal conduit.
C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems (Electric strut).
   2. Non-metallic slotted support systems.
B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include product data for components.
   2. Steel slotted channel systems. Include product data for components.
   3. Non-metallic slotted channel systems. Include product data for components.
   4. Equipment supports.
C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, “Structural Welding Code – Steel.”
B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section “Roof Accessories.”

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
      h. Or approved equal.
   2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   3. Non-metallic Coatings: Manufacturer’s standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   4. Painted Coatings: Manufacturer’s standard painted coating applied according to MFMA-4.
   5. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
   6. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
   7. Channel Dimensions: Selected for applicable load criteria.
B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Epoxy and Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1) Hilti Inc.
   2) ITTW Ramset/Red Head; a division of Illinois Tool Works, Inc.
   3) MKT Fastening, LLC.
   4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
   5) Or approved equal.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.
      6) Or approved equal.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded Steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
B. Materials: Comply with requirements in Division 05 Section “Metal Fabrications” for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
B. Maximum Support Spacing and Minimum Haner Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.
C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be the weight of supported components plus 200 lb.
D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code.
    1. To Wood: Fasten with lag screws or through bolts.
    2. To New Concrete: Bolt to concrete inserts.
    3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
    4. To Existing Concrete: Expansion anchor fasteners.
        a. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
    5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
    6. To Light Steel: Sheet metal screws.
    7. Items Mounted on Hollow Walls and Non-structural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section “Metal Fabrications” for site-fabricated metal supports.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be minimum of 10 bolt diameters from edge of base.
B. Use 2500 psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section “Cast-in-Place Concrete.”
C. Anchor equipment to concrete base.
    1. Place and secure anchorage devices. Use supported equipment manufacturer’s setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    2. Install anchor bolts to elevations required for proper attachment to supported equipment.
    3. Install anchor bolts according to anchor-bolt manufacturer’s written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use the same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:
   1. Metal conduits, tubing, and fittings.
   2. Non-metal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Surface raceways.
   5. Boxes, enclosures, and cabinets.
   6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Division 26 Section “Underground Ducts and Raceways” for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.
B. EMT: Electrical metallic tubing.
C. ENT: Electrical non-metallic tubing.
D. EPDM: Ethylene-propylene-diene terpolymer rubber.
E. FMC: Flexible metal conduit.
F. GRC: Galvanized rigid steel conduit.
G. IMC: Intermediate metal conduit.
H. LFMC: Liquidtight flexible metal conduit.
I. LFNC: Liquidtight flexible non-metallic conduit.
J. NBR: Acrylonitrile-butadiene rubber.
K. PVC: Polyvinyl Chloride.
L. RNC: Rigid non-metallic conduit.
M. RGS: Rigid galvanized steel.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.

2. For handholes and boxes for underground wiring, include the following:
    a. Duct entry provisions, including locations and duct sizes.
    b. Frame and cover design.
    c. Grounding details.
    d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Structural members in the paths of conduit groups with common supports.
2. Process piping, HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section “Vibration and Seismic Controls.” Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    a. The term “withstand” means “the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified.”
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For professional engineer and testing agency.

F. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.
5. Electri-Flex Company.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.

8. O-Z/Gedney; a brand of EGS Electrical Group.
9. Wheatland Tube Company.
10. Or approved equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. EMT: Comply with ANSI C80.6 and UL 797.

D. FMC: Comply with UL 1; zinc-coated steel or aluminum.

E. GRC: Comply with ANSI C80.1 and UL 6.

F. IMC: Comply with ANSI C80.6 and UL 1242.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. MC Cable: Flexible steel or aluminum conduit with THHN conductors.

I. PVC-Coated Steel Conduit: PVC-Coated rigid steel conduit.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch, minimum.

J. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: Comply with NEMA FB 1 and UL 514B. Listed for type and size raceway with which used, and for application and environment in which installed.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: Steel.
      b. Type: Set screw.
   3. Coating for Fittings for PVC-Coated Steel Conduit:
      a. Coating Thickness: 0.040 inch, minimum.
      b. Overlapping sleaves protecting threaded joints.
   4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

K. Joint Compound for IMC and GRC: Approved, as defined in NFPA 70, by the authorities having jurisdiction for use in cable connector assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NON-METALLIC CONDUIT, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Anamet Electrical, Inc.
   3. Arnco Corporation.
   4. CANTEX Inc.
   5. CertainTeed Corp.
   6. Condux international, Inc.
   7. Electri-Flex Company.
   8. Lamson & Sessions; Carlon Electrical Products.
   9. ElecSYS, Inc.
   10. Or approved equal.

B. Listing and Labeling: Non-metallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. ENT: Comply with NEMA TC 13 and UL 1653.
D. Continuous HDPE: Comply with UL 651B.
E. Rigid HDPE: Comply with UL 651A.
F. LFNC: Comply with UL 1660.
G. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
H. RTRC: Comply with UL 1684A and NEMA TC 14.
I. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit of tubing type and material.
J. Fittings for LFNC: Comply with UL 514B.
K. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper B-Line, Inc.
   2. Hoffman; a Pentair company.
   3. Square D; a brand of Schneider Electric.
   4. Or approved equal.
B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 as shown on drawings, unless otherwise indicated, and sized according to NFPA 70.
   1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
D. Wireway Covers: Hinged type unless otherwise indicated.
E. Finish: Manufacturer’s standard enamel finish.

2.4 NON-METALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hoffman; a Pentair company.
   2. Lamson & Sessions; Carlon Electrical Products.
   3. Or approved equal.
B. Listing and Labeling: Non-metallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for a complete system.
E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        a. Hubbell Incorporated; Wiring Device-Kellems Division.
        b. Wiremold/Legrand.
        c. Or approved equal.
C. Surface Non-Metallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        a. Hubbell Incorporated; Wiring Device-Kellems Division.
        b. Wiremold/Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. Cooper Technologies Company; Cooper Crouse-Hinds.
    2. EGS/Appleton Electric.
    3. Erickson Electrical Equipment Company.
    4. Hoffman; a Pentair Company.
    5. Hubbell Incorporated; Killark Division.
    6. O-Z/Gedney; a brand of EGS Electrical Group.
    7. RACO: a Hubbell Company.
    8. Thomas & Betts Corporation.
    9. Wiremold/Legrand.
    10. Or approved equal.
B. General Requirements: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
C. Sheet Metal Outlet and Devices Boxes: Comply with NEMA OS 1 and UL 514A.
D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Non-metallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
F. Metal Floor Boxes:
   1. Material: Cast metal.
   2. Type: Fully adjustable.
   3. Shape: Rectangular.
   4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
G. Non-metallic Floor Boxes:
   1. Type: Non-adjustable.
   2. Shape: Rectangular.
   3. Listing and Labeling: Non-metallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
H. Luminaire Outlet Boxes: Non-adjustable, designed for attachment of luminaire weighing 50lb. Outlet boxes designed for attachment of luminaires weighing more than 50lb shall be listed and marked for the maximum allowable weight.
I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70lb.
   1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
J. Small Sheet Metal Pull and Junction Boxes: Comply with NEMA OS 1.
K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
L. Box extensions used to accommodate new building finishes shall be of the same material as recessed box.
M. Device Box Dimensions: 4 inches by 4 inches by 2-1/8 inches deep.
N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 as shown on drawings with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Non-metallic Enclosures: Plastic.
   3. Interior Panels: Steel, all sides finished with manufacturer's standard enamel.
O. Cabinets:
   1. NEMA 250, Type 1, Type 3R, or Type 12 as shown on drawings, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Non-metallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements:
   1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and applications.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. CDR Systems Corporation; Hubbell Power Systems.
      d. NewBasis.
      e. Oldcastle Precast, Inc.; Christy Concrete Products.
      f. Or approved equal.
   2. Standard: Comply with SCTE 77.
   3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Non-skid finish shall have a minimum coefficient of friction of 0.50.
   6. Cover Legend: Molded lettering. “ELECTRIC.”
   7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
   8. Handholes 12 inches Wide by 24 inches Long and Larger: Have inserts for cable racks and pulling irons installed before concrete is poured.

2.8 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated “wall pipe,” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
D. Coordinate sleeve selection and application with firestopping specified in Division 07 Section “Penetration Firestopping.”

2.9 SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Advance Products & Systems, Inc.
   2. Calpico, Inc.
   3. Metraflex Co.
   4. Pipeline Seal and Insulator, Inc.
   5. Or approved equal.
B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC or IMC.
   2. Concealed Conduit, Aboveground: GRC, IMC, or EMT.
   3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried or concrete encased where shown.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.
B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Subject to Physical Damage: GRC or IMC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
      d. Electrical rooms.
      e. Warehouse spaces.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT, ENT, or RNC.
      a. MC Cable where allowed by the authorities having jurisdiction.
      b. Romex within residential units.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC.
      a. Use LFMC in damp or wet locations.
   5. Damp or Wet Locations: GRC or IMC.
   6. Boxes and Enclosures: NEMA 250, Type 1.
      a. Use NEMA 250, Type 4 stainless steel or non-metallic in institutional and commercial kitchens and damp or wet locations.
C. Minimum Raceway Size: 1/2-inch trade size.
D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install non-ferrous conduit or tubing for circuits operating above 60Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in non-metallic sleeve.
F. Do not install aluminum conduits, boxes or fittings in contact with concrete or earth.
G. Install surface raceways only where indicated on Drawings.
H. Do not install non-metallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping. Do not interfere with operating and maintenance access to process piping devices, as valves, strainers, gages, etc.
C. Complete raceway installation before starting conductor installation.
D. Comply with requirements in Division 26 Section “Hangers and Supports.”
E. Group conduit in parallel runs where practical, and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit. Bends in parallel conduit runs must be concentric. All conduits must be run straight and true.
F. Arrange stub-ups so curved portions of bends are not visible above finished slab.
G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
H. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated.
I. Support conduit within 12 inches of enclosures to which attached.
J. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 2 inches insert dimension of concrete cover in all directions.
   4. Do no embed threadless fittings in concrete unless specifically approved by Architect or Owner or each specific location.
K. Stub-ups to Above Recessed Ceilings:
   1. Use EMT, IMC, or RMC for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer’s written instructions.

M. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
N. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors.
O. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch trade size and insulated throat metal bushings on 1-1/2 inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
P. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight pule 1/4 turn more.
Q. Do not rely on locknuts to penetrate non-conductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
R. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200lb tensile strength. Leave at least 24 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
T. Surface Raceways:
    1. Install surface raceway with a minimum 2-inch radius control at bend points.
    2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
U. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
V. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
    1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    2. Where an underground service raceway enters a building or structure.
    3. Where otherwise required by NFPA 70.
W. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
    1. Use LFMC in damp or wet locations subject to physical damage.
    2. Use LFMC or LFNC in damp or wet locations not subject to physical damage.
Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
AA. Locate boxes so that the cover or plate will not span different building finishes.
BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
DD. Set metal floor boxes level and flush with finished floor surface.
EE. Set non-metallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit Prepare trench bottom as specified in Division 31 Section “Earth Moving” for pipe less than 6 inches in nominal diameter.
   2. Install backfill as specified in Division 31 “Earth Moving.”
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section “Earth Moving.”
   4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
   5. Warning Planks: Bury warning planks approximately12 inches above direct buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.
   6. Underground Warning Tape: Comply with requirements in Division 26 Section “Identification for Electrical Systems.”

3.4 INSTALLATION OF UDNERGROUND HANHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
D. Install handholes with bottom below frost line, 18 inches below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260544 – SLEEVES AND SLEEVE SEALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.
   5. Silicone sealants
B. Related requirements:
   1. Division 07 Section “Penetration Firestopping” for penetration firestopping installed in fire-resistance-related walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 SUBMITTALS

A. Product Data: For each type of product specified in this section.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
   1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
   2. Cast-Iron Pipe Sleeves: Cast or fabricated “wall pipe,” equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
C. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.
D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
F. Sleeves for Rectangular Openings:
   1. Material: Galvanized-steel sheet.
   2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company.
d. Pipeline Seal and Insulator, Inc.
e. Or approved equal.
2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
a. HOLDRITE.
b. Presealed Systems
c. Or approved equal.

2.4 GROUT

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
C. Design Mix: 5000 psi, 28-day compressive strength.
D. Packaging: Premised and factory packaged.

2.5 SILICONE SEALANTS

A. Description: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Silicone Foams: Muli-component, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.
B. Comply with NEMA VE 2 for cable tray and cable penetrations.
C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section “Joint Sealants.”
      b. Seal space outside of sleeves with mortar, grout, or silicone. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. De-burr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work to maintain any existing warranties.
F. Above-ground, Exterior-Wall Penetrations: Seal penetrations using PVC or steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
G. Underground, Exterior-Wall and Floor Penetrations: Install PVC or steel pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position watersop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 260548 – VIBRATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Channel support systems.
   2. Anchorage bushings and washers.
B. Related Requirements:
   1. Division 26 Section “Hangers and Supports” for commonly used electrical supports and installation requirements.

1.3 SUBMITTALS

A. Product Data: For each type of product specified in this Section.
B. Informational: Provide coordination drawings showing coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints. Electrical components include:
   1. Control and monitoring panels.
   2. Luminaires.
   3. Motor control centers.
   4. Panelboards.
   5. Switchboards.
   6. Photovoltaic system components.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are stricter.
B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amber/Booth Company, Inc.
   2. California Dynamics Corporation.
   3. Cooper B-Line, Inc; a division of Cooper Industries.

4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO Inc.
8. Unistrut; Tyco International, Ltd.

B. Busing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

C. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

D. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanized metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to the authorities having jurisdiction.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:
1. Install restrained isolators on electrical equipment.

2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-In Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors.
2. Do not drill in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to the authorities having jurisdiction.
2. Schedule test with Owner before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days advance notice.
3. Test at least four of each type and size of installed anchors and fasteners.
4. Test to 90 percent of rated proof load of device.

C. Seismic controls will be considered defective if they do not pass test and inspections.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Identification for raceway and metal-clad cable.
   2. Identification for conductors, communication and control cable.
   3. Underground-line warning tape.
   4. Warning labels and signs, especially arc-flash hazard labels.
   5. Equipment identification labels.
   6. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.
B. Identification Schedule: An of index of nomenclature of electrical equipment and system components used in identification signs and labels.
C. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.
B. Comply with NFPA 70.
C. Comply with NFPA 70E.
D. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer’s wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
C. Coordinate installation of identifying devices with location of access panels and doors.
D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 IDENTIFICATION FOR RACEWAY AND METAL-CLAD CABLE

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
B. Color for Printed Legend:
   1. Power Circuits: White letters on a black field.
   2. Fire Alarm: White letters on a red field.
C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 IDENTIFICATION FOR CONDUCTORS, COMMUNICATION AND CONTROL CABLE

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch-thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
D. Metal tags: Brass or aluminum, 2 inches by 2 inches by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.
E. Write-On Tags: Polyester tag 0.01 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape with metallic foil laminate.
   1. Not less than 6 inches wide by 4 mils thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.
   4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.
B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Engraved Laminated Plastic Signs: White, surface layer with red (warning), yellow (caution) or black layer exposed by engraving. 3/32 inch nominal thickness, minimum 1 inch by 3 inches, minimum text 1/8 inch, adhesive mounting, but drilled holes for use if adhesive doesn't stick.
D. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER – ELECTRICAL SHOCK HAZARD – EQUIPMENT HAS MUTIPLE POWER SOURCES."
   2. Workspace Clearance Warning: "WARNING – OSHA REGULATION – AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES."
   3. Arc-Flash Warning.

2.5 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch.
   2. Minimum Tensile Strength: 50lb.
   3. Temperature Range: -40 to +185 F.
   4. Color: Black, except where used for color-coding.
B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600V or Less, for Service, Feeder, and Branch Circuits More Than 30A: Identify with orange self-adhesive vinyl label or snap-around label or self-adhesive vinyl tape applied in bands.
B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands or snap-around, color-coding bands:
   1. Fire Alarm System: Red.
   2. Fire-Suppression Supervisory and Control System: Red and Yellow.
   3. Security System: Blue and Yellow.
   4. Mechanical and Electrical Supervisory System: Green and Blue.
   5. Telecommunication System: Green and Yellow.
   6. Control Wiring: Green and Red.
C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 4 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in the same junction or pull box, use aluminum wraparound marker labels. Identify each ungrounded conductor according to source and circuit number.
E. Conductors to Be Extending in the Future: Attach marker tape to conductors and list source and circuit number.
F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring. Install underground-line warning tape for both direct-buried cables and cables in raceway.
G. Instruction Signs:
    1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
    2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.
H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
    1. Labeling Instructions:
        a. Indoor Equipment: Adhesive film label or engraved, laminated acrylic> Unless otherwise indicated, provide a single line of text with 1/2 inch high letters on 1-1/2 inch high label; where 2 lines of text are required, use labels 2 inches high.
        b. Outdoor Equipment: Engraved, laminated acrylic 4 inches high.
    2. Equipment to Be Labeled:
        a. Panelboards, electrical cabinets, starters, starter doors in motor control centers, motors, equipment wired by electrical contractor and enclosures.
        b. Access doors and panels for concealed electrical items.
        c. Electrical switchboards.
        d. Transformers.
        e. Emergency system boxes and enclosures.
        f. Disconnect switches.
        g. Enclosed circuit breakers.
        h. Motor starters.
        i. Push-button stations.
        j. Power transfer equipment.
        k. Contactors.
        l. Remote-controlled switches, dimmer modules, and control devices.
        m. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.
B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
C. Apply identification devices to surfaces that require finish after completing finish work.
D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
E. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

END OF SECTION

SECTION 260913 – ELECTRICAL POWER MONITORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. Section includes equipment and systems used to monitor and control electrical consumption:
   1. Multifunction meters.
   2. Power meters.
   3. Electrical power monitoring system software.
   4. Network configuration software.
   5. System operator interfaces.

B. Related Requirements:
   1. Section 262713 "Electricity Metering" for equipment to meter electricity consumption and demand for tenant submetering.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for power monitoring and control.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings; For each product, submit detailed and dimensioned plan and elevation drawings including the following information:
   1. Installed unit ratings.
   2. Short circuit current ratings.
   3. Factory settings of integrated overcurrent protective devices as applicable.
   4. Wiring diagrams for power and control wiring.

C. Manufacturer Seismic Certification: As applicable in compliance with section 26 05 48 Vibration and Seismic Controls.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of distribution equipment and power monitoring and control components to form an integrated interconnection of compatible components.
   1. Match components and interconnections for optimum performance of specified functions.
B. Coordinate Work of this Section with those in Sections specifying distribution components that are monitored or controlled by power monitoring and control equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved manufacturers are as follows:
   1. Siemens
   2. Schneider Electric
   3. Or Approved Equal

2.2 HARDWARE OVERVIEW

A. The meters and the ancillary equipment shall meet revenue approval by the recognized authorities in Section 1.4.A and the authorities having jurisdiction.
B. Current Transformers (CT) - Manufacturer shall offer solid core or split core (Retrofit applications) designs and be rated for at least the following maximum amperage ratings; 50,125, 250, 400, 600, 800, 1200, 1600, and 2000 amps. Solid core CT shall meet Accuracy standard IEC 60044-1, Class 0.2s. Split core CT's shall meet accuracy down to 1%.
   1. CT's shall only have milliamp (100mA) output and measure accurately down to 1% of the maximum range.
   2. CT's shall be self-protecting and not require shorting blocks.
   3. CT's shall be rated for (CAT IV UL metering - evaluated for installation within equipment on the load side of the service equipment overcurrent device)
   4. CT's shall be compliance to UL 2808
   5. CT's shall be rated for 600VAC.
C. Micro Meter Modules – Individual micro metering modules shall be provided, one for each phase of the metered circuit. These meter modules will tie to the milliamp CT's. The CT's must be supplied by the manufacturer of the Meter Modules.
   1. Meter modules shall measure data at 1% accuracy as tested in accordance with ANSI C12.20
   2. When grouped together, the Meter Modules shall allow for measurement of 1, 2 and 3 phase circuits.
   3. Meter Modules shall incorporate a dip switch selector to select phase A, B, or C, and have a LED indicator to indicate the phase.
   4. The Meter Module shall be able to accept inputs from all available milliamp CTs ranging from 50 to 2000A.
   5. Setup for the CT sizing on each Meter Module shall be done through the controller web page.
   6. Meter modules shall plug directly into the metering rack without any additional installation work or tools needed.

7. All embedded metering solutions shall have the metering modules installed at the electrical equipment manufactures factory. No field installation shall be required.
8. Meter modules shall be pre-calibrated and will never need future calibration.
9. Meter modules shall provide a kwhr pulse indicator to reflect active energy usage pulse indication. The meter module pulse output is 5 Wh On and 5 Wh Off.
10. Micro Metering module shall record the kWh reading and retain up to 40 years without external power.

D. Racks – Micro Meter Modules are to be mounted on scalable Racks. The Rack Assembly shall be designed to allow the Micro Meter Modules to be snapped into the Rack without use of any tools.
1. Rack Assemblies shall be available in sizes of 3, 6, 9, 15 and 21 Micro Meter Modules.
2. Rack Assemblies shall be sized to meter all circuits denoted for metering on the drawings accept up to 3, 6, 9, 15 or 21 Micro Meter Modules.
3. Rack Assemblies will allow for open slots to accommodate future expansion as noted on the drawings.
4. Rack Assemblies shall be connected to the controller using a 600v rated communications cable.

E. Controller – The controller shall function as the collection, processing and setup location for the Micro metering units with a built-in web page interface.
1. The Controller shall be synchronized with NTP server for Date & Time.
2. Built-in Web page configuration and real-time data screens will include:
    a. System settings: IP Configuration, CT Ratios, PT Ratios, System type, SMTP email configuration, Modbus RTU slave configuration, Utility Software sealing, and System Time Setup.
    b. Global settings: for threshold and set-point alarms.
    c. Branch Meter configuration: for one, two or three pole; and individual meter warnings, CT ratings, and labels. Dynamic logic shall be built-in to the web configuration tool as to prevent the user from setting up an incorrect arrangement.
    d. Real-Time data monitoring for voltage, current, power, energy, water & gas
    e. Grouping of multiple circuits totalized logging and alarming
    f. Real-time data logs, alarm event logs and system event logs for historical trending dashboard (Today, Yesterday, DTD, WTW, MTM, YTY comparisons), emailing, download in CSV format, and alarm notifications.
    g. User Profile and User Configuration
    h. Diagnostics indications to be used to identify CT or phase angle misalignment of the configured meter module and allow user to download monitored Modbus register address information being passed to other monitoring or control systems.
    i. Firmware upgrade and webpage upgrade done through built-in web pages. No external software tool required to upgrade the firmware on the hardware.
    j. Meter Module serial numbers and Controller serial number display.
    k. Import and export of saved configurations in a file format.
    l. No additional software shall be required to configure the Controller or Micro Metering modules.
3. The Controller shall communicate metered values to external/third-party systems by:

a. HTML Web page interface, Modbus RTU, Modbus TCP, BACnet IP, BACnet MSTP, and SNMP.

4. Controller webpages shall allow user to configure BACnet settings, BACnet Object Map Configuration, BACnet Foreign Device Register and Object configuration.
5. One Controller shall be able to manage up to 45 Micro Meter Modules from the same voltage source.
6. The Controller shall have digital pulse inputs for receiving pulse inputs from other metering devices, such as gas and water.
7. The Controller shall have one configurable (KY or KYZ) digital pulse output that can be used to output total Kwh data from one or more Micro Metering modules totalized together.
8. The Controller shall be powered from its own voltage inputs and rated suitable for 480V, 240V, 208V and 120V AC applications.

F. Service Types
1. Poly- Phase Four Wire

G. Metering Data – Data recorded and calculated that can be passed on to an external system or displayed on the Controllers web page shall include for each breaker:
1. Energy: The meters shall provide true RMS, fully bi-directional and either 4-quadrant, revenue accurate or revenue certified energy metering for the following parameters.
a. kWh (Active Energy)
b. kVARh (Reactive Energy)
c. KVAh (Apparent Energy)
d. kW Demand
e. Integration of any instantaneous measurement
2. Instantaneous: The meters shall provide high accuracy of 0.2%, including true RMS per phase and total for the following parameters.
a. Voltage and current
b. Active, Reactive, and Apparent power (kW, kVAR, kVA)
c. Phase Angle
d. Power Factor
e. Current Demand
f. kW Demand
3. Instantaneous Max: The meters shall record each new maximum value for the following parameters:
a. Current Demand
b. Current
c. kW Demand
d. kW
4. Alarming/Monitoring: The system shall display and configure alarming for the following parameters
a. Phase Loss
b. Over Current Warning
c. Over Current Alarm
d. Over kW Demand Alarm

e. Under/Over Voltage Alarm

H. Data Logging
1. System shall data log up to 6 months for selected data registers.
2. System shall allow maximum of 16 data logs
3. System shall have a selectable option for logging the data at different interval time.
4. System shall have an option to down the Data log file in .CSV format in one-click download
5. System shall have an option to data log by created groups.

I. Onboard Dashboards
1. System shall display the trending of various data points for individual meters
2. System shall have maximum of 4 data points to display in trending graphs.
3. System shall have an option to select historical trending by Today, Yesterday, Day to Day, Week to Week, Month to Month and Year to Year comparison.
4. System shall have onboard default dashboard is fed from automatic data logging and compression, not from customer defined data logging.

J. Grouping
1. System shall have an option to data logs by created groups.
2. System shall display tending of various grouped data points

K. Emailing
1. System shall have an option to configure sending the log files via valid email address and schedule notification

L. System Overview
1. System
a. The sub-metering system shall automatically upload all the metering-based data on a predefined time period.
b. The data acquisition system shall store the data from the required meters and other sensing devices in a single database for a minimum of 36 months. For each energy supply and end use category required by C409.2 and C409.3, it shall provide energy consumption logged in one-hour or less intervals and energy consumption rate logged in 10-minute or less intervals. Data from the data acquisition system shall be viewable via the energy display in accordance with the requirements of Section C409.4.3.
c. Tenant software shall be expandable up to 5,000 tenant meters per site.
d. Input of other utilities such as water, air, gas is required.
e. Detailed energy profiles (Consumption Tracker) with a time period scalable by hour, day, month or yearly basis shall be included.
f. Energy usage bar charts by meter or groups of meters shall be included.
g. Detailed consumption reports with meter profile information shall be included.

M. Software operating system requirements for local computer work station.
1. Operating Environment
a. Windows 7 or 10 professional
b. Microsoft Database capability included. Provide storage and collection services that shall host the data within a standard exchange format such as XML, MS ACESS, EXCEL or CSV format and capable of exporting this data to the Management accounting system if desired.

c. Data shall be collected at a central point in the system known as the “data concentrator” or PTLS and connected to the Internet VIA standard TCP/IP Ethernet.
d. The Local server (PC) shall support at least:
   1) 12.4 Ghz, with 8 Gig Ram , 500 GB space and Microsoft Excel or other aforementioned database formats for reporting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall furnish, install and terminate all communication conductors and associated conduits external to any factory supplied equipment.
B. All communications conductor wiring and routing shall be per the manufacturer's recommendations and as shown on the contract drawings.
C. Additional connections to metering systems, where applicable, shall be done in the field by the manufacturer’s start-up service group or the installing contractor.

3.2 ADJUSTING AND CLEANING

A. The meters and CT’s shall be pre-calibrated and require only basic setup via the embedded web pages.
B. Clean exposed surfaces using manufacturer recommended materials and methods.

3.3 TESTING

A. Perform factory and installation tests in accordance with applicable NEC, NEMA, UL, IEC, ANSI, Weights and Measures California requirements.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service of the metering system. The representative shall be trained and qualified for metering systems.
B. Provide a qualified tradesman to assist in the commissioning of system.
C. Obtain and submit as part of final documents a field commissioning report.
D. Verify that the meters are installed and connected according to the Contract Documents.
E. Complete installation and startup checks according to manufacturer's written instructions.

3.6 SUPPORT

A. The electrical equipment manufacturer shall provide a 1-800 number for telephone support.
B. The vendor shall provide training at a dedicated training facility, complete with software, devices and demonstrations or offer remote training services if required.
C. The vendor shall also provide on-line support for technical information and literature.

END OF SECTION

SECTION 262413 – SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Service and distribution switchboards rated 600V and less.
   2. Disconnecting and overcurrent protective devices.
   3. Instrumentation.
   4. Control power.
   5. Accessory components and features.
   6. Identification.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and all local and state requirements, methods and criteria.
   1. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”

1.4 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, surge protective device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers’ technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
B. Shop Drawings: For each switchboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space round equipment. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types for types other than NEMA 250, Type 1.
   3. Detail bus configuration, current, and voltage ratings.
   4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
   5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
   6. Detail utility company’s metering provisions with indication of approval by utility company.
   7. Include evidence of NRTL listing for series rating of installed devices.

8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Sumit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 "Vibration and Seismic Controls." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field Quality-Control Reports:
1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
a. Routine maintenance requirements for switchboard and all installed components.
b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
c. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or NRTL.
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NEMA PB 2.

G. Comply with NFPA 70.
H. Comply with UL 891.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboard in sections or lengths that can be moved past obstructions in delivery path.
B. Remove loose packing and flammable materials from inside switchboards and take all necessary precautions to prevent condensation.
C. Handle and prepare switchboards for installation according to NECA 400 and NEMA PB 2.1.

1.7 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, life-out panels, and structures to provide pathway for moving switchboards into place.
B. Environmental Limitations:
   1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is compete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 104 deg F.
      b. Altitude: Not exceeding 6600 feet.
C. Service Conditions: NEMA PB2, usual service conditions, as follows:
   1. Ambient Temperature: Within specified limits.
   2. Altitude: Not exceeding 6600 feet.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, surge protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Square D.
   2. Eaton.
   3. ABB.
   4. Siemens.
B. Front-Connected, Front-Accessible Switchboards:
   1. Main Devices: Panel or Fixed, individually mounted.
   2. Branch Devices: Panel mounted.
   3. Section front and rear aligned.
C. Nominal System Voltage: 208Y/120V.
D. Main-Bus Continuous: As noted on plans.
E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section “Vibration and Seismic Controls.”
F. Indoor Enclosures: Steel, NEMA 250, Type 1.
G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer’s standard finish over a rust-inhibiting primer on treated metal surface.
H. Barriers: Between adjacent switchboard sections.
I. Insulation and isolation for main and vertical buses of feeder sections.
J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company’s requirements; hinged sealed door; buses provisioned for mounting utility company’s current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
K. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks.
L. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
M. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
N. Pull Box on Top of Switchboard:
   1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
   2. Set back from front to clear circuit-breaker removal mechanism.
   3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
   4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
   5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

O. Buses and Connections: Three phase, four wire unless otherwise indicated.
   1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.
   2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
   3. Tin-plated aluminum feeder circuit -breaker line connections.
   4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
   5. Ground Bus: 1/4 inch by 2 inch hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
   6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for the entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
   7. Disconnect Links:
      a. Isolate neutral bus from incoming neutral conductors.
      b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
   8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
   9. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

P. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

Q. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

R. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field adjustable trip setting.
   3. Electronic trip circuit breakers with RMS sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
      a. Instantaneous trip.
      b. Long- and short-time pickup levels.
      c. Long- and short-time time adjustments.
      d. Ground-fault pickup level, time delay, and I2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- or two-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
    f. Communication Capability: Din-rail-mounted communication module with functions and features capable with power monitoring and control system specified in Division 26 Section “Electrical Power Monitoring.”
    g. Shut Trip: 120V trip coil energized from separate circuit, set to trip at 75 percent rated voltage.
    h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    i. Auxiliary Contacts: Two SPDT switches with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, b” contacts operate in reverse of circuit-breaker contacts.
    j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in the off position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

C. Fuses are specified in Division 26 Section “Fuses.”

2.3 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
1. Potential Transformers: IEEE C5713; 120V, 60Hz, single tapped secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: IEEE C57.13; 5A, 60Hz, secondary; wound type, single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devise.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3kVA.

4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
   1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
      a. Phase Currents, Each Phase; Plus or minus 1 percent.
      b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
      c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
      d. Megawatts: Plus or minus 2 percent.
      e. Megavars: Plus of minus 2 percent.
      f. Power Factor: Plus or minus 2 percent.
      g. Frequency: Plus or minus 0.5 percent.
      h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
      i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.
      j. Contact devices to operate remote impulse-totalizing demand meter.
   2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

2.4 CONTROL POWER

A. Control Circuits: 120V AC, supplied from remote branch circuit.

2.5 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

2.6 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400 and NEMA PB 2.1.
B. Equipment Mounted: Install switchboards on a concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Division 03 Section “Cast-in-Place Concrete.”
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
D. Comply with mounting and anchoring requirements specified in Divion 26 Section “Vibration and Seismic Controls.”
E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate the frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
F. Install filler plates in unused spaces of panel-mounted sections.
G. Install overcurrent protective devices, surge protective devices, and instrumentation.
1. Set filed-adjustable switches and circuit-breaker trip ranges.
H. Comply with NECA 1.

3.2 CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in Division 26 Section “Enclosed Bus Assemblies.”
B. Comply with requirements for terminating cable trays specified in Division 26 Section “Cable Trays.”
C. Bond conduits entering underneath the switchboard to the equipment ground bus with a bonding conductor sized per NFPA 70.
D. Support and secure conductors within the switchboard according to NFPA 70.
E. Extend insulated equipment grounding cable to busway ground connection and support cable at intervales in vertical run.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section “Identification for Electrical Systems.”
B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section “Identification for Electrical Systems.”
C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Division 26 Section “Identification for Electrical Systems.”

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
C. Perform tests and inspection with the assistance of a factory-authorized service representative.
D. Tests and Inspections:
    1. Acceptance Testing:
        a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protective and other electronic devices prior to insulation test. Reconnect after test.
        b. Test continuity of each circuit.
    2. Test ground-fault protection of equipment for service equipment per NFPA 70.
    3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
    5. Perform the following infrared scan tests and inspections, and prepare reports:
        a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
        b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
        c. Instruments and Equipment:
            1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
E. Switchboard will be considered defective if it does not pass test and inspections.
F. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Distribution Panelboards.
   2. Lighting and appliance branch-circuit panelboards.
   3. Load centers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.
   1. Include materials, switching and overcurrent protective devices, surge protective devices, accessories, and components indicated.
B. Shop Drawings: For each product, submit detailed and dimensioned plan and elevation drawings including the following information:
   1. Circuit breaker configuration within panel.
   2. Bus configuration, current, and voltage ratings.
   3. Short circuit current ratings of panelboards and overcurrent protective devices.
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Include evidence of NRTL listing for SPD as installed in panelboard.
   6. Factory settings of individual overcurrent protective devices as applicable.
   7. Wiring diagrams for power and control wiring.
C. Manufacturer Seismic Certification: As applicable in compliance with Division 26 Section "Vibration and Seismic Controls."
D. Field Quality-Control Reports:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
E. Panelboard Schedules: Submit final versions after load valancing in both printed and electronic format.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.
C. Comply with NEMA PB 1.
D. Handle and prepare panelboards for installation in accordance with NECA 407.

1.5 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces re enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
      a. Ambient Temperature: Not exceeding 0 to +104 deg F.
      b. Altitude: Not exceeding 6600 feet.
B. Service Conditions: NEMA PB 1, usual service conditions as follows:
   1. Ambient Temperature: Within specified limits.
   2. Altitude: Not exceeding 6600 feet.
   3. Comply with NFPA 70E.

1.6 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other trade equipment, raceways and piping. Maintain required workspace clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section “Vibration and Seismic Controls.”
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA PB 1.
D. Comply with NFPA 70.
E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Kitchen Wash-Down Areas: NEMA 250, Type 4X, Stainless Steel.
      d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   2. Height: 84 inches maximum.
   3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
   4. Finishes:

a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Galvanized steel.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

F. Incoming Mains:
1. Location: Convertible between top and bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:
1. Material: Tin-plated aluminum.
a. Plating shall run entire length of bus.
b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

H. Conductor Connectors:
1. Material: Tin-plated aluminum.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Sub-feed Lugs: Mechanical type, suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type, suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

I. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

J. Future Devices: Mounting brackets, bus connections, filler plate, and necessary appurtenances required for future installation of devices.

K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by a NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000A RMS symmetrical.

2.2 DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
B. Panelboards: NEMA PB 1, distribution type.
C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches high, provide two latches; keyed alike.
D. Mains: Circuit breaker or lugs only.
E. Branch Overcurrent Protective Devices for Circuit Breaker Frame Sizes 125A and Smaller: Bolt-on circuit breakers.
F. Branch Overcurrent Protective Devices for Circuit Breaker Frame Sizes Larger Than 125A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
C. Mains: Circuit breaker or lugs only.
D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

2.4 LOAD CENTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
B. Comply with UL 67.
C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
E. Doors: Concealed hinges secured with flush latch with tumbler lock; keyed alike.
F. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407.
B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.
B. Install panelboards and accessories according to NECA 407.
C. Install anchor bolts to elevations required for proper attachment to panelboards.
D. Attach panelboard to the vertical finished or structural surface behind the panelboard.
E. Temporary Lifting Provisions; Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
F. Comply with mounting and anchoring requirements specified in Division 26 Section “Vibration and Seismic Controls.”
G. Mount panelboards per NEC height requirements.
H. Mount panelboard cabinet plumb and rigid without distortion of box.
I. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
J. Install overcurrent protective devices and controllers not already factory installed.
    1. Set field-adjustable, circuit-breaker trip ranges.
    2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or toque screwdriver per manufacturer’s written instructions.
K. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
L. Install filler plates in unused spaces.

3.3 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
B. Tests and Inspections:
    1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Perform the following infrared scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
    c. Instruments and Equipment:
        1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

C. Panelboards will be considered defective if they do not pass tests and inspections.
D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
B. Set field-adjustable circuit-breaker trip ranges as indicated.
C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
    1. Measure as directed during period of normal system loading.
    2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services.
    3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
    4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.5 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer’s written instructions.

END OF SECTION

SECTION 262500 – LOW-VOLTAGE ENCLOSED BUS ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Feeder-bus assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.
B. Shop Drawings; For each product, submit detailed and dimensioned plan and elevation drawings including but not limited to the following information:
   1. Fabrication and installation details, including mounting and hanging components, connectors, and fittings.
   2. Required clearances, method of field assembly, and location and size of each field connection.
   3. Connection details at each equipment termination, including transitions from feeder-bus to cable/conductor.
   4. Wiring diagrams for power wiring.
C. Manufacturer Seismic Certification: As applicable in compliance with section 26 05 48 Vibration and Seismic Controls.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.
C. Source limitations: obtain enclosed bus assemblies through one source from a single manufacturer.
D. Comply with NEMA BU 1.1, Busways for Handling, Installation, Operation and Maintenance of Busway Rated 600 volts or less.

1.5 COORDINATION

A. Coordinate layout and installation of enclosed bus assemblies and suspension system with other construction that penetrates ceilings or floors or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
   5. Or approved equal.
B. Standards
   1. NEMA BU 1.
C. Seismic Fabrication Requirements: Fabricate mounting provisions and attachments for feeder-bus assemblies with reinforcement strong enough to withstand seismic forces as defined in Section 26 05 48 Vibration and Seismic Controls for Electrical Systems when mounting provisions and attachments are anchored to building structure.

2.2 FEEDER-BUS ASSEMBLIES

A. Low-impedance bus assemblies in enclosed, nonventilated housing; single-bolt joints; ratings as indicated.
   1. Voltage: 208Y/120V.
   2. 3-phase, 4-wire, 100% Neutral.
   3. Current-carrying aluminum conductors, fully insulated with Class 130C insulation except at joints, plated surface at joints.
   4. Temperature Rise: 55 degrees C above 40 degrees C ambient maximum for continuous rated current.
   5. Ground:
      a. 50 percent capacity integral with housing.
      b. 50 percent capacity internal bus bars of material matching bus material.
      c. 50 percent capacity isolated, internal bus bar of material matching bus material.
   6. Enclosure: Aluminum with manufacturer’s standard finish.
   7. Mounting: Arranged flat, edgewise, or vertically without derating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Support bus assemblies independent of supports for other elements such as equipment enclosures at connections to panelboards and switchboards, pipes, conduits, ceilings, and ducts.
   1. Design each fastener and support to comply with seismic restraint requirements according to Section 26 05 48 Vibration and Seismic Controls.
   2. Design each fastener and support to carry 200lb or 4 times the weight of the bus assembly, whichever is greater.
   3. Support bus assembly to prevent twisting from eccentric loading.

4. Support bus assembly with not less than 3/8inch steel rods. Install side bracing to prevent swaying or movement of bus assembly.
5. Fasten all supports securely to building structure per Section 26 05 29 Hangers and Supports.

B. Install expansion fittings at locations where bus assemblies cross building expansion joints. Install at additional locations such that distance between expansion fittings does not exceed manufacturer's recommended distance between fittings.

C. Construct rated fire-stop assemblies where bus assemblies penetrate fire-rated elements such as walls, floors, and ceilings. Seal around penetrations according to section Penetration Firestopping.

D. Coordinate bus-assembly terminations to equipment enclosures to ensure proper phasing, connection, and closure.

E. Tighten bus-assembly joints with torque wrench or as recommended by manufacturer. Tighten joints after bus assemblies have been energized for 30 days.

3.2 CONNECTIONS

A. Ground equipment according to Section 26 05 26 Grounding and Bonding.

B. Connect wiring according to 26 05 19 Low-Voltage Conductors and Cables.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
2. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
3. Remove and replace malfunctioning units and retest as specified above.

B. Infrared Scanning: Perform infrared scan of bus assembly including joints and plug-in units not more than two months after substantial completion.
1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Prepare a certified report identifying bus assembly checked and describing results of scanning. Include notation of deficiencies detected, actions taken, and scanning observations after remedial action.
3. Perform follow-up infrared scan of bus assembly at 11 months after Substantial Completion.

C. On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

END OF SECTION

SECTION 262713 – ELECTRICAL POWER METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Meter Centers and Meter Stacks

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.
B. Shop Drawings; For each product, submit detailed and dimensioned plan and elevation drawings including the following information:
   1. Installed unit ratings.
   2. Short circuit current ratings.
   3. Factory settings of integrated overcurrent protective devices as applicable.
   4. Wiring diagrams for power and control wiring.
C. Manufacturer Seismic Certification: As applicable in compliance with section 26 05 48 Vibration and Seismic Controls.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate with requirements of the providing electric utility, including coordination of installation and connection of all utilities and services and utility provided components.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.

2. Eaton.
3. Siemens.
4. Square D.

B. Standards
1. UL 67.
2. UL 916.

2.2 METER CENTERS AND METER STACKS

A. The entire assembly shall be front accessible and shall include a main disconnect device.
B. Tenant disconnects shall be molded case circuit breakers.
C. The meter sockets shall be ring type, rated as shown on the plans. The meter sockets and associated branch protective device positions shall be completely pre-wired and shipped ready for installation of the meters and tenant main breakers. Meter sockets shall include covers with sealing provisions.
D. BUS
1. All bus bars shall be tin-plated aluminum. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on UL standard temperature rise criteria for multi-metering equipment.
2. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.
3. All hardware used for aluminum bus bar connections shall be high-tensile strength, zinc-plated.
E. ENCLOSURES
1. NEMA 1.

PART 3 - EXECUTION

A. INSTALLATION
1. Comply with equipment installation requirements of NECA 1.
2. Install all equipment per manufacturer’s written instructions.
3. Coordinate installation of meters furnished by utility company per utility company requirements and instructions. Provide empty conduits for metering leads and grounding connections as required by the utility company.

3.2 FIELD QUALITY CONTROL

A. Standard factory tests shall be performed on the equipment provided prior to installation. Perform manufacturer recommended tests with assistance of factory-authorized service representative.

END OF SECTION

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Receptacles.
   2. Toggle switches.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate plug configurations for any cord and plug equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper.
   2. Hubbell.
   3. Leviton.
   4. LeGrand.

2.2 RECEPTACLES

A. Straight Blade Receptacles
   1. Specification grade, 125V, 20A. NEMA 5-20R. Tamper resistant.
   2. NEMA WD 1 and NEMA WD 6.
   3. UL 498.

B. Ground-Fault Circuit Interrupter (GFCI) Receptacles
   1. In addition to Straight Blade Receptacle requirements:
      a. UL 943.
      b. Include indicator light for unit trip status.
C. Weatherproof Receptacles
   1. In addition to Straight Blade Receptacle requirements:
      a. UL listed for use in wet locations, including weatherproof while-in-use gasketed, hinged cover.
      b. Integral GFCI protection.
D. USB Receptacles
   1. In addition to Straight Blade Receptacle requirements:
      a. Receptacle to have one USB type-A and one USB type-C charging port.
E. Range Receptacles
   1. NEMA 14-50R configuration, 125/250V.
F. Dryer Receptacles
   1. NEMA 14-30R configuration, 125/250V.

2.3 TOGGLE SWITCHES

A. NEMA WD 1 and UL 20.
B. 120/277V, 20A

PART 3 - EXECUTION

3.1 INSTALLATION

1. Outlet mounting heights as indicated. Verify with ADA compliance and architectural appurtenances prior to rough-in.
2. Application
   a. Finishes per architectural schedule, all devices in like kind.
3. Coordination:
   a. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   b. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint and other material that may contaminate the raceway system, conductors, and cables.
   c. Install wiring devices after all wall preparation, including painting, is complete.

3.2 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105V to 132V.
   2. Percent Voltage Drop under 15A load: A value of 6% or higher is not acceptable.
   3. Ground Impedance: Values of up to 2ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL943.
   5. Using test plug, verify that device and outlet box are securely mounted.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 262813 – FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
B. Section 26 28 16 – Enclosed Switches and Circuit Breakers

1.2 SUMMARY

A. This Section includes the following:
   1. Low voltage (600V and less) cartridge fuses

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer's technical data for physical and material characteristics, including the following:
   1. Dimensions and technical data on features, performance, electrical characteristics, and ratings.
   2. Time-current coordination curves.
   3. Current-limitation curves for current limiting fuses.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate fuse type with fuse holders.
B. Coordinate fuse ratings with equipment nameplate requirements for maximum fuse size and system short circuit current levels.
C. Coordinate time-coordination curves between devices.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bussman
   2. Littelfuse

3. Or approved equal.

B. Standards
   1. NEMA FU-1

2.2 LOW VOLTAGE CARTRIDGE FUSES

A. Fuseholders
   1. Provide in accordance with UL 4248-1.
B. Current Limiting Type (Class R)
   1. UL 248-12.
   2. Types RK-1, RK-5. 600V, zero to 600A rating, 200kAIC, time delay.
C. High-Interrupting Capacity, Current Limiting Type (Class J)
   1. UL 248-8.
   2. Type J: 600V, zero to 600A rating, 200kAIC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are physically damaged.
B. Examine fuseholders for compliance with installation tolerances and compatibility with fuses. Only install fuses of types and sizes permitted by manufacturer instructions.
C. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fuses in fusible devices, such that rating information is visible without removing fuse from the device.

END OF SECTION

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following, where individually mounted:
   1. Fusible switches.
   2. Non-fusible switches.
   3. Molded-case circuit breakers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, provide data including the following:
   1. Current and voltage ratings
   2. Short-circuit current ratings (Interrupting and withstand)
B. Shop Drawings; For each product, submit detailed and dimensioned plan and elevation drawings including the following information:
   1. Wiring diagrams for power and control wiring.
C. Manufacturer Seismic Certification: As applicable in compliance with section 26 05 48 Vibration and Seismic Controls.
D. Operation and maintenance Data:
   1. Provide operation and maintenance manuals
   2. Provide time-current coordination curves

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of enclosed switches and circuit breakers with other trades and components. Maintain all workspace clearances and access door clearances.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
   5. Or approved equal.
B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, rating and poles as indicated.
B. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses.
C. Lockable handle, interlocked with cover in closed position.
D. Fuses installed shall meet requirements of Section 26 28 13 – Fuses.
E. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
F. Lugs : Mechanical type, suitable for number, size and material.

2.3 NON-FUSIBLE SWITCHES

A. Type HD, Heavy Duty, rating and poles as indicated.
B. UL 98 and NEMA KS 1, horsepower rated.
C. Lockable handle, interlocked with cover in closed position.
D. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
E. Lugs: Mechanical type, suitable for number, size and material.

2.4 MOLDED-CASE CIRCUIT BREAKERS

A. Rating and poles as indicated.
B. UL 489.
C. Lockable handle, interlocked with cover in closed position.
D. Multipole Breakers: common trip-type with single operating handle, designed such that overload in one pole automatically causes all poles to open.
E. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frames 250A and larger.
F. Adjustable, Instantaneous-Trip Circuit Breakers: magnetic trip element with front-mounted, field-adjustable trip setting.

G. Electronic Trip Circuit Breakers: Field-replaceable plug, rms sensing, with field adjustable settings:
   1. Instantaneous trip
   2. Long and short-time pickup levels
   3. Long and short-time time adjustments
   4. Ground-fault pickup level, time ddelay, and I-squared t response
H. Current Limiting Circuit Breakers: Frame sizes 400A and smaller, let-through ratings less than RK-5 fuse.
I. Ground Fault Circuit Interrupter (GFCI) Breakers: Class A ground fault protection (6mA trip).
J. Lugs: Mechanical type, suitable for number, size and material.

2.5

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed switches and circuit breakers for compliance with requirements, installation tolerances, and other conditions affecting performance.
   1. Proceed with installation only after conditions have been corrected.
B. INSTALLATION
   1. Comply with NECA 1.
   2. Install complete assemblies according to manufacturer's written instructions. Comply with Section 26 05 48 Vibration and Seismic Controls as applicable.
   3. Install fuses in fusible devices.

3.2 FIELD QUALITY CONTROL

A. Test
   1. Perform visual inspection of all parts and pieces in comparison with manufacturer's instructions.
   2. Perform manual operation of circuit breakers to ensure smooth function of moving components.
B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 262913 – ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:
   1. Across-The-Line Controllers.
   2. Reduced-Voltage Controllers.
   3. Variable Frequency Controllers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, submit manufacturer data.
B. Shop Drawings; For each product, submit detailed and dimensioned plan and elevation drawings including the following information:
   1. Installed unit nameplate ratings.
   2. Short circuit current ratings.
   3. Factory settings of integrated overcurrent protective devices as applicable.
   4. Wiring diagrams for power and control wiring.
C. Manufacturer Seismic Certification: As applicable in compliance with section 26 05 48 Vibration and Seismic Controls.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate installation of equipment supports and structural penetrations.
B. Coordinate features and functions of each controller with ratings and characteristics of supply circuit, motor supplied, required control sequence, and duty cycle of motor load.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB.
   2. Eaton.
   3. Siemens.
   4. Square D.
   5. Or approved equal.
B. Standards
   1. NEMA ICS 1 AND NEMA ICS2
C. Accessories:
   1. In addition to any specific features noted by controller type, controllers must have the following features:
      a. Control Circuit: 120V obtained from integral control power transformer of a sufficient capacity to operate connected pilot, indicating, and control devices, plus 100% spare capacity.
      b. Overload Relay: Selectable switch, thermal overload protection in each phase, with electronic phase-voltage monitor designed to protect motors from phase-loss, undervoltage, and over-voltage. Provide time adjustable restart relay to prevent immediate restarting.
      c. Combination motor controllers: Integral disconnecting means per UL-489.
D. Enclosures
      a. NEMA 1, except NEMA 3R where outdoors or subject to wet environments.

2.2 ACROSS-THE-LINE CONTROLLERS

A. Magnetic Controller: Class A, full voltage, non-reversing, across the line, unless otherwise indicated.
   1. Control Circuit: 120V obtained from integral control power transformer of a sufficient capacity to operate connected pilot, indicating, and control devices, plus 100% spare capacity.
   2. Overload Relay: Selectable switch, thermal overload protection in each phase, with electronic phase-voltage monitor designed to protect motors from phase-loss, undervoltage, and over-voltage.

2.3 REDUCED VOLTAGE CONTROLLERS

A. Solid-State, Reduced-voltage controller, with adjustable acceleration rate control utilizing voltage or current ramp and adjustable starting torque control.
   1. Surge suppressor in solid-state power circuits providing 3-phase protection against supply voltage surges 10 percent or more above nominal line voltage.
   2. LEDs indicating motor and control status, including the following conditions:

a. Control power available.
b. Controller on.
c. Overload trip.
d. Loss of phase
e. Shorted rectifier.

2.4 VARIABLE FREQUENCY CONTROLLERS

A. Fixed frequency input, variable frequency controller, listed and labeled as a complete unit arranged to provide variable speed of induction motor by adjusting output.
1. Rating: 3-phase with plus or minus 5% ac input voltage tolerance at 208V And plus or minus 10% ac voltage tolerance at 480V.
2. Adjustable speed, acceleration, deceleration, and current limit.
3. LEDs indicating motor and control status, including the following conditions:
a. Power on.
b. Run.
c. Overvoltage.
d. Line fault.
e. Overcurrent.
f. External fault.
4. Integral Disconnecting Means – UL489.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.
B. INSTALLATION
1. Install complete assemblies according to manufacturer’s written instructions. Assemblies to be bolted to structural steel channels bolted to wall, or to freestanding racks compliant with Section 26 05 48.
C. CONTROL WIRING
1. Install control wiring between motor control devices according to manufacturer instructions and diagrams, and in accordance with Section 26 05 19 Low-Voltage Conductors and Cables.

3.2 FIELD QUALITY CONTROL

A. Test insulation resistance for each controller, component, supply, feeder, and control circuit.
1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS mandatory tests.. Certify compliance with test parameters.
B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 264300 – SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:
   1. Surge Protective Devices (SPD)s for low voltage (rated 600V or less) power distribution and control equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the authority having jurisdiction and marked for intended use.
B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ABB
   2. Eaton
   3. Siemens
   4. Square D
B. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. Compliant with UL 1449
   3. Compliant with UL 1283

2.2 SERVICE ENTRANCE AND TRANSFER SWITCH SPD

1. UL 1449 Type 1 rated, Metal Oxide Varistors, SCCR equal to or exceeding the rating of the device to be protected.

2. Include the following features:
    a. Integral disconnect switch.
    b. Integral thermal protection.
    c. Redundant suppression circuits.
    d. LED indicator lights for power and protection status.
    e. Form-C contacts rated 5A, 250V ac, one normally open and one normally closed for remote monitoring of status.
    f. Transient-event counter to total surge events.
3. Peak Single-Impulse Surge Current: 320kA per phase
4. Protection modes and UL 1449 voltage rating for grounded wye circuits shall be as follows:
    a. Line to Neutral: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    b. Line to Ground: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    c. Neutral to Ground: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    d. Line to Line: Maximum 1800V for 480Y/277V, 1200V for 208Y/120

2.3 PANEL AND DEVICE SPD

1. UL 1449 Type 2 rated, Metal Oxide Varistors, SCCR equal to or exceeding the rating of the device to be protected.
2. Include the following features:
    a. Integral thermal protection.
    b. LED indicator lights for power and protection status.
    c. Form-C contacts rated 5A, 250V ac, one normally open and one normally closed for remote monitoring of status.
3. Peak Single-Impulse Surge Current: 100kA per phase
4. Protection modes and UL 1449 voltage rating for grounded wye circuits shall be as follows:
    a. Line to Neutral: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    b. Line to Ground: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    c. Neutral to Ground: Maximum 1200V for 480Y/277V, 700V for 208Y/120
    d. Line to Line: Maximum 1800V for 480Y/277V, 1200V for 208Y/120

2.4 ENCLOSURES

A. Indoor Installation: NEMA Type 1.
B. Outdoor Installation: NEMA Type 3R.

2.5 WIRING

A. Comply with section 26 05 19 Low-Voltage Conductors and Cables

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 and all manufacturer instructions.
B. Install OCPD or disconnect as required to comply with UL listing of the device.
C. Install conductors between suppressor and points of attachment as short and straight as possible. Adjust circuit breaker positions to achieve shortest and straightest leads. Do not exceed manufacturer's lead length, do not extend SPD leads except where explicitly permitted by manufacturer. Do not bond neutral and ground.
D. Use crimped connectors and splices only.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:
    1. Confirm equipment nameplate data compliance with Drawings and Specifications
    2. Visually inspect all components and confirm alignment, grounding, and clearances.
    3. Verify electrical installation complies with manufacturer's instructions. Complete startup checks according to manufacturer's written instructions.
    4. Do not perform insulation-resistance tests of distribution wiring equipment with SPDs installed. Disconnect SPDs during testing and reconnect.
    5. Energize SPDs after power system has been energized, stabilized, and tested.
C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

265000 – LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section provides general requirements for a complete and fully operational lighting system and includes information regarding light fixtures, lamps, accessories, control gear, light fixture support, processes for submittals and execution. The term “luminaire” and “light fixture” may be used interchangeably.

B. Related Documents include:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2. The provisions of Division 26 Section, Common Work Results for Electrical, apply to this section.

C. Related Sections include:

1. Section 260526 Grounding and Bonding for Electrical Systems.

2. Section 260519 Low Voltage Electrical Power Conductors and Cables.

3. Section 260923 Lighting Control Devices.

4. Section 260933 Central Dimming Controls.

5. Section 260943 Network Lighting Controls.

6. Section 262726 Wiring Devices.

7. Section 265100 Lighting Cutsheets.

8. Light Fixture Schedule – found within the architectural Drawings.

D. Drawings and Coordination:

1. Provide all lighting outlets indicated on the Drawings with a luminaire of the type designated and appropriate for the location. Outlet symbols on the Drawings without a type designation shall have a luminaire the same as those used in similar or like locations.

2. Where a luminaire type designation cannot be determined by the Contractor, request a clarification from the Architect and provide a suitable luminaire type as directed.

3. Coordinate installation of luminaires with the ceiling installation and all other trades to provide a total system that is neat and orderly in appearance.

4. Install all remote control gear in enclosures as required by luminaire specified. Locate remote gear as shown on drawings; where no location is shown, provide recommendation for approval prior to commencing field installation. Remote mounted gear shall be located within the distance limitations specified by the fixture manufacturer.

5. Light fixture voltage shall be coordinated to match the voltage of the circuit serving the light fixture.

6. Provide all frames, supplementary support structures, hangers, spacers, stems, aligner canopies, auxiliary junction boxes and other hardware as required for a complete and proper installation. Recessed fixtures to have frames that are compatible with associated ceiling systems.

7. Luminaires indicated in the drawings as continuous or joined linear runs to be longest run-lengths possible to fit installation conditions. A minimum quantity of power feeds is to be provided to the fixture, for normal and emergency operation. Manufacturer's shop drawings are required to show lengths intended to be provided, power feeds, corner conditions, and all associated mounting hardware. Installation contractor to review and approve lengths and components for each as-built condition.

1.2 QUALITY ASSURANCE

A. The lighting design for this project is based on luminaire types and manufacturers as specified.

B. Specified manufacturers are pre-qualified to bid on products where specified. Inclusion of manufacturer and product series does not relieve specified manufacturer from providing product as described in Light Fixture Schedule; modifications to standard product, if required, shall be included with initial bid.

C. Other manufacturers and products: Submit Substitution Request prior to bid, complying with requirements of "Section 012500 Product Options and Substitutions". Approval shall be determined by review of the following luminaire characteristics where applicable. Lack of pertinent data on any characteristic shall constitute justification for rejection of the submittal.

1. Performance
   a. Distribution.
   b. Utilization.
   c. Average brightness/maximum brightness.
   d. Spacing to mounting height ratio.
   e. Visual comfort probability.

2. Construction
   a. Engineering.
   b. Workmanship.

c. Rigidity.
d. Permanence of materials and finishes.

3. Installation Ease
   a. Captive parts and captive hardware.
   b. Provision for leveling.
   c. Through-wiring ease.

4. Maintenance
   a. Re-lamping ease.
   b. Ease of replacement of ballast, lamp sockets, light engines or control gear.

5. Appearance
   a. Architectural integration.
   b. Light tightness.
   c. Neat, trim styling.
   d. Conformance with design intent.

D. Mockups: Refer to the Light Fixture Schedule for fixture type(s) requiring mockups. Provide lighting fixtures for room or module mockups.

1. Obtain Lighting Designer's and Architect's approval of fixtures for mockups prior to starting installation.

2. Install fixtures for mockups with power and control connections.

3. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

4. Remove mockups when directed. Fixtures may be reinstalled in the Work with approval of Owner.

5. Mockups evaluated on the project site may become part of the complete Work with the approval of the Owner, Lighting Designer, and Architect if the mockup is undisturbed at the time of substantial completion.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Architect's office with General Contractor, Electrical Contractor, Architect, Owner's Representative, and Lighting Designer.
   1. Discuss the intended process for coordination of trade-partners with design team during submittal review and shop drawing process.
   2. Discuss prioritized lighting specification items relative to lead-time implications.
   3. Discuss field related drawing pickups and the intended process to enable conformed set documentation with the entire team.
   4. Discuss intended timing for first in place assessments and mockups.
   5. Discuss field staking of lighting elements, as related to landscape plantings.
   6. Discuss any unresolved signage or branding elements related to tenant improvements or phased implementation of items impacting specified design.

1.4 ACTION SUBMITTALS

A. Submit the following in accordance with Section 260500:
   1. Shop Drawings, to include:
      a. Product Data. Provide manufacturer's published product data information.
      b. Luminaire dimensions on a fully dimensioned line drawing.
      c. Lamp or light-engine information.
      d. Lamp socket or light-engine base and heat-sink information, and modularity or replaceability of provided components.
      e. Control gear information using manufacturers published product data information. Multiple devices may be submitted for single luminaire if compatible with specification included in contract documents, e.g. for emergency purposes or dimmability. Include certification of light source and control gear compatibility for all submitted fixtures and controls. Should official certification not be available, submit working product samples and controls as part of the shop drawing process.
      f. Mounting details including clips, canopies, supports, and methods for attachment to structure.
      g. Testing Laboratory labeling information.
      h. Photometric Reports (when requested) consisting of:
         1) IES file, in electronic format
         2) Candlepower distribution curves: Provide five plane candlepower distribution data at no more than 5 degree vertical angle increments.
         3) Coefficient of utilization table.
         4) Zonal lumen summary including overall luminaire efficiency.
         5) Luminaire luminance: Provide measured maximum brightness data for luminaires with reflectors and average brightness data for luminaires with refractors.
         6) Spacing to mounting height ratio. If parallel and perpendicular ratios differ, provide data on each plane.
      i. Special requirements of the specification.

   2. Operation and maintenance data. Prepare two copies of a Lighting Systems Maintenance Manual consisting of the following in a hard-cover binder for review. After review, Architect will deliver one copy to Owner.
      a. One complete set of final submittals of actual product installed, including product data and shop drawings. Include product data for actual control gear installed where applicable.
      b. List of lamps and replaceable LED modules used in Project, cross-referenced to fixture types, with specific manufacturer's names and ordering codes.
      c. Relamping instructions for fixtures that require special precautions (electrostatic discharge concerns, etc.).
      d. Lighting fixture cleaning instruction, including chemicals to be used or avoided.

1.5 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall

be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty for LED Lighting Fixtures: A warranty must be provided by the manufacturer made out to Owner for luminaires, covering repair or replacement of defective electrical parts (including light engine, driver and power supplies) within specified warranty period indicated below.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special Warranties for Control Gear: Written warranty, executed by manufacturer agreeing to replace power supplies, drivers, or ballasts that fail in materials or workmanship within specified warranty period.
   1. Special Warranty Period for power supplies and LED drivers: Five years from date of manufacture, but not less than four years from date of Substantial Completion.

D. Special Warranty for retrofit lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Two years from date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below, or as described in the Architectural Light Fixture Schedule, that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Glass and Plastic Lenses, Covers, Louvers, and Other Optical Parts: 10% or one dozen (whichever is less) of each type and rating installed. Furnish at least one of each type.
   2. Adjustable Accent Lights (track, recessed, or surface mounted): One case or 20% (whichever is less) of each retrofit lamp type. A spot distribution and a flood distribution lamp are considered to be two different lamp types. 10% or one dozen (whichever is less) additional lenses, color filters, louvers, and other accessories to be used during final focusing.
   3. LED light engines, drivers, and power supplies: 10% extra individual modular LED strips or replaceable source modules, drivers and power supplies. If product does not have replaceable components, furnish at least 10% extra entire fixture assembly. Furnish at least one spare of each type.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide product as specified in the Light Fixture Schedule. Supply specified product, or in the case of pre-approved alternates, supply design-team approved alternate, as indicated in the submittal review process.

B. Luminaires are to be new and complete with mounting accessories, junction boxes, trims, lamps, and control gear.

C. Luminaire assemblies listed in accordance with a Nationally Recognized Testing Laboratory (NRTL), as defined by OSHA in 29 CFR 1910.7.

D. Luminaire assemblies listed by NRTLs appropriate to mounting conditions and application.

E. Luminaire photometric data to be provided by a manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

F. Each luminaire family type in the same visual area, and with similar intended reflector appearance (downlights, etc.), to be supplied by only one manufacturer.

G. Electrical components, devices and accessories to be listed and labeled as defined in NFPA 70 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use. Installations are to comply with NFPA 70.

H. Fixtures recessed in suspended ceilings where space above the ceiling is either an air supply or return plenum shall conform to NEC Article 300-22.

I. Luminaires, lamps and other components and controls shall equal or exceed the requirements of all applicable state and/or municipal energy codes.

2.2 LAMPS

A. LED:
1. See section on LED fixtures. All fixtures are anticipated to be LED, unless otherwise indicated in the Light Fixture Schedule.
2. Integrated LED lamps: Unless otherwise indicated in the light fixture schedule, LED light engines provided as part of the luminaire, informally called "lamps", are considered a component of the luminaire, and subject to the section on LED fixtures.
3. LED lamps separate to fixtures:
    a. All fixtures require a lamp, or light engine to function, and should be procured with each fixture.
    b. Line-voltage, socket-based lamps will meet the wattage, voltage, beam spread, base style, and bulb shape stated for the specific luminaire type as indicated by the specified manufacturer, or as specifically indicated in the Light Fixture Schedule, or as specified herein.
    c. Low Voltage, socket-based lamps will meet the wattage, voltage, beam spread, base style, and bulb shape stated for the specific luminaire type as indicated by the specified manufacturer, or as specifically indicated in the Light Fixture Schedule. Low-voltage lamps must be compatible with transformed power control gear.
    d. Lamps cutsheets, indicating the specific make/model to be procured, will be submitted for review with luminaire shop drawings and submittals.
    e. Where unstated in the specification, lamps are to have a Color Rendering Index (CRI) exceeding 90.

f. Lamps procured separately from the fixture are to be tested to comply with the dimming performance indicated in the Light Fixture Schedule or Lighting Controls Specification.

B. Other sources:
1. Incandescent and tungsten halogen lamps are not to be used, unless specifically indicated in the Light Fixture Schedule for decorative or specialty purposes mandated by the installation, as approved by the owner, and compliant with municipal code.
2. Linear fluorescent and compact fluorescent lamps are not to be used, unless specifically indicated in the Light Fixture Schedule for decorative or specialty purposes mandated by the installation, as approved by the owner, and compliant with municipal code.
3. Induction lamps are not to be used, unless specifically indicated in the Light Fixture Schedule for decorative or specialty purposes mandated by the installation, as approved by the owner, and compliant with municipal code.
4. High Intensity Discharge lamps and ceramic arc tube type lamps are not to be used, unless specifically indicated in the Light Fixture Schedule for decorative or specialty purposes mandated by the installation, as approved by the owner, and compliant with municipal code.

C. Lamps used in open luminaires shall be rated for such use.

D. Special types as indicated in Light Fixture Schedule.

2.3 LAMP SOCKETS

A. Of configuration and design to accept standard lamp bases.

B. Replaceable lamp sockets shall be unglazed porcelain or thermoplastic (PET GF) with copper-alloy screw shell for medium or mogul screw base. Bi-pin base to have ceramic casing with mica cover plate, copper alloy contact surfaces and pin distance designed for lamp provided. For other lamp types as required by base type and NRTL approved as part of tested fixture.

2.4 LED FIXTURES

A. All Luminaires:
1. Comply with the following testing procedures and standards.
a. IES LM79 Electrical and Photometric Measurement of Solid State Lighting
b. IES LM80 Method for Measuring Lumen Maintenance for SSL Light Sources
c. IES LM82 Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature
d. DOE Energy Star criteria
2. Luminaires shall not draw power in the off state. Luminaires with integral occupancy, motion, photo-controls, or individually addressable fixtures with external control and intelligence are exempt from this requirement. The power draw for such luminaires shall not exceed 0.5 watts when in the off state.
3. Color spatial uniformity shall be within .004 of CIE 1976 diagram.
4. Color maintenance over rated life shall be within .007 of CIE 1976.

5. White LED luminaires shall achieve a minimum CRI of 80, and R9 value above 24, and Binning of white LEDs used in the luminaires shall fall within a 3-step MacAdam ellipse minimum, or as indicated in the Architectural Light Fixture Schedule.
6. Luminaire manufacturers shall adhere to device manufacturer guidelines, certification programs, and test procedures for thermal management
7. LED package(s)/module(s)/array(s) used in qualified luminaires shall deliver at least 70% of initial lumens, when installed in-situ, for a minimum of 50,000 hours per IES L70.
8. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.

B. Power Supplies and Drivers:
1. Fully rated to operate low-voltage load at listed wattage with no derating.
2. Limit voltage regulation to 5 percent or less of rated output voltage (5 percent or less of rated output voltage for DMX).
3. Operating temperature: minimum of -20°C or below when used in luminaires intended for outdoor use.
4. Maximum driver case temperature not to exceed driver manufacturer recommended in-situ operation.
5. Output operating frequency: 120Hz.
6. Integral short circuit, open circuit, and overload protection.
7. Interference: EMI and RFI compliant with FCC 47 CFR Part 15.
8. Total Harmonic Distortion Rating: Less than 3%, or as specified in the Architectural Light Fixture Schedule.
9. Meet electrical and thermal conditions as described in LM-80 Section 5.0.
10. Primary Current: Confirm primary current with Electrical Drawings.
11. Secondary Current: Confirm secondary current specified by individual luminaire manufacturers.
12. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified control components.
13. Solid-state control components to be integral or external per each specified luminaire. Remote control gear to be enclosed in Class 1, Class 2, or NEMA 3R or 4X enclosures as required.

C. Controller and Control System
1. System electronics driver / controller to use coordinated communication protocols: DMX512, 0-10V, DALI, or proprietary as required
2. Contractor to ensure that external control equipment is compatible with LED control requirements
3. Provide connector types and wiring as appropriate for un-interrupted communication between devices, considering distance maximums, field obstructions, and accessibility. Ensure that connection points are optically isolated for system noise reduction.
4. For control components that are part of overall area control system see Electrical Dimming Controls specification.
5. For stand-alone controlled LED systems see the Architectural Light Fixture Schedule.
6. Compatibility: Certified by manufacturer for use with individually specified luminaire and individually specified power supplies and/or drivers.

2.5 LUMINAIRE CONSTRUCTION

A. See Lighting Schedule for exact specification of luminaires to be provided. In the case that insufficient data is provided as part of manufacturer's data the design team will assess the following as general performance criteria:

B. Housings:
1. Recessed: Minimum code gauge steel or rigid aluminum construction, with exposed weld marks and seams filled and ground smooth unless otherwise indicated in the Light Fixture Schedule. Luminaires used as air-handling registers for HVAC systems shall meet the requirements of NFPA 90A.
2. Suspended or surface mounted:
a. Extruded aluminum fixtures to have one piece housing of AA 6063 T5 extruded aluminum with 0.14 minimum thickness smooth and free of tooling lines in one uninterrupted section of 1 foot to 24 foot with the cross sectional dimensions as indicated in the Light Fixture Schedule. Section lengths shall be as shown on the drawings and shall be such that the luminaire shall be able to be transported into and out of the installation location after final construction without any building demolition being required.
b. Steel fixtures to have 20 gauge (0.7mm or 0.027") minimum, free of dents, scratches, or other defects. Exposed weld marks, joints and seams shall be filled and sanded smooth before finishing. All edges shall be cleaned and dressed to remove sharp edges or burrs. Section lengths shall be as shown on the drawings comprised of 1 foot to 12 foot lengths.
c. End Plates to be die cast end plates shall be mechanically attached without exposed fasteners. End caps shall be minimum 0.125" thick.
d. Where housing sections are joined together to form a continuous row, an internal alignment spline shall be provided.
e. Door Frames for lensed luminaires: White painted, flat aluminum with mitered corners, rotary cam or spring assisted latches to hinge from either side. Provide mitered corners with no gaps or light leaks.

C. Exterior finish:
1. All exposed aluminum surfaces shall be treated with an acid wash and clear water rinse prior to painting. The luminaire shall then be electrostatically painted or powder coated and oven baked in the color indicated in the Light Fixture Schedule.
2. All exposed steel surfaces shall be treated with an acid wash and clear water rinse, then prime coated. The luminaire shall then be electrostatically painted or powder coated and oven baked in the color indicated in the Light Fixture Schedule.

D. Interior finish: Baked white dry polyester powder, unless otherwise specified, with a minimum average reflectance of 85% on all exposed and light reflecting surfaces. Steel components shall be prepared for finishing with a 5-step zinc phosphating process prior to painting. Luminaire (including all painted component parts) shall be painted after fabrication unless specifically noted in the Light Fixture Schedule.

E. Lensing: To be mechanically secured from within the housing. Lenses to be installed with textural diffusion on the interior and smooth surfaces on the exterior.

F. Louvers and Reflectors:
1. White Reflectors shall be steel or aluminum, minimum 22 gauge, with hard baked white enamel finish with minimum 85% reflectance.
2. Metallic reflectors shall be low iridescent specular or as indicated in the Light Fixture Schedule.

G. Mounting hardware:
1. Suspension Devices, type as specified in the Light Fixture Schedule:
   a. Aircraft Cable: Stainless steel type - 3/32" nominal diameter, stranded, with positive pressure, field adjustable clamp at fixture connection.
   b. Rigid Pendant: ½" nominal diameter or as specifically shown on drawings. Supplied by fixture manufacturer when available as standard product. At fixture end of stems, provide earthquake type swivel fitting to permit 45° swing in any direction away from vertical. Flat canopy to permit splice inspection after installation.
   c. Chain hangers: Length to suit fixture mounting height if shown or as field conditions dictate. Use two heavy duty chains with "S" hooks at each suspension point. Length to suit mounting height as shown on Drawings.
   d. Suspension system must permit ±13mm (1/2") minimum vertical adjustment after installation.
2. Supports:
   a. Provide internal safety cable from fixture body to stud in outlet box.
   b. Carry fixture weight to structure and provide horizontal bracing from suspension points to ceiling framing to prevent sideways shifting. Provide diagonal seismic restraint wires per code.
3. Feed Point:
   a. Flat-plate canopy to cover outlet box, with holes for support cable and power cord, concealed fasteners to permit splice inspection after installation.
   b. At the electrified connection provide straight cord feed. Where emergency feed is required, a separate feed point shall be provided.
   c. Power cord: white multi-conductor cord, parallel to support cable (aircraft cable); within pendant (rigid pendant); or flexible conduit (chain hanger).
   d. Where emergency feed is required, a separate feed point shall be provided.
4. Non-feed Points:
   a. 13mm (1/2") o.d. polished chrome end sleeve, inside threaded 1/4"-20, with 50mm (2") diameter. Flat white plate to cover hole in ceiling. Top of cable with ball swaged on end, to fit inside sleeve.
   b. Contractor to provide support above ceiling as required.
5. Suspension method shall allow adjustment to be made in hanging length to allow for variance in ceiling height.
6. All exposed paintable suspension components shall have the same finish and color as the luminaire housing or as shown in the Light Fixture Schedule.

2.6 INDUSTRIAL USE LUMINAIRE CONSTRUCTION

A. See Light Fixture Schedule for exact specification of industrial use luminaires to be provided. In the case that insufficient data is provided as part of manufacturer's data the design team will assess the following as general performance criteria:

1. Housing: To be minimum code gauge steel or rigid aluminum construction painted after fabrication. Steel housings shall be bonderized or otherwise rust protected.
2. Components: Concealed parts of fixture such as lamp holders, yokes, accessory holders, and housing shall be matte black finish. Visible surfaces shall be powder coated paint unless otherwise specified. Color and finish to be selected by Architect.
3. Lamp holder housing: shall be cast aluminum with integral heat radiating fins to insure cool lamp base operation.
4. Lensing: Fixtures which will not accommodate open fixture rated lamps shall have clear tempered glass lenses.

B. Suspension means shall be as indicated in Light Fixture Schedule.

2.7 SPECIALTY USE LUMINAIRE CONSTRUCTION

A. See Lighting Schedule for exact specification of specialty use luminaires to be provided. In the case that insufficient data is provided as part of manufacturer's data the design team will assess the following as general performance criteria:
1. Tungsten halogen lamp seal temperature shall not exceed 350 degrees Celsius with an ambient temperature of 25 degrees Celsius when tested per UL Bulletin 57, Paragraph 328-334. Submit certified heat test by independent testing laboratory when required in the Lighting Schedule.
2. Recessed luminaires: Equip with protective thermal cutout and a through-wiring junction box accessible from the ceiling opening of the luminaire. Housings to be compatible for ceiling type where fixture is located. Interior and exterior surfaces of housing and hardware to be matte black.
3. Adjustable Lamp Mechanisms: To have aiming stops which can be permanently set to position lamp vertically and rotationally.
4. See Section on low voltage luminaires for information regarding transformers where required.

2.8 LOW VOLTAGE COMPONENTS

A. Transformers, Power Supplies and Drivers shall comply with the following:
1. See Section on LED Fixtures.
2. Location of power supplies and drivers may be integral or remote to fixtures. Contractor to verify locations are accessible and ventilated, or thermally protected, and within suitable distances to fixtures per manufacturers' requirements or per voltage-drop considerations.
3. Contractor to confirm compatibility of gear and lighting control equipment to achieve specified dimming performance, as indicated in the Light Fixture Schedule.

B. Other Low-Voltage equipment, such as control gear shall comply with the following:
1. See Section on LED Fixtures.
2. Locate in interior or exterior locations, as needed for optimization of wiring distances. Contractor to ensure suitability of location and enclosure to achieve specification performance criteria.
3. Contractor to locate gear within remote enclosures per the section on Remote Enclosures.

C. Outdoor Remote Enclosures:
   1. For transformer/power supplies located outdoors provide IP68 rated direct burial vault (e.g. Q-Tran Q-VAULT-5) engineered to be buried in soil, gravel, or concrete, with all sealing materials supplied by the manufacturer.
   2. Contractor to confirm housing type with location where enclosure is to be placed, including housing guard or pour ring. Obtain plate cover finish selection from landscape designer and architect.
   3. Control equipment not purpose-built for Q-Tran Q-VAULT Series enclosures to be placed within NEMA Type 4X enclosures, constructed for protection against ingress of solid foreign objects, the harmful effects on equipment due to the ingress of water, corrosion, and the external formation of ice on the enclosure.
   4. Maximum driver case temperature not to exceed driver manufacturer recommended in-situ operation.

2.9 TRACK LIGHTING SYSTEMS

A. Lighting Track: Extruded aluminum track with extruded poly-vinyl insulator. Twenty amp, copper conductor strips with separate ground to provide electrical and mechanical connection for the specified track mounted luminaires. Number of circuits as indicated in luminaire schedule, with separate neutrals per circuit. Provide connectors, current limiting devices, elbows, stems, feed ends, end caps and fittings to make a complete system.

B. Track Fixtures (heads): To provide positive mechanical and electrical connection for track heads to track. Removable fixture either twists into or snaps into specified lighting track. Where unspecified, fixtures to have lockable, adjustable aiming which can be set to position lamp vertically and rotationally.

C. Transformers: To provide proper lamp voltage to low voltage lamp fixtures, or to the track. All magnetic transformers to be encapsulated for silent operation. Magnetic and electronic transformers remote to the track fixtures will be located accessibly in a well-ventilated nearby location. Suitable distance for voltage drop to be coordinated.

D. LED control gear: See section on LED Fixtures. Integral drivers to be accessed for maintenance, not interfere with fixture aiming, and to be compatible with control system serving the track.

E. Finish: All visible surfaces to be of color and texture as directed in Light Fixture Schedule.

F. Shop Drawings mandatory for track lighting systems as part of the submittal review process, showing all components, specific lengths and quantities to be provided.

2.10 LENSES

A. See Light Fixture Schedule for exact specification of lenses to be provided. In the case that insufficient data is provided as part of manufacturer’s data the design team will assess the following as general performance criteria:

1. Prismatic Acrylic: 12"x24" and Larger: Injection molded of clear virgin UV stabilized acrylic plastic, 0.160" minimum overall thickness with 0.125” nominal unpenetrated thickness square cone base, similar to Pattern 12 configuration.
2. Opal acrylic: Extruded or injection molded of virgin UV stabilized acrylic plastic, 0.080" minimum overall thickness.
3. Opal acrylic overlay: High transmittance type, extruded of virgin UV stabilized acrylic plastic, 0.040” overall thickness, with minimum 80% light transmittance, unless otherwise specified.
4. Accessory lenses: A variety of lenses may be requested for accent luminaires. In the case that a beam softening or diffusing lens is requested, the baseline criteria will be performance equivalent to SOLITE clear micro diamond pattern glass lenses, unless otherwise indicated. For linear spread lenses, Hecker lenses, or other, provide indication of lens performance to be provided as part of submittals.
5. Distribution: The optical distribution of the lens and/or combination of reflector and lens will provide the specified pattern of light emitted from the luminaire. Conformance of distribution to be provided will be proven through photometric file sent as part of the submittal process, or sample fixture should photometric files not be available.

2.11 REFLECTOR CONES

A. See Light Fixture Schedule for exact specification of reflectors to be provided. In the case that insufficient data is provided as part of manufacturer’s data the design team will assess the following as general performance criteria:
   1. Material: Spun of uniform gauge aluminum, free of spinning marks or other defects. Plastic material shall not be used for reflector cones, unless otherwise specified.
   2. Flanges: to be integral to the reflector where specified and flush to the finished ceiling without gaps or light leaks.
   3. Finish: Color and finish as specified in Light Fixture Schedule. All optical reflectors shall be of the Alzak® process, and shall be of the low iridescent type, unless otherwise specified.
   4. Distribution: The optical distribution of the reflector and/or combination of reflector and lens will provide the specified pattern of light emitted from the luminaire. Conformance of distribution to be provided will be proven through photometric file sent as part of the submittal process, or sample fixture should photometric files not be available.

2.12 CUSTOM LUMINAIRES

A. The custom luminaire manufacturer, if selected by the contractor to create custom parts for specified light fixtures, shall not have less than five years of continuous experience in the design and manufacture of custom lighting elements of the type and quality shown.

B. The specifications and drawings are intended to convey the features, function and character of the custom luminaire only and do not necessarily illustrate every component or detail required in the finished piece of equipment.

C. Details and components that are necessary for the proper appearance and functioning of the custom luminaire shall be included.

D. All custom light fixtures require a prototype to be submitted prior to commencement of fabrication. In the case of single, specialty elements, the prototype may be an in-progress version of the final custom product. The purpose of the prototype will be to review construction, lamp placement within the fixture, lamp type, optical assembly, finishes, etc. Modifications may be required as a result of the prototype review. These modifications and others that do not materially affect the cost of the fixture shall be incorporated at no additional cost to the Owner.

E. The sample / prototype luminaire shall be installed and connected by the contractor in a mutually acceptable location for demonstration and evaluation by the design team. The Architect and Lighting Consultant shall be the final judge in determining whether the sample / prototype complies with the specifications.

F. The contractor shall coordinate the timing of the either sample / prototype luminaire review or final custom luminaire construction and installation with the constraints of the project schedule and coordinate directly with pertinent subcontractors relative to schedule implications.

2.13 WIRING

A. All wiring shall be as required by code for fixture wiring.

B. All flexible cord wiring between fixture components or to electrical receptacles and not in wireways shall have a minimum temperature rating of 105 degrees Celsius.

C. Cords shall be fitted with proper strain reliefs and watertight entries where required by application.

D. No internal wiring shall be visible at normal viewing angles.

E. Provide #18 AWG, 3 wire flexible conduit connections (whips) for dual level switching as shown on Electrical Drawings for light fixtures recessed in accessible suspended ceiling. Provide 3-wire whips for all dual level switching. Wire count on wire whips is not shown on Drawings and shall be the responsibility of the Contractor to provide proper wire count for the lighting control as shown on Drawings.

2.14 FIXTURE SUPPORT COMPONENTS

A. Comply with Section pertaining to General Electrical Provisions, paragraph entitled Equipment anchorage, Support, Seismic Restraint, and Bracing for fixture support and bracing.

B. Where the ceiling is of insufficient strength to support the weight of the lighting fixtures, provide additional framing from building structure to support luminaires as required. Do not support fixtures from ceiling T-Bar system.

C. Single-Stem Hangers shall be 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish shall be the same as the luminaire.

D. Twin-Stem Hangers shall be two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish shall be the same as the luminaire.

E. Rod Hangers shall be 3/16-inch minimum diameter, cadmium-plated threaded steel rod.

F. Wires shall be ASTM A 641/A 641M, Class 3, soft temper, zinc coated steel, 12 gauge.

G. Wires for humid spaces shall be ASTM A 580/A 580M, composition 302 or 304, annealed stainless steel, 12 gauge.

H. Hook Hangers shall be integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

I. Aircraft Cable Support shall use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

J. Hangers for Pendant Industrial Fixtures shall be heavy duty No. 8 jack chain with hangers, "S" hooks, mounting, straps, and all required accessories for complete installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall meet the general requirements of NFPA 70, National Electric Code.

B. Mounting heights specified on drawings:
   1. Wall mounted luminaires: shall be to centerline of luminaire.
   2. Pendant mounted luminaires: shall be to bottom of luminaire unless specifically identified in the Light Fixture Schedule or on drawings.

C. Support:
   1. The luminaires shall be supported by separate means from the building structure and not from the ceiling system, ductwork, piping or other systems.
   2. The final decision as to adequacy of support and alignment will be given by the Architect.

D. Level luminaires align in straight lines and locate as shown on the architectural elevations and reflected ceiling plan.

E. Manufacturer's labels or monograms shall not be visible after luminaire is installed but must be included for future reference.

F. When lamping luminaires with separate lamps, use silk gloves to insert lamps.

G. Luminaires with lamp life less than 10,000 hours shall not be energized during construction to prevent dust build up on lamp, socket and lamp chamber. Lamping shall occur as last stage of construction.

H. Recessed luminaires shall have trims which fit neatly and tightly to the surfaces in which they are installed without light leaks or gaps. Where necessary, install heat resistant non-rubber gaskets to prevent light leaks or moisture from entering between luminaires trim and the surface to which they are mounted.

I. Install fixtures with vent holes free of air blocking obstacles.

3.2 COORDINATION OF WORK

A. The Architectural Reflected Ceiling Plans shall take preference as to the exact placement of the luminaires in the ceiling.

B. Determine ceiling types in each area and provide suitable accessories and mounting frames where required for recessed luminaires. Luminaire catalog numbers do not necessarily denote specific mounting accessories for type of ceiling in which a luminaire may be installed.

3.3 CLEANING AND ADJUSTING

A. Remove protective plastic covers from light fixtures and fixture diffusers only after construction work, painting and clean-up are completed. Remove, clean, and reinstall all dirty lamps, reflectors and diffusers.

B. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer for cleaning Alzak reflectors, anti-microbial finishes, and other surfaces.

C. Make final adjustment of aimable light fixtures and adjustable light settings under the direction of the Lighting Designer during a scheduled period of time prior to the completion of the project, after normal business hours if required. Include all equipment and personnel expenses including overtime required for focusing.

D. Fixtures, reflectors, and accessories which are damaged, blemished, or impregnated with fingerprints shall be replaced at the contractor's expense. All finishes shall be unmarred upon project completion.

3.4 AIMING

A. Aim luminaires with proper lamps installed.

B. Aim all directional luminaires, including but not limited to luminaires described in the Contract Documents or by the luminaire manufacturer as "aimable," "adjustable," or "asymmetric" as follows:
   1. To provide the lighting pattern for which the luminaire is designed.
   2. To provide the lighting pattern as shown on the drawings.
   3. To predetermined aiming points as shown on the drawings.
   4. Where aiming cannot be determined, request, in writing, clarification from the Architect, indicating luminaires needing clarification.

C. Re-aim luminaires as determined by Architect during final project walkthrough.

D. Adjustable luminaires shall be installed with “dead” zone of rotation away from intended aiming point.

3.5 PROJECT CLOSEOUT

A. Leave luminaires clean at the time of acceptance of the work. If luminaires are deemed dirty by the Architect at completion of the work, the Contractor shall clean them at no additional cost. Protective plastic wrap is to be removed from parabolic luminaires just prior to owner acceptance.

B. Coordinate inspection and testing of Lighting Fixtures with specification section describing Lighting Control Equipment. Test as follows:
   1. Verify proper operation, switching and phasing of each fixture after installation.
   2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation. Verify normal transfer to generator and retransfer to normal.
   3. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to the lighting system, retest to demonstrate compliance with standards.

C. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

D. Provide fixtures with new lamps all operating at time of final acceptance. Exception: For fluorescent dimming fixtures, provide minimum 100 hour/maximum 200 hour, continuously lit lamps or per ballast manufacturer’s recommendations.

E. Where fixtures are used for construction lighting, the lamps shall be replaced with new lamps just prior to occupancy by the owner

END OF SECTION 265000

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Duet

Wall Sconce

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ WS-55206 6"	❍ 2700K ❍ 3000K ❍ 3500K	❍ BK Black ❍ WT White	9.6W 9.6W 9.6W	1000 1000 1000	354 380 377

Example: **WS-55206-35-WT**

For custom requests please contact customs@waclighting.com

FEATURES

- Up and downlight illumination
- Built in color temperature adjustability. Switch from 2700K/3000K/3500K
- Option to pre-select color temperature or adjust in the field
- Driver concealed within the canopy
- 5 Year warranty

SPECIFICATIONS

Color Temp:	2700K,3000K,3500K
Input:	120-277V,50/60Hz
CRI:	90
Dimming:	ELV: 100-10% ,TRIAC: 100-10%
Rated Life:	50000 Hours
Mounting:	Can be mounted on wall in all orientations
Standards:	ETL, cETL,Title 24 JA8 Compliant,ADA
	Damp Location Listed
Construction:	Aluminum body, frosted glass diffuser

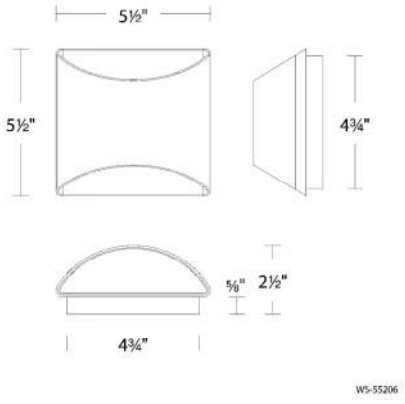
REPLACEMENT PARTS

HDW-LG22-WA - Hardware Pack

FINISHES:

White Black

LINE DRAWING:



ACCORD LIGHTING

Specifier: _____ Date: _____

Project name: _____

Project location: _____

5033LED (LED)

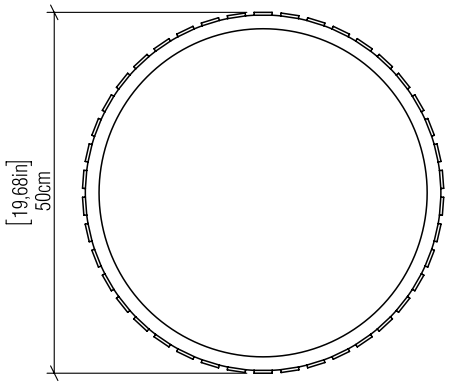
Name: Slatted Accord Ceiling Mounted 5033 LED
Collection: Slatted
Application: Ceiling
Construction: Natural Wood Venner, MDF and Acrylic

Specifications

Light Source:	Integrated LED Module
Driver Location	Inside the luminaire
Color Temperature:	3000K, 3500K and 4000K
Dimming Option:	0-10V, ELV/TRIAC
CRI:	90
Delivered Lumens:	2475lm
Total Power:	36W
Input Voltage:	120V - 277V
Input Frequency:	60 Hz
Canopy Dimension	N/A
Height Adjustment Limit:	N/A
Weight:	N/A

Fixture Image

Technical Drawing



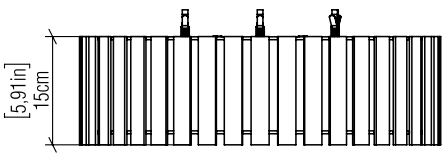
Photometric Graph

Coming Soon!

Standards

c UL us

DAMP LOCATION



ACCORD LIGHTING

Specifier: _____ Date: _____

Project name: _____

Project location: _____

5034LED (LED)

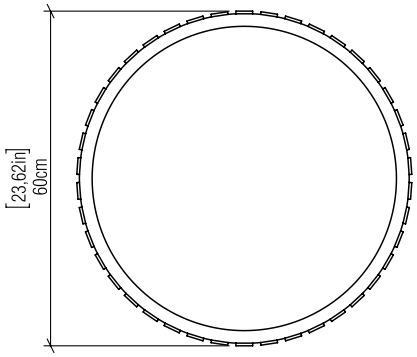
Name: Slatted Accord Ceiling Mounted 5033 LED
Collection: Slatted
Application: Ceiling
Construction: Natural Wood Venner, MDF and Acrylic

Specifications

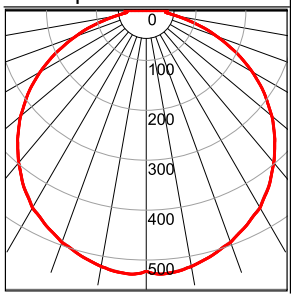
Light Source:	Integrated LED Module
Driver Location	Inside the luminaire
Color Temperature:	3000K, 3500K and 4000K
Dimming Option:	0-10V, ELV/TRIAC
CRI:	90
Delivered Lumens:	1584lm
Total Power:	32W
Input Voltage:	120V - 277V
Input Frequency:	60 Hz
Canopy Dimension	N/A
Height Adjustment Limit:	N/A
Weight:	N/A

Fixture Image

Technical Drawing



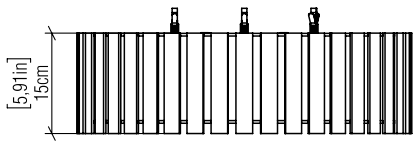
Photometric Graph



Standards

c UL us

DAMP LOCATION



accordlighting.com

M Series Cylinder

Project:	Type:
Product Code:	Date:

V102523

4" Surface Mount

- Integrated Drivers allow for down to 0.1% dimming options within the pendant and no need to locate anything above the canopy
- Customize your cylinder with over one million configurations, allowing for easy maintenance and on-site modifications
- Attaches directly to a surface or recessed mounted junction box, ideal for areas with limited ceiling height & plenum space restrictions
- Die-cast aluminum trims with no visible hardware for a sleek, symmetrical design

CYLINDER

Mount
Surface

Size
Diameter: 4"
Height: Small (4"), Medium (8"), Large (12")

Canopy
Standard

Trims & Shades
Standard, Snoot, Decorative, Hyperbolic, Flat Shade, Round Shade

Finish
White, Black, Brushed Aluminum, Bronze, Custom Color

EMERGENCY LIGHTING

Optional Remote Inverter or Emergency LED Driver for lighting up to 90 minutes in event of power failure

LIGHT OUTPUT & DISTRIBUTION

Lumens (Power)
750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (16.5W), 2000 lm (24.5W), 2500 lm (27.5W), 3000 lm (34W)

Color Quality
93 CRI, 2-step SDCM

Color Temperature
2700K 3000K 3500K
4000K Warm Dim (3000K–1800K)
Tunable White (4000K–1800K)
Tunable White (6500K–2700K)

Beam Spread
Narrow Spot (15°)
Spot (25°)
Flood (40°)
Wide Flood (60°)
General (90°)

Lighting Type
Downlight Adjustable

POWER & CONTROLS

Input Voltage
120/277V

Dimming
0-10V (120/277V): 1%
TRIAC/ELV (120V): 1%
DALI-2 (120/277V): 0.1%

SPECIALTY LENS

Hexcell Louver

RATINGS

Wet Location / IP65 Rated Configurations Available
NSF Listed (White and Black Finish Only)
DarkSky Approved (Downlight only, CCT less than or equal to 3000K)

WARRANTY

5 year limited warranty; 50,000 hours

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M Series Cylinder

4" Surface Mount

PRODUCT BUILDER

CYLINDER	DC4	**DC4** 4" Cylinder			
MOUNT	SM	**SM** Surface Mount			
MOISTURE RATING		**S** Standard (Damp Location)	**W** Wet Location ◈[1]		
LENGTH		**S** Small (4") *1500 lm Max*	**M** Medium (8") *2000 lm Max*	**L** Large (12") *3000 lm Max*	
LIGHT OPTIONS		**D** Fixed ◈	**A** Adjustable[2]		
LUMENS DOWN[3]		**07** 750 lm ◈	**10** 1000 lm ◈	**12** 1250 lm ◈[4]	**15** 1500 lm ◈[3,4]
		20 2000 lm ◈[4,5]	**25** 2500 lm[4,5]	**30** 3000 lm[4,5]	
BEAM SPREAD DOWN		**GA** General Ambient (90°+)[4,6]	**NS** Narrow Spot (15°)[7]	**SP** Spot (25°)	
		FL Flood (40°)	**WF** Wide Flood (60°)[4]		
SPECIALTY LENS DOWN		**0** None ◈	**H** Hexcell Louver[8]		
LUMENS UP	00	**00** None			
BEAM SPREAD UP	00	**00** None			
CCT		**27** 2700K	**30** 3000K	**35** 3500K	**40** 4000K
		3W Warm Dim (3000K-1800K)[9]	**T1** Tunable White (4000K–1800K)[10]	**T2** Tunable White (6500K–2700K)[10]	
FINISH		**WH** White	**BK** Black	**BA** Brushed Aluminum	
		BZ Bronze	**CC** Custom Color		
DIMMING		**T** TRIAC/ELV (1%)	**O** 0-10V (1%)	**D** DALI-2 (0.1%)[11]	
EMERGENCY		**00** None	**EM** EM, Remote Test Switch[12]		
TRIM / SHADE DOWN		**R** Round Standard Trim ◈	**H** Hyperbolic Trim	**S** Snoot *(black only)*	**D** Decorative Trim ◈[6,13]
		L Low Profile Decorative Trim ◈[6,13]	**RWC** Round Shade: White, Clear	**RWW** Round Shade: White, Warm	**RBC** Round Shade: Black, Clear
		RBW Round Shade: Black, Warm	**RAC** Round Shade: Aluminum, Clear	**FWC** Flat Shade: White, Clear	**FWW** Flat Shade: White, Warm
		FBC Flat Shade: Black, Clear	**FBW** Flat Shade: Black, Warm	**FAC** Flat Shade: Aluminum, Clear	

◈ *Required for Wet Location/IP65 rating*

[1] *Only available in 750, 1000, 1250, 1500 or 2000 lm; with Round Standard, Decorative, or Low Profile Trim*
[2] *Only available in 750 or 1000 lm; Damp Location moisture rating; Round Standard or Hyperbolic trim*
[3] *Sum of Lumens cannot be greater than 1500 lm for Small size, 2000 lm for Medium size, 3000 lm for Large size*
[4] *Not available in Adjustable*
[5] *Only available in 0-10V*
[6] *Only available in 750 lm, 1000 lm, 1250 lm, or 1500 lm*
[7] *Only available in 750-2000 lm; Not available in Warm Dim or Tunable White*
[8] *Only available for Adjustable; not available for DALI-2*
[9] *Only available in 1000 lm; not available in Narrow Spot*
[10] *Only available in 1000 lm Downlight, 750 lm Adjustable and DALI-2 dimming*
[11] *Only available in 1000 lm Warm Dim, Tunable White or 1250 lm Static CCT Downlight and 1000 lm Warm Dim or Static CCT and 750 lm Tunable White Adjustable*
[12] *Not available in Uplight; TRIAC/ELV driver utilizes micro inverter; 0-10V or EcoSystem drivers utilize EM Kit mounted above ceiling with emergency LED driver & remote test switch*
[13] *Only available in General Ambient beam spread*

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M Series Cylinder
4" Surface Mount

PRODUCT BUILDER

ACCESSORIES

DCCX-RW	Round Standard Trim, White
DCCX-RB	Round Standard Trim, Black
DCCX-RA	Round Standard Trim, Brushed Aluminum
DCCX-RZ	Round Standard Trim, Bronze
DCCX-RC	Round Standard Trim, Custom Color
DCCX-HW	Hyperbolic Trim, White
DCCX-HB	Hyperbolic Trim, Black
DCCX-HA	Hyperbolic Trim, Brushed Aluminum
DCCX-HZ	Hyperbolic Trim, Bronze
DCCX-HC	Hyperbolic Trim, Custom Color
DCCX-S	Snoot
DCCX-RWC	Round Shade: White Outside, Clear Diffused Inside
DCCX-RWW	Round Shade: White Outside, Warm Diffused Inside
DCCX-RBC	Round Shade: Black Outside, Clear Diffused Inside
DCCX-RBW	Round Shade: Black Outside, Warm Diffused Inside
DCCX-RAC	Round Shade: Brushed Aluminum Outside, Clear Diffused Inside
DCCX-FWC	Flat Shade: White Outside, Clear Diffused Inside
DCCX-FWW	Flat Shade: White Outside, Warm Diffused Inside
DCCX-FBC	Flat Shade: Black Outside, Clear Diffused Inside
DCCX-FBW	Flat Shade: Black Outside, Warm Diffused Inside
DCCX-FAC	Flat Shade: Brushed Aluminum Outside, Clear Diffused Inside
DCCX-JW	Junction Box Cover, White
DCCX-JB	Junction Box Cover, Black
DCCX-JA	Junction Box Cover, Brushed Aluminum
DCCX-JZ	Junction Box Cover, Bronze
DCCX-JC	Junction Box Cover, Custom Color

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M Series Cylinder

4" Surface Mount

PRODUCT SUMMARY

LED: Cree® LED, Bridgelux

DELIVERED LUMENS: 750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (16.5W), 2000 lm (24.5W), 2500 lm (27.5W), 3000 lm (34W)

EFFICACY: 79 lm/W, 80 lm/W, 87lm/W, 91 lm/W, 82 lm/W, 91 lm/W, 88 lm/W

COLOR QUALITY: 93+ CRI, 2-step SDCM

CCT: 2700K, 3000K, 3500K, 4000K, Warm Dim (3000K-1800K), Tunable White (4000K-1800K), Tunable White (6500K-2700K)

DIMMING: Down to 1% for TRIAC/ELV at 120V, 1% for 0-10V at 120/277V, 0.1% DALI-2

INPUT VOLTAGE: 120/277V, 50/60Hz

MAX INPUT CURRENT (120V): 0.085 amps (750 lm), 0.110 amps (1000 lm), 0.125 amps (1250 lm), 0.145 amps (1500 lm), 0.205 amps (2000 lm), 0.235 amps (2500 lm), 0.290 amps (3000 lm)

MAX INPUT CURRENT (277V): 0.045 amps (750 lm), 0.055 amps (1000 lm), 0.060 amps (1250 lm), 0.070 amps (1500 lm), 0.100 amps (2000 lm), 0.110 amps (2500 lm), 0.135 amps (3000 lm)

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

EMERGENCY LIGHTING: Optional installer mounted Remote Inverter or Emergency LED Driver for lighting up to 90 minutes in event of power failure

PHOTOMETRIC TESTING: Tested in accordance to IESNA LM-79-2008

LISTINGS: ENERGY STAR® qualified*, California Title 24 2019 - 2022 JA8-E Compliant, UL Listed for Wet Location (option), IP65 rated (option), UL Certified US·CA, Declare, NSF/ANSI-2 Splash Zone Safe**, Dark Sky Compliant (option), DALI-2 Compliant

LIFETIME: 50,000 hours at 70% lumen maintenance

CYLINDER: Extruded aluminum; 4" (small), 8" (medium), 12" (large)

FINISH: White, Black, Bronze, Brushed Aluminum, Custom Color

MOUNT: Installs in most 3" octagonal, 4" octagonal, 3" round, 4" round and 4" square boxes.

JUNCTION BOX COVERS: Allows up to 4 solid metal conduit branches. Compatible with 4" octagonal and 4" square boxes.

WARRANTY: 5 year limited warranty

** Refer to ENERGY STAR Certified light fixtures database*
*** This product is evaluated in accordance to NSF/ANSI 2 for Splash Zones having designated trim finishes*

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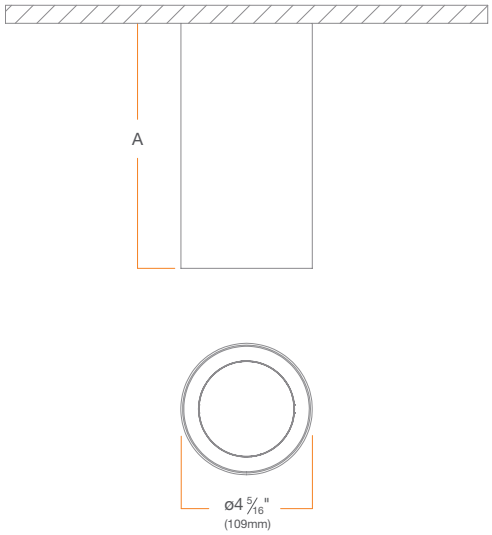
M Series Cylinder
4" Surface Mount

Surface Mount

DC4SM



CYLINDER SIZE	A
Small	4" [102 mm]
Medium	8" [203 mm]
Large	12" [305 mm]

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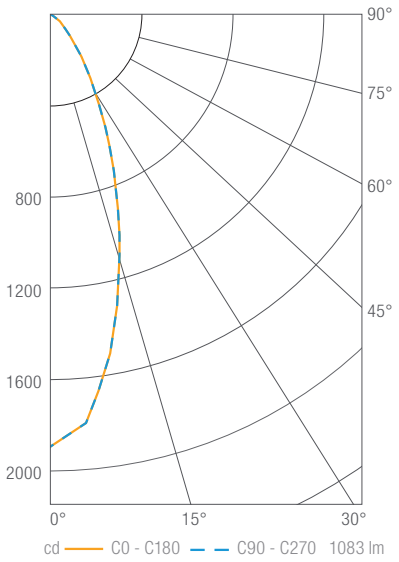
M Series Cylinder

4" Surface Mount

PRODUCT SUMMARY

M Series Cylinder Fixed, 1000 lm, 3000K, Flood

DC4xxxxD10FLxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	1890
5°	1792
10°	1503
15°	1161
20°	849
25°	589
30°	391
35°	256
40°	162
45°	107
50°	74
55°	51
60°	30
65°	18
70°	8
75°	5
80°	3
85°	1
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	760	70
0-40	925	85
0-60	1058	98
0-90	1081	100
0-180	1083	100

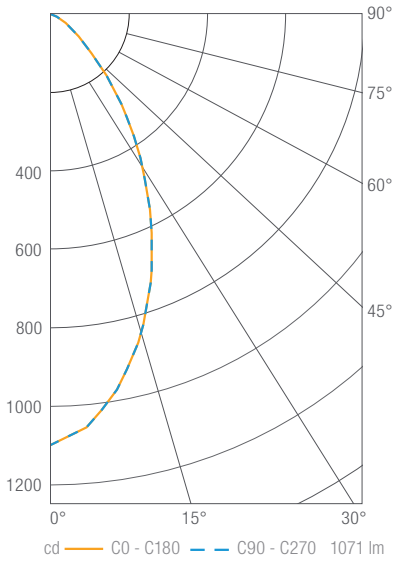
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	210	2.0'
6'	52	4.0'
9'	23	6.0'
12'	13	8.0'

Beam Angle: 37°

M Series Cylinder Fixed, 1000 lm, 3000K, Wide Flood

DC4xxxxD10WFxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	1100
5°	1058
10°	973
15°	866
20°	743
25°	609
30°	478
35°	361
40°	252
45°	161
50°	102
55°	68
60°	41
65°	24
70°	11
75°	6
80°	4
85°	2
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	620	58
0-40	845	79
0-60	1037	97
0-90	1069	100
0-180	1071	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	122	3.1'
6'	31	6.2'
9'	14	9.3'
12'	8	12.3'

Beam Angle: 55°

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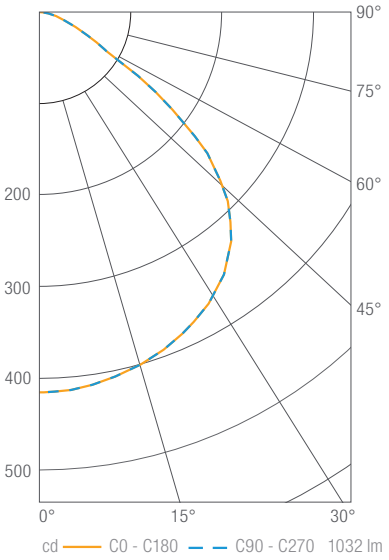
M Series Cylinder

4" Surface Mount

PHOTOMETRY

M Series Cylinder Fixed, 1000 lm, 3000K, General Ambient

DC4xxxxD10GAxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	416
5°	415
10°	410
15°	403
20°	394
25°	382
30°	369
35°	351
40°	327
45°	291
50°	240
55°	162
60°	84
65°	54
70°	33
75°	21
80°	12
85°	6
90°	1

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	333	32
0-40	557	54
0-60	942	91
0-90	1024	99
0-180	1032	100

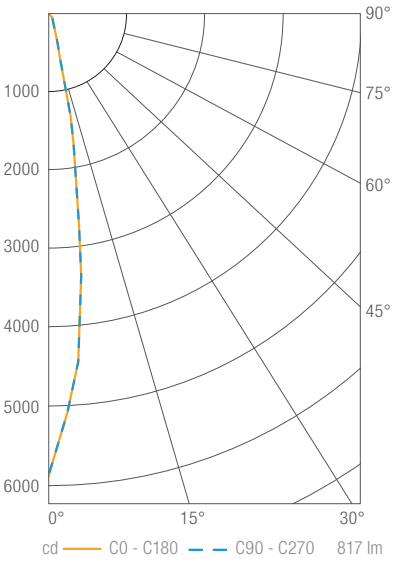
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	46	7.8'
6'	12	15.5'
9'	5	23.3'
12'	3	31.1'

Beam Angle: 100°

M Series Cylinder Adjustable, 750 lm, 3000K, Narrow Spot

DC4xxxxA07NSxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	5897
5°	4418
10°	1911
15°	561
20°	280
25°	165
30°	117
35°	87
40°	69
45°	57
50°	47
55°	38
60°	31
65°	23
70°	16
75°	10
80°	4
85°	1
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	645	79
0-40	701	86
0-60	781	96
0-90	817	100
0-180	817	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	655	0.8'
6'	164	1.7'
9'	73	2.5'
12'	41	3.3'

Beam Angle: 16°

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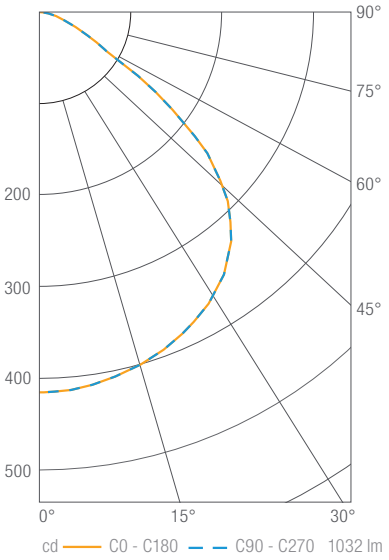
M Series Cylinder

4" Surface Mount

PHOTOMETRY

M Series Cylinder Fixed, 1000 lm, 3000K, General Ambient

DC4xxxxD10GAxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	416
5°	415
10°	410
15°	403
20°	394
25°	382
30°	369
35°	351
40°	327
45°	291
50°	240
55°	162
60°	84
65°	54
70°	33
75°	21
80°	12
85°	6
90°	1

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	333	32
0-40	557	54
0-60	942	91
0-90	1024	99
0-180	1032	100

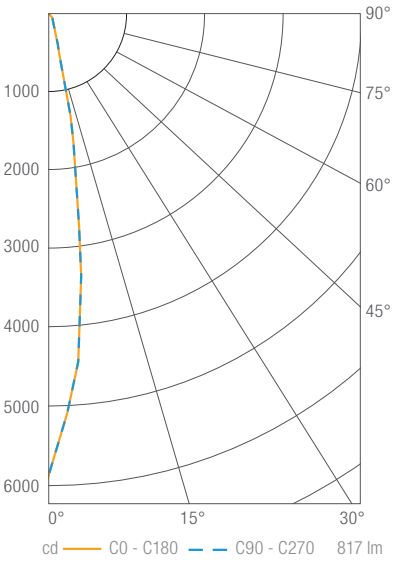
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	46	7.8'
6'	12	15.5'
9'	5	23.3'
12'	3	31.1'

Beam Angle: 100°

M Series Cylinder Adjustable, 750 lm, 3000K, Narrow Spot

DC4xxxxA07NSxxxxx30



Luminous Intensity

Gamma	C 0˚
0°	5897
5°	4418
10°	1911
15°	561
20°	280
25°	165
30°	117
35°	87
40°	69
45°	57
50°	47
55°	38
60°	31
65°	23
70°	16
75°	10
80°	4
85°	1
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	645	79
0-40	701	86
0-60	781	96
0-90	817	100
0-180	817	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	655	0.8'
6'	164	1.7'
9'	73	2.5'
12'	41	3.3'

Beam Angle: 16°

DMF LIGHTING 1118 E 223rd Street, Carson, CA 90745 323.934.7779 info@dmflighting.com dmflighting.com

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SPECIFICATION SHEET

DOT 2

AESTHETIC MICROCYLINDER
SMALL BEYOND COMPARE

Housing
Diameter : Ø2.5" | Height : 8.5" | Weight : 1.9 lbs

Material
Housing: Extruded Aluminum
Lens: TIR Polycarbonate Lens

Power Input
10W, 15W, 20W | 120-277V

Lumen Output
1,070 lm (10W)
1,600 lm (15W)
2,150 lm (20W)

Dimming
Superior 0-10V: dims to 1%, dims to dark
Linear line-voltage phase control, dims to 1%
TRC: Linear line-voltage phase control, dims to 1%

Color Quality
CRI 85, CRI 93 | UGR ≤ 19

Rated Life
> 100,000 Hours (L70)

Finish

Black White

Color Temperature

2700K 3000K 3500K 4000K

Optics

20° 30° 45° 60°

Mounting

Stem Mount | Cord Mount | Surface Mount | Stem Adjustable | Surface Adjustable

Warranty
5 Year limited warranty

Listing

Intertek

One Microcylinder Family To Rule Them All

The Dot 2.5 micro cylinders come with a delivered lumen package of up to 2,150 lm. Available in black and white finishes, a variety of mounting options, and accessories.

Two years on from the introduction of the Dot series, we have now expanded the line to include even smaller apertures and greater optical, and design accessories. Offering optimal balance between diminutive design and high performance.

METEOR

meteor-lighting.com

SPECIFICATION SHEET

DOT 2

AESTHETIC MICROCYLINDER
SMALL BEYOND COMPARE

METEOR

SPECIFICATION

PROJECT NAME

DATE

CATALOG #

QUANTITY

The product configurator function on this page works only with the latest version of Chrome or Adobe Acrobat Reader.

DT2	MODEL	DOT 2
	WATTAGE	○ 10 10W ○ 15 15W ○ 20 20W
	CCT / CRI	○ 278 2700K / CRI 85 ○ 279 2700K / CRI 93 ○ 408 4000K / CRI 85 ○ 308 3000K / CRI 85 ○ 309 3000K / CRI 93 ○ 358 3500K / CRI 85 ○ 359 3500K / CRI 93
UNV	VOLTAGE	UNV 120 – 277V
	DIMMING	○ SPV Superior 0-10V dims to 1%, dims to dark ○ TRC[1] Linear line-voltage phase control, dims to 1%
	BEAM ANGLE	○ 20 20° ○ 60 60° ○ 30 30° ○ 45 45°
	FINISH	○ BLK Black ○ WHT White
	MOUNTING	○ SUM Surface Mount ○ ST2 Stem Mount 2ft ○ ST4A Stem 4ft Adjustable ○ SA Surface Adjustable ○ ST4 Stem Mount 4ft ○ CM10 Cord Mount 10ft ○ ST2A Stem 2ft Adjustable
	ACCESSORIES	☐ HC[2,5] Hex Cell Louver ☐ FCS[6] Field Cut Stem Adapter Kit ☐ SL[3,5] Solite Lens ☐ SSB[4,5] Spot Shield Bezel

CLEAR FORM

[1] *Option is only compatible with 120V*
[2] *Please factor in change in lumen output of -30%*
[3] *Please factor in change in lumen output of -15%*
[4] *Please factor in change in lumen output of -20%, Option is not compatible with SA, ST2A, ST4A*
[5] *Only one accessory can be chosen*
[6] *Option is not compatible with ST2A, ST4A*

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SPECIFICATION SHEET

DOT 2

AESTHETIC MICROCYLINDER
SMALL BEYOND COMPARE

METEOR

TECHNICAL DETAILS

Electrical

- 1,070 lm (10W)
- 1,600 lm (15W)
- 2,150 lm(20W)
- Power Input: Universal (120-277V)
- Operating Temperature: 14°F~95°F
- Surge Protection: Built-in is 2.5KV
- Integral Driver on all product configurations

LED Features

- Color Temperature: 2700K, 3000K, 3500K, 4000K
- CRI 85, CRI 95
- UGR ≤ 19
- Long life LED system designed for typical TM21 lumen maintenance ≥ L70 @ 100,000Hours

Optics

- TIR Polycarbonate Lens
- Beam Angle: 20°, 30°, 45°, 60°

Advanced Dimming

- Proprietary VX Driver™ is incorporated to all dimming options for video flicker-free lighting
- Superior 0-10V: dims to 1%, dims to dark
- Linear line-voltage phase control, dims to 1%
- TRC: Linear line-voltage phase control, dims to 1%

Housing

- Diameter: Ø2.5"
- Height: 8.5"
- Material: Extruded Aluminum
- Weight: 1.9 lbs

Mounting

- Surface Mount
- Surface Adjustable Mount (355° Rotation / 90° Tilt)
- Stem Mount 2ft or 4ft
- Stem Adjustable Mount 2ft or 4ft (355° Rotation / 90° Tilt)
- Cord Mount 10ft

Warranty

- 5-year limited warranty

Listing

- ETL Damp Location Listed
- CE
- FCC
- JA8 Title 24 Compliant

PERFORMANCE SUMMARY*

STD (Standard)				
CCT/WATTAGE	2700K	3000K	3500K	4000K
10W	1,000lm	1,040lm	1,060lm	1,070lm
15W	1,450lm	1,550lm	1,580lm	1,600lm
20W	1,950lm	2,050lm	2,100lm	2,150lm

Current Consumption		
WATTAGE / VOLT	120V	277V
10W	0.09A	0.04A
15W	0.14A	0.06A
20W	0.18A	0.09A

**Beam Angle: 60° * Tolerance ±8%*

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SPECIFICATION SHEET

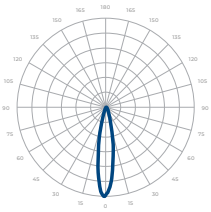
DOT 2

AESTHETIC MICROCYLINDER
SMALL BEYOND COMPARE

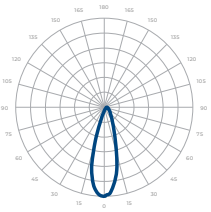
METEOR

PHOTOMETRICS

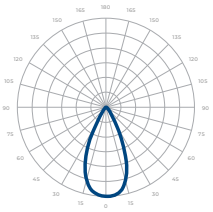
Below is a typical photometric representation of the Dot 2 fixture. Please download IES files to ensure exact photometric value.



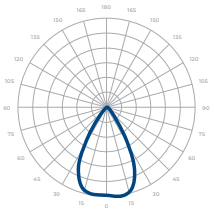
20°



30°



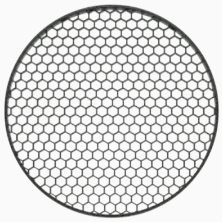
45°



60°

ACCESSORIES

Hex Cell Louver



Solite Lens

Spot Shield Bezel

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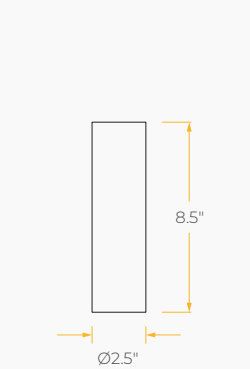
SPECIFICATION SHEET

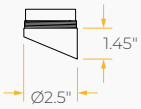
DOT 2 AESTHETIC MICROCYLINDER
SMALL BEYOND COMPARE

METEOR

DIMENSIONS



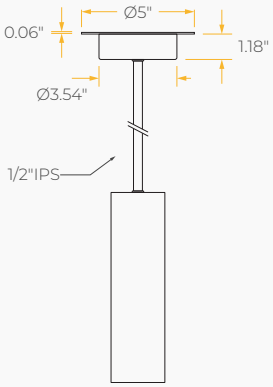
Spot Shield Bezel



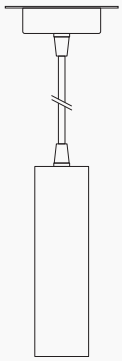
MOUNTING OPTIONS*

**Juntion Box not included*

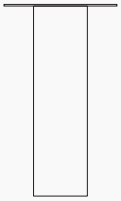
Stem Mount



Cord Mount



Surface Mount



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VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

- 80 Suspension Kit configurations allow fixture to be seamlessly incorporated into any interior
- Create long, continuous lines of light with easy-to-use inline bracket and double feed joiner connectors
- A VERSatile fixture with a black louver that is designed to eliminate glare
- A custom-sized black louver fits snugly above a low-profile clear or diffused lens in the interior of the housing
- Features integrated metal endcaps and durable anodized aluminum housings
- With standard internal White Optics coating, fixtures achieve greater lumen efficacies
- Suitable for installation in the storage area of a clothes closet when specified with LEDs at 4.0 watts or less per foot per NEC regulations
- Consult factory for field assembly options

1 PRODUCT	2 WATTS/ FT	3 CCT	4 RATED	5 LENS	6 EXTERNAL LOUVER	7 WIRE INPUT/ OUTPUT	8 CONNECTOR/ WIRE IN	9 CONNECTOR/ WIRE OUT	10 WIRE COLOR	11 WIRE TYPE	12 MOUNTING	13 FINISH	14 LENGTH (IN)	15 EXACT/ OPTIMAL
VERS-07-SK-SW					N/A	S2	BW	CLS	SV	AWM	SK			

Sample Part Number: **VERS-07-SW-5.0-30-DRY-DF-P1-CON6-CON6-BK-CL2-MG-BK-48"-E**

1 PRODUCT

VERS-07-SK-SW

See following pages for compatible power supplies.

2 WATTS/FT

1.5	1.5W/ft
3.0	3.0W/ft
4.0	4.0W/ft
5.0	5.0W/ft
1.5HE	1.5W/ft HE
3.0HE	3.0W/ft HE
6.0HE	6.0W/ft HE

1.5	1.5W/ft
3.0	3.0W/ft
4.0	4.0W/ft
5.0	5.0W/ft

3 CCT

20	2000K
22	2200K
24	2400K
27	2700K
30	3000K
35	3500K
40	4000K

24	2400K
27	2700K
30	3000K
35	3500K
40	4000K

4 RATED

DRY	IP20
DMP	IP54

5 LENS

DF	Diffused
CL	Clear

For representation of LED visibility, see Diode Visibility section on following pages.
For beam angles, see Photometric Performance section on following pages.

6 EXTERNAL LOUVER

N/A	No Louver

7 WIRE INPUT/OUTPUT

S2	Single 2 (Input only) - Bottom Feed

8 CONNECTOR/WIRE IN

BW	Bare Wire (Standard 36")

Connector/Wire In not needed to specify product.
BW: Standard length is 36", max length is 120".
Request custom length by writing in part number next to BW (example: BW48)

9 CONNECTOR/WIRE OUT

CLS	Closed End (No feed)

10 WIRE COLOR

SV	Silver

11 WIRE TYPE

AWM	Appliance Wiring Material

12 MOUNTING

SK	Suspension Bracket

13 FINISH

ST	Satin
BK	Black
BZ	Bronze
WH	White
CU	Custom

14 LENGTH (IN)

Fixture length min 24", max 98" not including end caps.
Tolerance +0 – 1/8". Consult factory for lengths under 24".
Shop drawings required for run lengths over 8ft.

15 EXACT/OPTIMAL

O	Optimal Illumination
E	Exact Specified Length

Exact fixtures are the exact length specified +0 – 1/8".
Optimal fixtures' length is rounded down with illumination end to end.
See Exact/Optimal Fixture Length charts.

5 year warranty | Warranty only valid with QTL power supplies | Field modifications void warranty | Data subject to change, all data has +/- 5% tolerance | Suitable for installation in the storage area of a clothes closet when using wattage of 4.0W/ft or less

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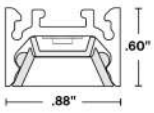
Specification subject to change. Rev-12-30-24

VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

1 PRODUCT - DIMENSIONS



Profile with lens

2 DELIVERED LUMENS

[Calculated L70 = 70000 hrs, L70 = 66000 hrs for HE]
Tested with VERS-07-SK-SW-**-30-DRY

	1.5 W/FT			1.5HE W/FT			3.0 W/FT			3.0HE W/FT			4.0 W/FT			5.0 W/FT			6.0HE W/FT		
	LM/FT	CRI	UGR	LM/FT	CRI	UGR	LM/FT	CRI	UGR	LM/FT	CRI	UGR	LM/FT	CRI	UGR	LM/FT	CRI	UGR	LM/FT	CRI	UGR
CL	79	97	≤ 13.3	109	98	≤ 14.7	136	98	≤ 15.5	198	97	≤ 16.9	169	98	≤ 16.1	205	98	≤ 16.7	382	98	≤ 19.3
DF	69	97	≤ 13.8	86	98	≤ 14.8	118	98	≤ 15.7	164	98	≤ 17.2	145	98	≤ 16.6	175	98	≤ 17.3	300	98	≤ 19.3

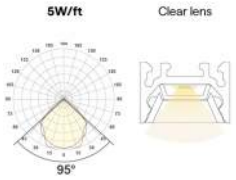
5 DIODE VISIBILITY

DF - Diffused lens

CL - Clear lens

PHOTOMETRIC PERFORMANCE

Nominal beam spread shown, beam spread varies based on light engine. For more detailed information, see photometric data.



TEMPERATURE RATINGS

		1.5 W/FT		1.5 HE W/FT		3.0 W/FT		3.0 HE W/FT		4.0 W/FT		5.0 W/FT		6.0 HE W/FT		9.0 HE W/FT	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
DRY	Ambient Operating Temp - Surface	-4°F	140°F	-4°F	145°F	-4°F	130°F	-4°F	135°F	-4°F	125°F	-4°F	120°F	-4°F	120°F	-4°F	100°F
DMP	Ambient Operating Temp - Surface	-4°F	135°F	-4°F	140°F	-4°F	125°F	-4°F	130°F	-4°F	120°F	-4°F	115°F	-4°F	115°F	-13°F	95°F
WET	Ambient Operating Temp - Surface	-4°F	135°F	—	—	-4°F	125°F	—	—	-4°F	120°F	-4°F	115°F	—	—	—	—

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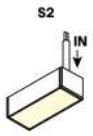
VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

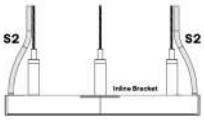
7 WIRE INPUT/ OUTPUT

SINGLE (Input only)

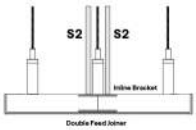


CONFIGURATION OPTIONS

Single Feed



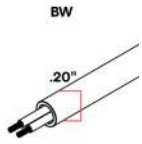
Continuous Row End Feeds



Continuous Row Center Feeds

8/9 CONNECTOR/WIRE – IN/OUT

Connector/Wire In or Out not needed to specify product.



Bare Wire 36" | 22 AWG
Clear outer jacket, metal shield

10 WIRE COLOR

Silver

12 MOUNTING

Suspension Bracket

2 required up to 6' lengths; additional support required between 6' to 8'

13 FINISH

Satin
Black
Bronze
White

Custom color available

RAL color matching and anodization color available, call factory

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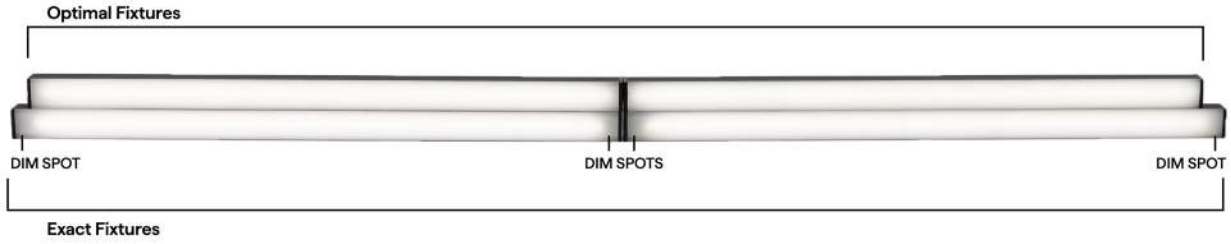
Specification subject to change. Rev-12-30-24

VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

15 EXACT/OPTIMAL FIXTURE LENGTH

Exact fixtures are the exact length specified. Optimal fixtures' length is rounded down based on LED cut points to allow the fixture to be illuminated end to end. For runs with multiple fixtures that need to fill a specific length, it's recommended to order all optimal fixtures with an exact fixture at the end of the run.



SW DRY, DMP LENGTHS BY INCH

Available in any length in between 24" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 24".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	.5"
13"	.5"
14"	.5"
15"	.5"
16"	.5"
17"	.5"
18"	.5"
19"	.5"
20"	.5"
21"	.5"
22"	.5"
23"	.5"
24"	.5"
36"	.5"
48"	.5"
60"	.5"
72"	.5"
84"	.5"
96"	.5"

OPTIMAL LENGTH

Requested Nominal Length	S2 S2
12"	11.5"
13"	12.5"
14"	13.5"
15"	14.5"
16"	15.5"
17"	16.5"
18"	17.5"
19"	18.5"
20"	19.5"
21"	20.5"
22"	21.5"
23"	22.5"
24"	23.5"
36"	35.5"
48"	47.5"
60"	59.5"
72"	71.5"
84"	83.5"
96"	95.5"

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VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

SW-HE DRY LENGTHS BY INCH

Available in any length in between 24" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 24".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	1"
13"	0.5"
14"	1"
15"	0.5"
16"	1"
17"	0.5"
18"	1"
19"	0.5"
20"	1"
21"	0.5"
22"	1"
23"	0.5"
24"	1"
36"	1"
48"	1"
60"	1"
72"	1"
84"	1"
96"	1"

OPTIMAL LENGTH: highlighted rows are closest to requested nominal length

Requested Nominal Length	S2 S2
12"	10.5"
13"	12.5"
14"	12.5"
15"	14.5"
16"	14.5"
17"	16.5"
18"	16.5"
19"	18.5"
20"	18.5"
21"	20.5"
22"	20.5"
23"	22.5"
24"	22.5"
36"	34.5"
48"	46.5"
60"	58.5"
72"	70.5"
84"	82.5"
96"	94.5"

COMPATIBLE POWER SUPPLIES

See power supplies cut sheets for more information. Data subject to change, all data has +/- 5% tolerance.

DIM TO LEVEL	INDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Dim to Black	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1
0.1%	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QTM-eLED+0-10V QTM-eLED+0-10V-AWN QZ-BOWTIE+DIMMER QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QTM-eLED+0-10V QTM-eLED+0-10V-AWN QZ-BOWTIE+DIMMER QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP
1%	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6
10%	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle

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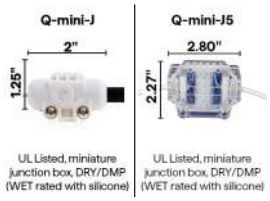
Specification subject to change. Rev-12-30-24

VERS-LOUVER-SK (07) STATIC WHITE

24VDC Linear Fixtures - Suspended

DIMMING PROTOCOL	INDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Non-Dim	QT-CAB-eLED-ND QTM-eLED-ND QZ-ND	QT-CAB-eLED-ND QTM-eLED-ND QZ-ND
Phase	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-BOWTIE+DIMMER QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-BOWTIE+DIMMER QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1
0-10V	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QTM-eLED+0-10V QTM-eLED+0-10V-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QTM-eLED+0-10V QTM-eLED+0-10V-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP
Lutron Athena	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+0-10V-AWN QTM-eLED+DALI-DT6-AWN	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+0-10V-AWN QTM-eLED+DALI-DT6-AWN
ECO System	QTM-eLED(E)	QTM-eLED(E)
DMX	QZ-DMX	QZ-DMX
DALI-2: DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6
SCENE App Dimmed	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle

COMPATIBLE WIRING ACCESSORIES



UL Listed, miniature junction box, DRY/DMP (WET rated with silicone)

UL Listed, miniature junction box, DRY/DMP (WET rated with silicone)

COMPATIBLE APPS

NFC APP

Q-NFC

Read and write DMX addresses and adjust voltage

VERS-SK

Linear Fixtures - Suspended

- Shop drawings required for run lengths over 8ft
- If no suspension length provided, 36" is standard
- Suspension cable maximum length: 120"
- Suspension cable is field cuttable
- Suspended fixtures over 6ft require additional suspension points. 8ft lengths will bow 0.25" in middle without additional support.
- Any run length over 8' requires inline brackets
- Consult factory for power over aircraft
- Consult factory for custom color of canopy
- Lag Screw is for mounting into drywall, wood, or other types of finished ceilings for non-feed mounting only

POWER FEED SUSPENSION KIT

1 PRODUCT	2 FEED	3 CANOPY SHAPE	4 CANOPY SIZE	5 CANOPY FINISH	6 APPLICATION	7 SUSPENSION CABLE LENGTH (IN)
SK			5"			

Sample Part Number: **SK-SF-RD-5"-WH-JB-36"**

1 PRODUCT
- **SK**

2 FEED
- **SF** Single
- **DF** Double

3 CANOPY SHAPE
- **RD** Round
- **SQ** Square

4 CANOPY SIZE
- **5"**

5 CANOPY FINISH
- **WH** White
- **BK** Black

6 APPLICATION
- **JB** Junction Box
- **TB** T-Bar Mount

JB - mounting bracket only, junction box not included
TB - mounting bracket and junction box

7 SUSPENSION CABLE LENGTH (IN)
- **36"**
- **120"**

NON-FEED SUSPENSION KIT

1 PRODUCT	2 FEED	3 CANOPY SHAPE	4 CANOPY SIZE	5 CANOPY FINISH	6 APPLICATION	7 SUSPENSION CABLE LENGTH (IN)
SK	NF					

Sample Part Number: **SK-SF-RD-5"-WH-JB-36"**

1 PRODUCT
- **SK**

2 FEED
- **NF** No Feed

3 CANOPY SHAPE
- **RD** Round
- **SQ** Square

4 CANOPY SIZE
- **2"**
- **5"**
- **5"**

5 CANOPY FINISH
- **WH** White
- **BK** Black
- **WH** White
- **BK** Black

6 APPLICATION
- **TB** T-Bar Mount
- **LS** Lag Screw

TB - T-Bar clip only, junction box not included

- **JB** Junction Box

Mounting bracket only, junction box not included

7 SUSPENSION CABLE LENGTH (IN)
- **36"**
- **120"**

KIT CONTENTS

- 1/16" Steel suspension cable – 36" standard
- Selected canopy
- Cable Gripper
- Cable Coupler

JBOX
- Bracket to mount to junction box (junction box not included)
- Wire strain relief
- Ties for securing electrical cable to suspension cable

T-BAR – feed
- Includes junction box specifically designed for T-BAR applications
- Bracket to mount to junction box
- Wire strain relief
- Ties for securing electrical wire to suspension cable

T-BAR – non-feed
- Bracket to mount to T-BAR (no junction box)

LAG SCREW – non-feed only
- Double ended screw, with a wood thread side and machine thread side
- One piece cable coupler

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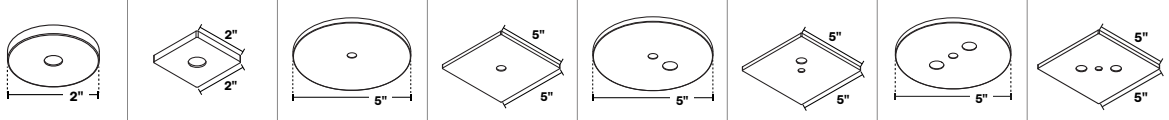
Specification subject to change. Rev-09-12-24

VERS-SK

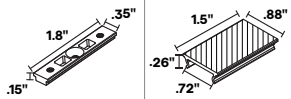
Linear Fixtures - Suspended

3 CANOPY OPTIONS

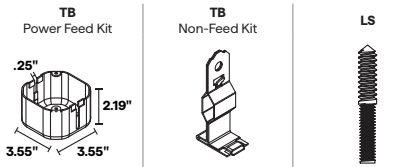


5 CANOPY FINISH

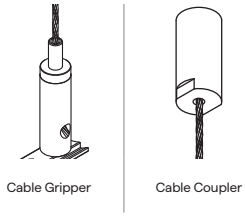
JOINTS/CONNECTORS



6 APPLICATION



KIT HARDWARE



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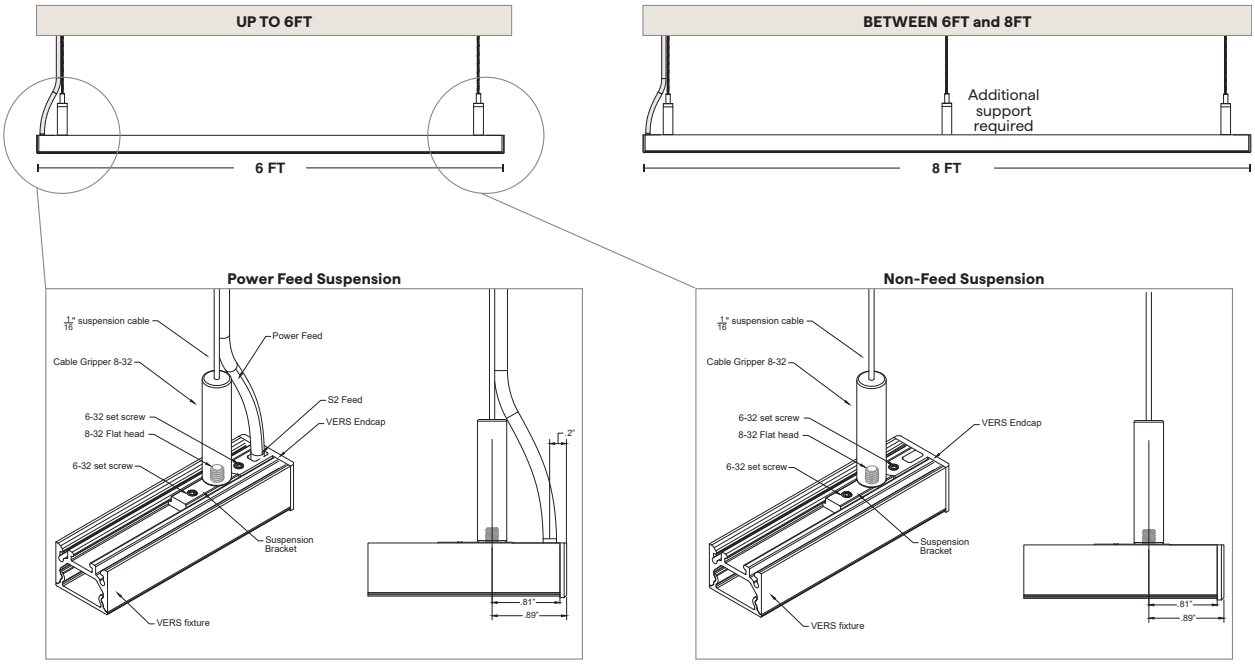
Specification subject to change. Rev-09-12-24

VERS-SK

Linear Fixtures - Suspended

MOUNTING

- Maximum single fixture length: 98"
- Suspended fixtures over 6ft require additional suspension points. 8ft lengths will bow 0.25" in middle without additional support.
- Shop drawings required for run lengths over 8ft
- Any double fed fixture will come with double feed joiner and inline bracket



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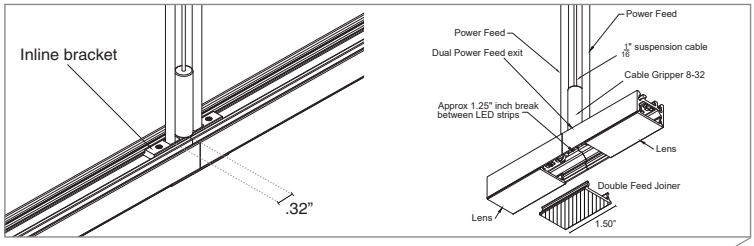
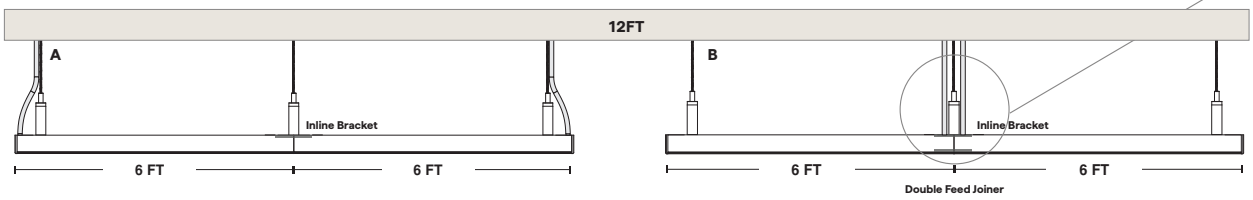
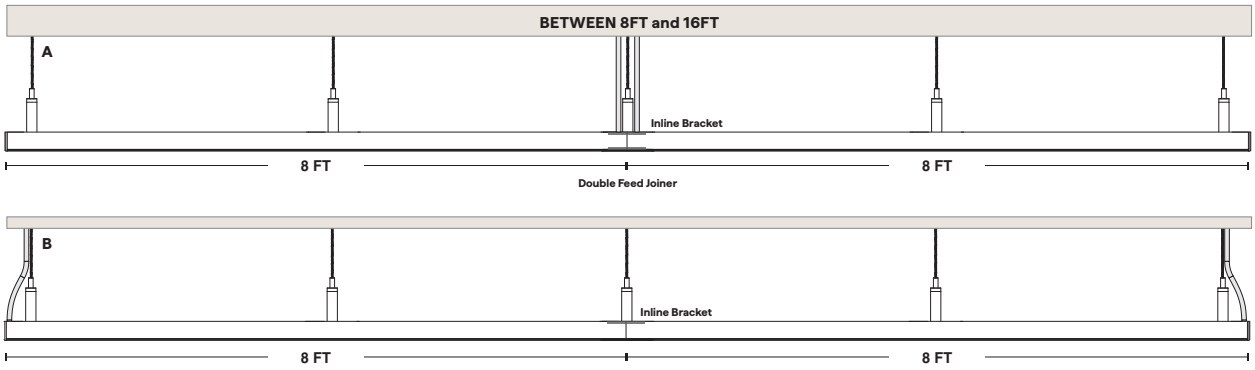


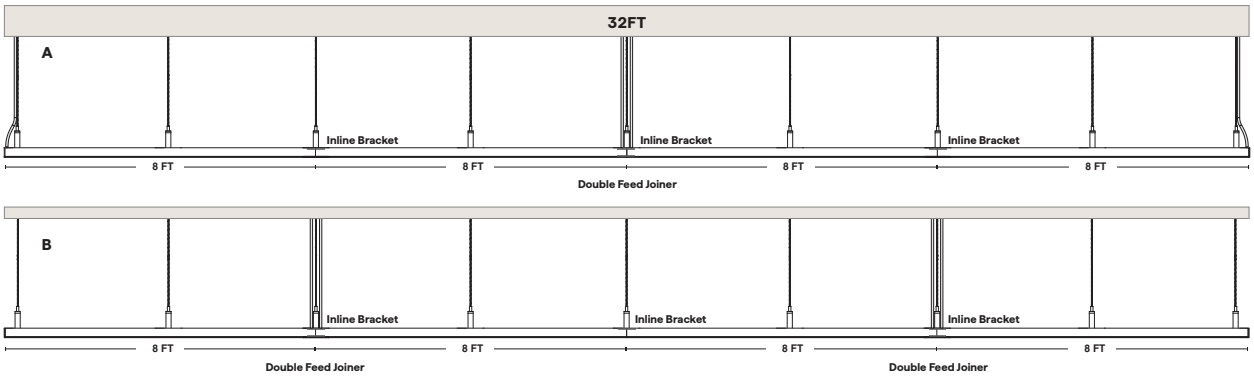


Part number example for a suspended VERS-01 dry rated static white fixture with a diffused lens in 1.5W/ft, 3000K, in a satin finish:

A VERS-01-SK-SW-1.5-30-DRY-DF-N/A-S2-BW-CLS-SV-AWM-SK-ST-144" (1X)
SK-SF-RD-5"-WH-JB-36" (2X)
SK-NF-RD-5"-WH-JB-36" (1X)

B VERS-01-SK-SW-1.5-30-DRY-DF-N/A-S2-BW-CLS-SV-AWM-SK-ST-144" (1X)
SK-DF-RD-5"-WH-JB-36" (1X)
SK-NF-RD-5"-WH-JB-36" (2X)





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Specification subject to change. Rev-09-12-24

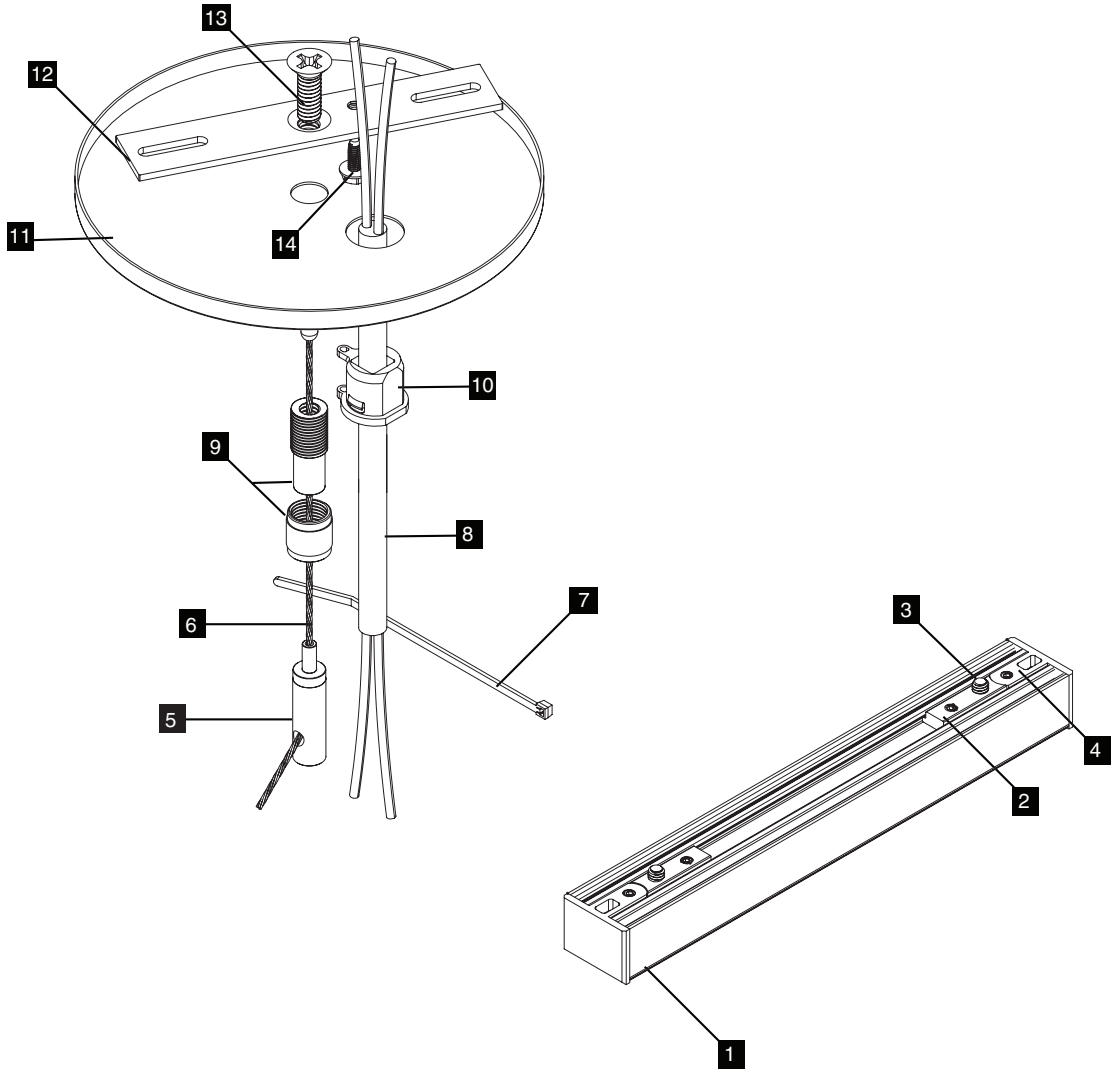
VERS-SK

Linear Fixtures - Suspended

SUSPENSION POWER FEED ASSEMBLY - TO MOUNT TO JUNCTION BOX*

*JUNCTION BOX NOT INCLUDED

SK-SF-RD-5-**-JB-36



VERS SUSPENSION COMPONENTS

1	VERS	2	Suspension Bracket	3	8-32 Screw	4	Endcap	5	Cable Gripper	6	1/16” Cable	7	Tie
8	Lead Wire	9	Cable Coupler	10	Strain Relief	11	Canopy	12	Crossbar	13	1/4”-20	14	Ground Screw

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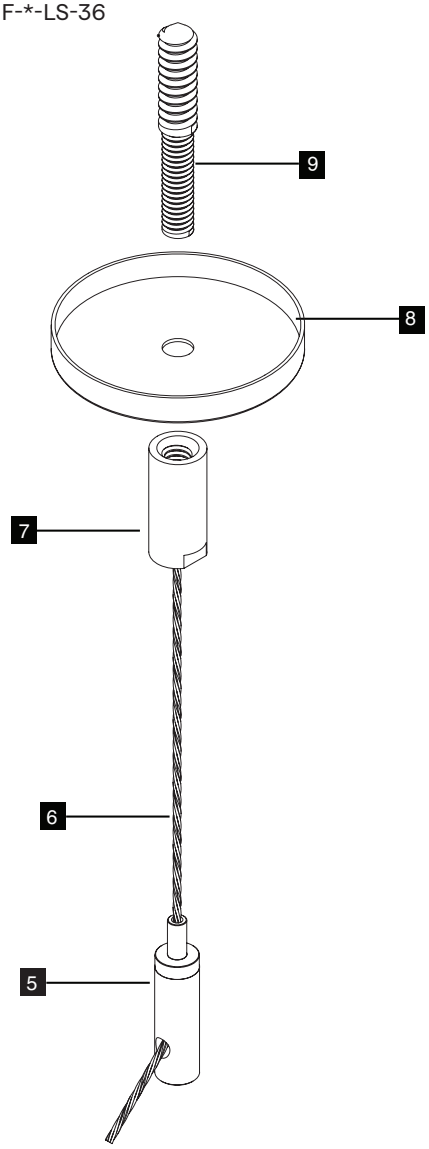
Specification subject to change. Rev-09-12-24

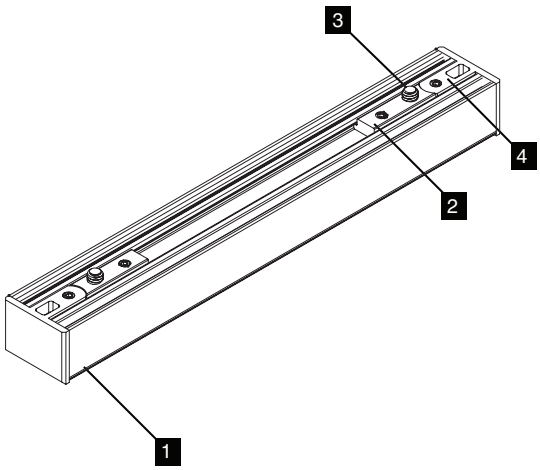
VERS-SK

Linear Fixtures - Suspended

LAG SCREW NON-FEED ASSEMBLY

SK-NF-RD-2-NF-*-LS-36





NON-POWERED FEED KIT

1 VERS	2 Suspension Bracket	3 8-32 Screw	4 Endcap	5 Cable Gripper
6 1/16” Cable	7 Cable Coupler	8 Canopy	9 Lag Screw	

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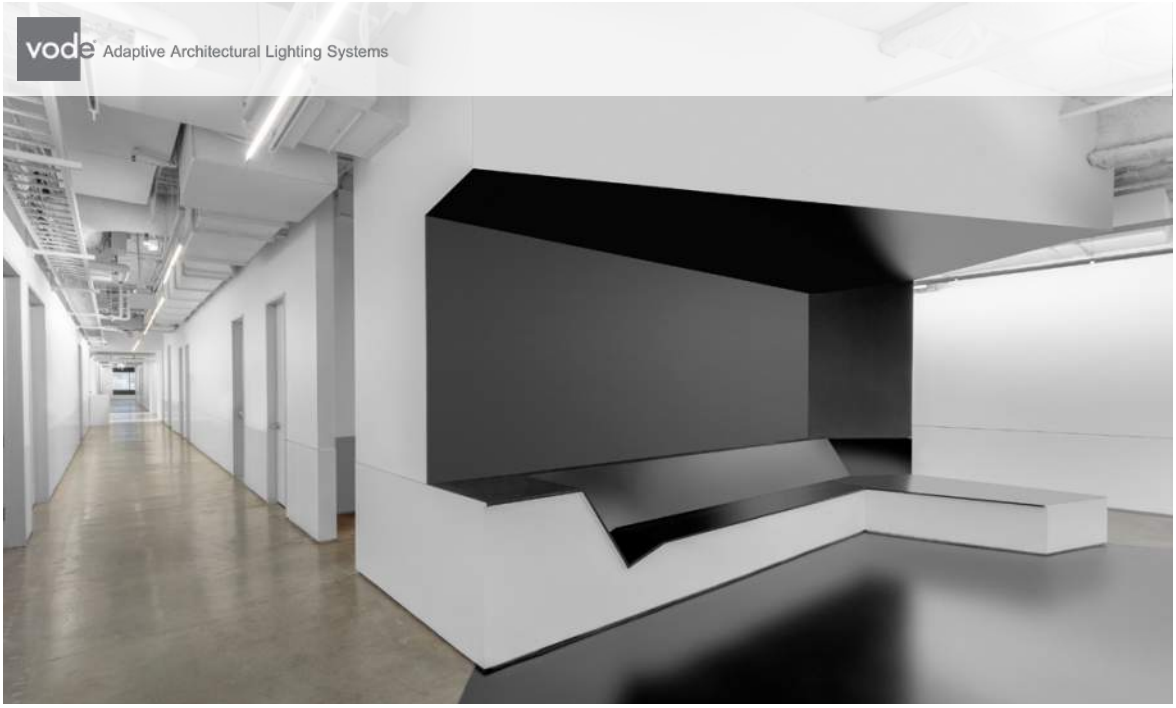


Spec Guide

WingRail | Ceiling Cable | 107

Red List Approved
Declare.

Direct or indirect lighting for wall wash, grazing and ceiling wash applications.

WingRail: direct or indirect, infinite rotation.

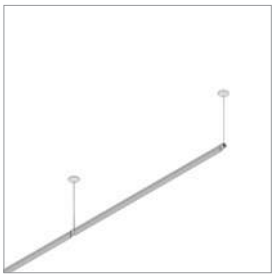
Benefits & Features

Minimal Profile, Robust Design
Asymmetric profile, 1.14 in x 2.12 in.

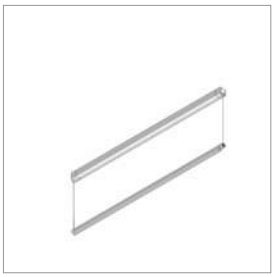
Superior Light Quality & Performance
Output up to 1376 lm/ft (HO), 121 lm/W (HO). 90 CRI static & tunable white 2200K - 5000K. Custom ranges available upon request.

Adaptive Power
Break through Batwing lens designed for excellent fixture to fixture spacing.

Better Optics & Beam Control Options
Asymmetric distribution. White or black Baffle, EdgeSoft™ lens or diffuse lens and narrow optics available. Directional control with infinite rotation, angle gauge and lock.



Small Round Canopy, Remote Power



Integral Power

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WingRail | Ceiling Cable | 107 Spec Guide

Build Your Specification

107-WG	01			CC	

System & Rail Type
107-WG WingRail

Single/Double Rail
01 Single Rail

System Length
Specify overall system length in ft/in or M/mm.

Corner and Shapes Available ***See Guide*** *for details.*

Rail Length
24 24" (610mm)
36 36" (914mm)
48 48" (1219mm)
60 60" (1524mm)
72 72" (1829mm)
ZZ Other rail length or layout (please specify)

See ***Rail Length Chart*** *for more details.*

⚠ ***Custom lengths may result in light gaps on the fixture. See Rail Length Chart for more details.***

Mounting
CC Ceiling Cable

Cable Length
Field adjustable.
48 48" cable (1219mm)
96 96" cable (2438mm)
ZZ Other (please specify)

Power Location

Integral Power
IP Integral Power

Remote Power
Specify mounting and harness length code example: **2R25, 4R25**...etc.

Mounting Option
2R Small Round Canopy
4R Large Round Canopy

Wire Harness
10 10' (3.048m) Wire Harness
25 25' (7.62m) Wire Harness
50 50' (15.24m) Wire Harness
75 75' (22.86m) Wire Harness
100 100' (30.48m) Wire Harness

Power Type

Flexible 1 to 1 Power
AE 0-10v, 1.0% Dimming
AT 0-10v, 0.1% Dimming
AD DALI, 0.1% Dimming
AX DMX, 100-0% Dimming
AH Hi-lume 1% EcoSystem, Soft On / Fade to Black Technology, LDE[1]
AH2 ELV 1% 2-wire (Forward and Reverse Phase)

Optimized Power
Add '**O**' to power type example: AE**O**, AT**O**...etc. [1]

VodeNODE
Add '**N**' to power type for Flexible 1 to 1 Power
Add '**ON**' to power type for Optimized Power
example: AE**N**, AT**N**, AE**ON**, AD**ON**...etc. [2]

ZZ Other (please specify)

See ***Power Guide*** *for driver features & limitations.*

Voltage
1 120V
2 120V - 277V
X Not Yet Specified

Emergency Power
0 No Emergency Power
ZZ Emergency Power *(specify requirements)*

LED Type
Z Zipper Board
B Button Board [3]

Lumen Output
LO Low Output
SO Standard Output
HO High Output
ZZ Other (please specify)

See ***IES Files*** *page for details.*
See ***Power Guide*** *for driver features & limitations.*

Color Temperature

90+ CRI
27 2700K
30 3000K
35 3500K
40 4000K

ZZ Tunable White Available
See Guide for details.

Optics

Zipper Board (Z)
WB White Baffle with EdgeSoft™
BB Black Baffle with EdgeSoft
C1 Clear with EdgeSoft
D1 Diffuse

Button Board (B)
19 19° x 48° Oval
36 36° Medium

Sensors [7]
0 None
ENC Canopy with integrated Enlighted Micro Sensor [6]
WSC Canopy with integrated Legrand Wattstopper sensor [6]
LAC Canopy with integrated Lutron Athena sensor [6]
ZZ Other (please specify)

Finish
AL Clear Anodized
WH White Powder Coat
BL Black Anodized
ZZ Custom finishes available. Please specify RAL #

Options
0 None
9 9' 18/3 Cord and Plug
CP Chicago Plenum
LLLC Luminaire Level Lighting Controls

NOTES & LIMITATIONS
[1] *Optimized Power is not available with Hi-lume 1% EcoSystem (AHO) Power Type.*
[2] *VodeNODE enclosure is not available with ELV 1% 2-wire (AH2) Power Type.*
[3] *Button Board (B) is not available in 90 CRI.*
[4] *9' 18/3 Cord and Plug only available with Remote Power (RP).*
[5] *Chicago Plenum not applicable for wall arm mounting.*
[6] *Rotating fixture as an uplight will interfere with sensor operation.*
[7] *Sensors, drivers and control units that are integrated into Vode fixtures are discrete components that communicate with network lighting controls. For more information about each network lighting control system, visit the manufacturer's website for additional system information and technical data sheets.*
For general information about network lighting controls, consult the DesignLights Consortium® (DLC) ***Networked Lighting Control Qualified Product List****.*

Standard 5 Year Limited Warranty. See details ***here****. Contact factory for options on Limited Warranties up to 20 years.*

Listed to UL standards for damp location by a Nationally Recognized Testing Laboratory (NRTL) recognized by OSHA. Certain limitations exist for each Certification. Contact factory for verification.

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Declare Label

All Vode Lighting linear light fixtures proudly carry the Red List Approved designation.

See ***International Living Future Institute*** website for details.

Declare.

Vode Adaptive Architectural Lighting Systems
Vode Lighting LLC

Final Assembly: Sonoma, California, US
Life Expectancy: 10+ Year(s)
End of Life Options: Recyclable (100%)

Ingredients:

Anodized Aluminum (6063-T5 Alloy); Steel; Small Electrical Component (RoHS)[1]; Copper; Fluorinated Ethylene Propylene (masterbatch)[2]; Polymethyl methacrylate (PMMA); Stainless Steel; Polyoxymethylene Copolymer (POM); Styrene-butadiene polymer, hydrogenated; Poly(methyl methacrylate/butyl acrylate/styrene) (PMMA/BA/S); Styrene/butadiene copolymer; Distillates; Polypropylene; Calcium carbonate; Polycarbonate; EVA Copolymer; Methyl methacrylate (MMA); Polyphenylene Oxide; Brass; Tin, Organic

[1]LBC Temp Exception RL-002 - Small Electrical Components
[2]LBC Temp Exception RL-023 - Wire Sheathing Subject to NFPA 90A, NFPA 262, UL® 910

Living Building Challenge Criteria: Compliant

I-13 Red List:
☐ LBC Red List Free
■ LBC Red List Approved
☐ Declared

% Disclosed: 100% at 100ppm
VOC Content: Not Applicable

I-10 Interior Performance: Not Applicable
I-14 Responsible Sourcing: Not Applicable

VDE-0001
EXP. 01 JAN 2025
Original Issue Date: 2018

MANUFACTURER RESPONSIBLE FOR LABEL ACCURACY
INTERNATIONAL LIVING FUTURE INSTITUTE™ living-future.org/declare

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WingRail | Ceiling Cable | 107 Spec Guide

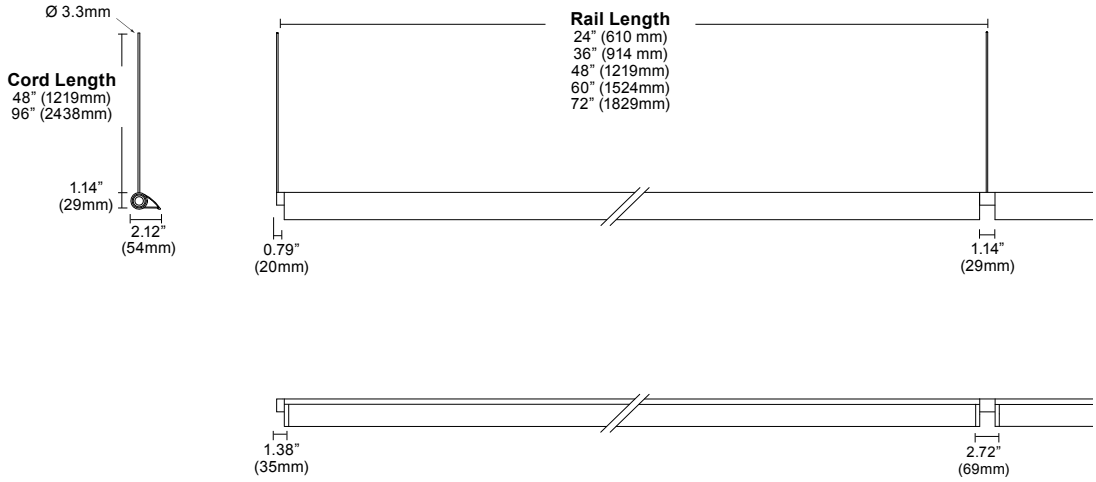
Structure

Rail Lengths	24” (610mm) - 72” (1829mm). Modified lengths available. *See **Rail Length Chart** or more details.*
Rail Dimensions	1.14” (29mm) x 2.12” (54mm) x length.
Construction	Extruded and machined 6063 aluminum.
Mounting	Ceiling mount to jbox or integral power driver housing.
Cable Length	48” (1219mm) and 96” (2438mm) available. Field adjustable. Non-standard cable lengths available.
System Run Length	24” (610mm) minimum. Unlimited maximum.
Operating Temperature	32ºF to 104ºF (0ºC to 40ºC).
Humidity	0-85%, non-condensing.
System Weight	0.74lbs per ft (0.34kg per 305mm) Power supply and housing not included.

Materials

LED Board Construction	Aluminum core PCB, black LCP connectors, RoHS compliant.
Lens	High-impact extruded acrylic glass (PMMA).
Baffle	6063 aluminum, RoHS compliant painted finish.
Suspension Cable	Ø3.3mm, 22/2 AWG, PVC or TPE and RoHS compliant *(PVC free in 2020).*
Power Cable	Ø4mm, 18/2 AWG, Plenum (CMP) rated semi-rigid PVC or FEP, flame tested UL-910 *(PVC free in 2020).*
Cable Connectors	Unfilled black nylon, rated UL 94 V-0, halogen free, PVC or FEP overmold, RoHS compliant *(PVC free in 2020).*
Remote Linear Power Housing (RLP)	20.7” x 2.375” x 2.53”, 0.054” formed Galvanized Steel.
Remote Brick Power Housing (RBP)	4.32” x 3.37” x .078” Galvanized Steel mounting plate.

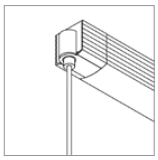
Dimensions

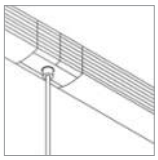


Mounting Options

Small Round Canopy
Ø2.5” (51mm)

Large Round Canopy
Ø4.5” (114mm)


Integral Power (end)
h 1.8” (46mm)
w 1.7” (43mm)


Integral Power (joint)

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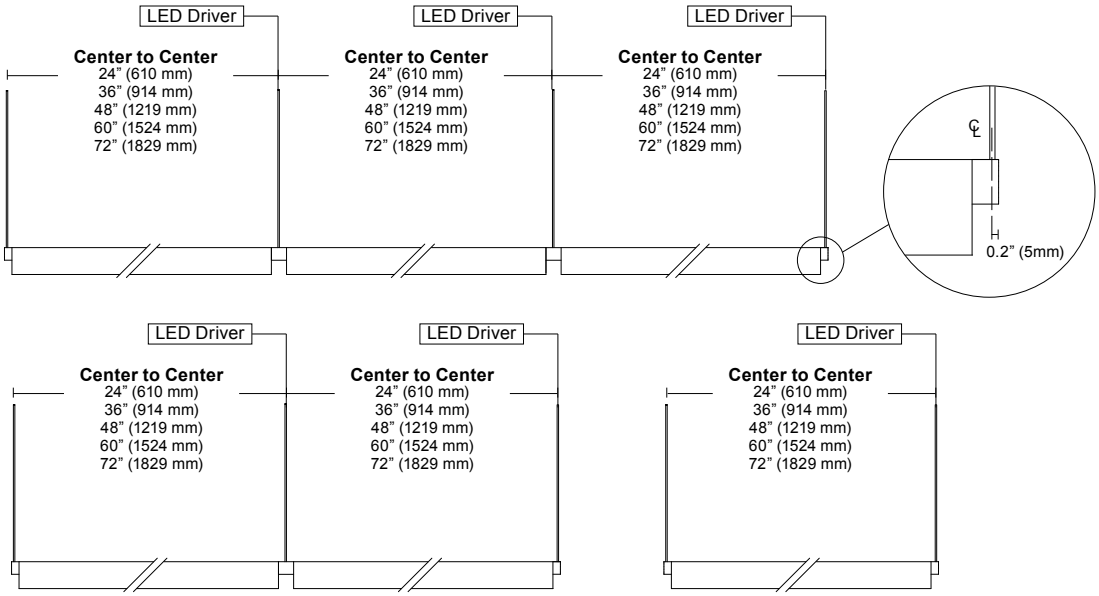
Layout



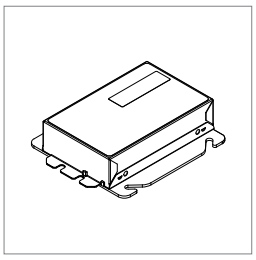
Corner and Shapes Available (Square, Rectangle, L-Shape, U-Shape, ZigZag) ***See Guide*** *for details.*

Power and Controls

Power Type	Class 2 (<60V output) constant current driver.
Dimming Controls	Dimming (0.1%, 1%), 0-10V, DALI, DMX, Hi-lume 1% are available. *See* ***Power Guide*** *for details.*
Input Voltage	120V - 277V, 50/60hz.
Power Location	Integral or remote power. Maximum remote distance up to 100' (30.5m) *depending* on driver selection. *See* ***Power Guide*** *for details.*

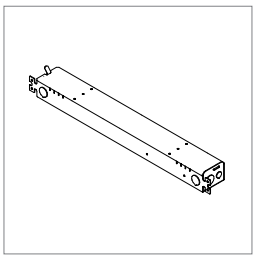
Vode power locations fall into two categories: integral and remote. Remote power is locating the power supply away from the fixture. Remote power comes in two housing styles: brick style and linear style. Consult ***Power Guide*** to determine which type you will receive. Integral power is locating the power supply into the lighting fixture or mounting.

Remote Brick Power Housing



Supplied for some remote power applications. One remote power supply housing is supplied for each rail. Provided driver mounting plate fits standard 4" metal, square J-Boxes with a minimum volume of 21 in^3 (J-Box not provided).
See ***Tech Sheet*** for details.

Remote Linear Power Housing

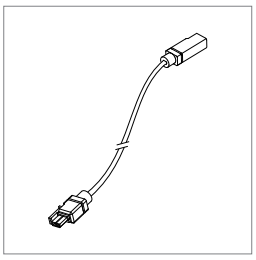


One remote power supply housing is supplied with each power supply. All Vode linear remote drivers come in a 0.054" (0.8mm) formed galvanized steel power supply housing with five (5) knockouts: (4) 1-1/8", (1) 7/8" and (1) 9/16". Accommodates standard linear power supplies.
See ***Tech Sheet*** for details.

Integral Power

Houses integral power supply. Direct conduit feed is recommended, but integral power supply housing will mount to any standard North America 4" j-box. Mounts to most surfaces. Blocking is recommended at all arm junctions.
See ***Tech Sheet*** for details.

Wire Harness



Wire harness connects driver to rail section. Lengths of 10' (3.0m) & 25' (7.6m) with snap-lock connectors for quick and easy installation. Multiple harnesses may be combined for lengths up to 100' (30.5m).
See ***Tech Sheet*** for details.

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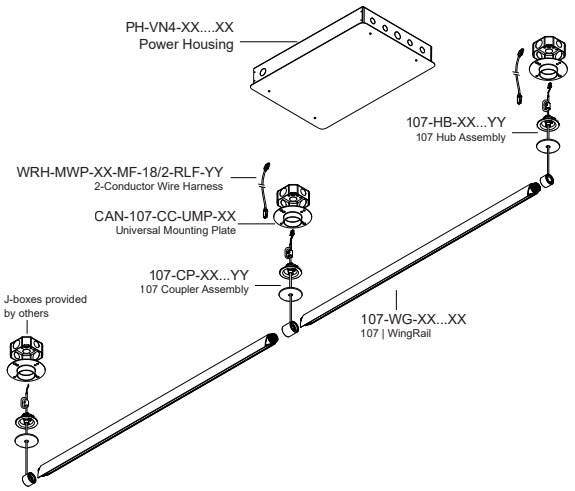
Power and Controls

Flexible 1 to 1 power

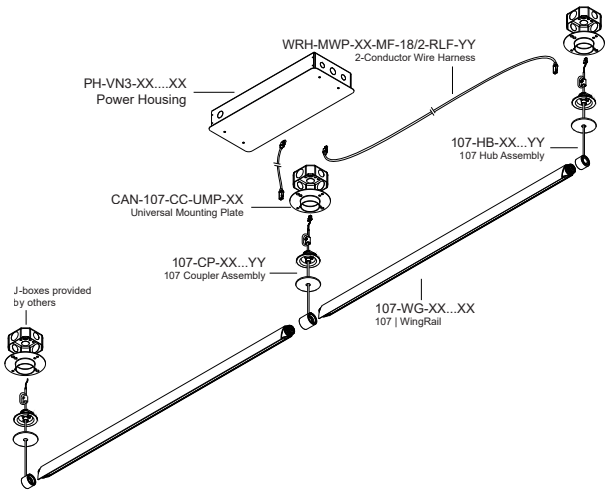
For Flexible 1 to 1 Power, Vode supplies one single output driver per fixture, allowing each fixture to be controlled independently. Direct/Indirect fixtures are supplied with two single output drivers, allowing the direct and indirect lighting to be controlled independently. Consult ***Power Guide*** to determine which type you will receive.



Optimized Power

To optimize power, Vode configures specifications with drivers that have 2 or 4 outputs. Depending on system configurations and power requirements, up to 4 fixtures can be powered from a 4-output driver. Consult ***Power Guide*** to determine which type you will receive.

IMPORTANT: Each fixture will still require individual wire harnesses, as shown below.



Note: Drawings not to scale, for reference only.

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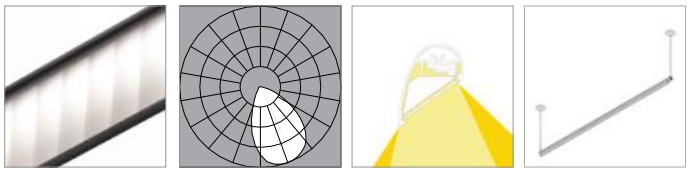
Performance | Zipper Board Optics

Button Board Optics design has 72 diodes per foot (305mm).

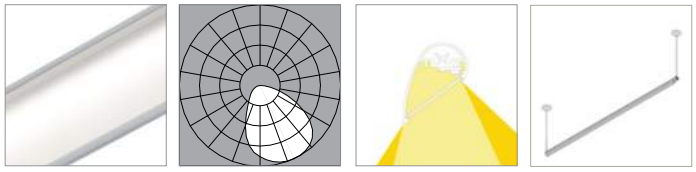
Black Baffle with EdgeSoft (BB)



L80 >60,000 hours

	90 CRI (90min., 96 avg.)			
Low Output (LO)	2700K	3000K	3500K	4000K
Efficacy - Lumens per Watt	40	41	42	43
Lumens per foot (305mm)	147	151	155	158
Watts per foot (305mm)	3.8	3.8	3.8	3.8
Standard Output (SO)				
Efficacy - Lumens per Watt	49	51	52	53
Lumens per foot (305mm)	294	303	309	315
Watts per foot (305mm)	6.1	6.1	6.1	6.1
High Output (HO)				
Efficacy - Lumens per Watt	46	47	48	49
Lumens per foot (305mm)	558	576	587	599
Watts per foot (305mm)	12.4	12.4	12.4	12.4

Clear with EdgeSoft (C1)



L80 >60,000 hours

	90 CRI (90min., 96 avg.)			
Low Output (LO)	2700K	3000K	3500K	4000K
Efficacy - Lumens per Watt	78	81	82	84
Lumens per foot (305mm)	291	300	306	312
Watts per foot (305mm)	3.8	3.8	3.8	3.8
Standard Output (SO)				
Efficacy - Lumens per Watt	97	100	102	104
Lumens per foot (305mm)	582	600	612	624
Watts per foot (305mm)	6.1	6.1	6.1	6.1
High Output (HO)				
Efficacy - Lumens per Watt	90	93	95	97
Lumens per foot (305mm)	1105	1140	1163	1187
Watts per foot (305mm)	12.4	12.4	12.4	12.4

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cerno
DESIGNED AND MADE IN CALIFORNIA
Rima Sconce

cerno

dark stained walnut

white washed oak

walnut

brushed brass

distressed brass

oil rubbed bronze

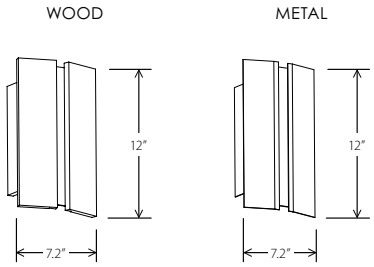
satin nickel

textured black

textured white

The Rima sconce is an illuminating example of functional minimalism. The shade is distilled down to a few essential materials composing a sleek modern design that emits a beautiful quality of light. The Rima is available in a variety of metal and wood finishes.

Rima sconce



Dimensions: 12″ x 7.2″ x 4″
Product weight: 3 lb
Light source: integrated LED
Light output: 1130 Lumens (source)
Light color: 2700 K, 3000 K, 3500 K, or 4000 K
Color accuracy: 90+ CRI
Power usage: 14 W
Wood grain will vary
Specifications subject to change

c UL us LISTED ADA

Rima Sconce part # 03-270- -

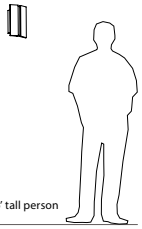
Body - Wood Construction
walnut (CM-001) **W**
dark stained walnut (CM-002) **D**
white washed oak (CM-095) **O**

Body - Metal Construction
textured black (CM-049) **B**
textured white (CM-060) **Y**
satin nickel (CM-124) **N**
brushed brass (CM-120) **R**
distressed brass (CM-117) **P**
oil rubbed bronze (CM-029) **Z**

Lamping
2700 K LED **27**
3000 K LED **30**
3500 K LED **35**
4000 K LED **40**

Driver
AC input Voltage Range: 120-277 V
120 V input: TRIAC, ELV & 0-10 V dimmable **P1**
240 & 277 V input: only 0-10 V dimmable

Includes
frosted polymer (CM-051)



⚠**WARNING.** California Proposition 65 Warning for California Consumers. This product can expose you to chemicals including wood dust and lead which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

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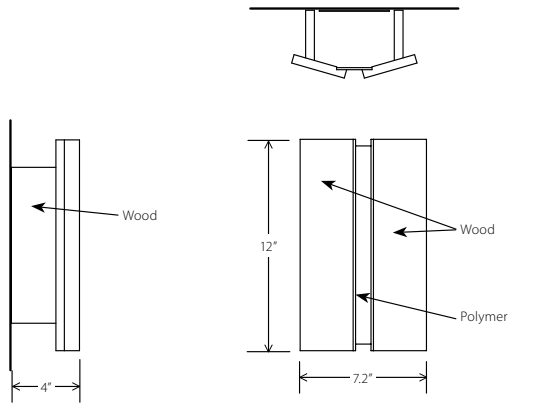
Rima sconce

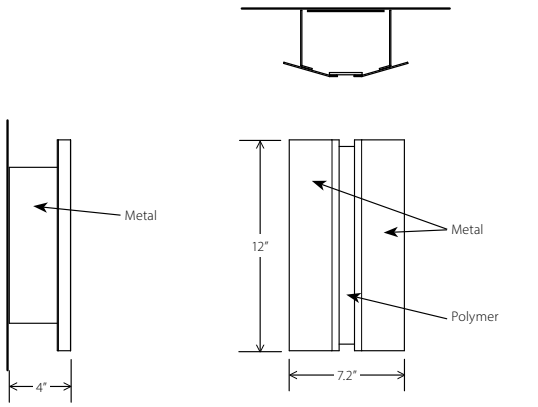
SPECIFICATION SHEET

cerno

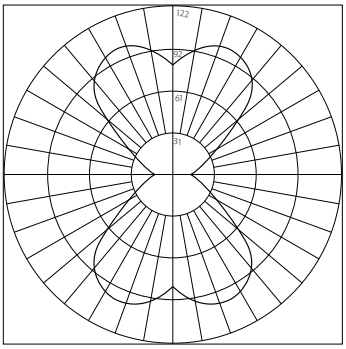
WOOD



METAL



PHOTOMETRIC POLAR GRAPH



Maximum Candela = 122
Located at:
Horizontal Angle = 0,
Vertical Angle = 35

Output specifications shown for 2700K CCT and walnut finish for vertical plane through 90-270 degree horizontal angles. Other CCTs and material finishes may cause output specifications to vary.

FINISHES

walnut (CM-001)

dark stained walnut (CM-002)

white washed oak (CM-095)

brushed brass (CM-120)

distressed brass (CM-117)

oil rubbed bronze (CM-029)

satin nickel (CM-124)

textured black powder coat (CM-049)

textured white powder coat (CM-060)

TECHNICAL SPECIFICATIONS

Light source: integrated LED
Light output: 1130 Lumens (source)
Light color: 2700 K. 3000 K, 3500 K, or 4000 K
Input voltage: 120-277 V AC
Color accuracy: 90+ CRI
Power usage: 14 W
Dimmablility: TRIAC, ELV, or 0-10V at 120 V AC input
0-10V only at 240-277 V AC input
Materials: solid wood, polymer, aluminum
Wood grain will vary
Specifications subject to change

c UL us LISTED ADA

⚠**WARNING.** California Proposition 65 Warning for California Consumers. This product can expose you to chemicals including wood dust and lead which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

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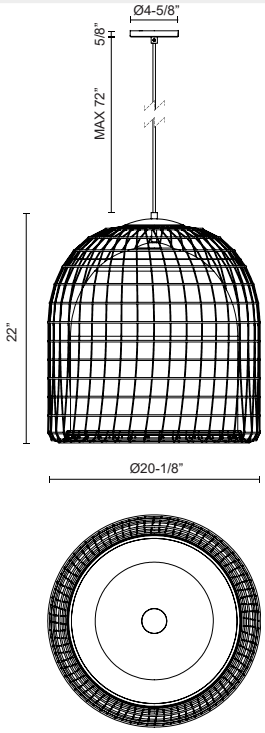
alora mood

P. 1.855.855.8926
CANADA:19054 28TH Avenue Surrey - BC V3Z 6M3
USA: 3035 E. Lone Mountain Rd - Las Vegas, NV, 89081



BONDI
PD631920

FIXTURE DIMENSIONS	D20-1/8" x H22"
LAMP TYPE	E26
MAX WATTAGE	60W
BULB QTY	1
BULBS INCLUDED	No
VOLTAGE	120V
MATERIAL	Steel + Rattan
WIRE LENGTH	72" Max
MINIMUM HANG HEIGHT	24"
SLOPED CEILING ADAPTABLE	Yes
ILLUMINATION DIRECTION	Omni-directional
LOCATION	Damp
CANOPY DIMENSIONS	D4-5/8" x H5/8"
PAINT FINISH	BG01; MB01;

[D - Diameter, L - Length, W - Width, H - Height, E - Extension]

AVAILABLE FINISHES:

PD631920BGOP
Brushed Gold/Matte Opal

PD631920MBOP
Matte Black/Matte Opal

*For complete warranty terms, please visit: www.aloralighting.com/warranty

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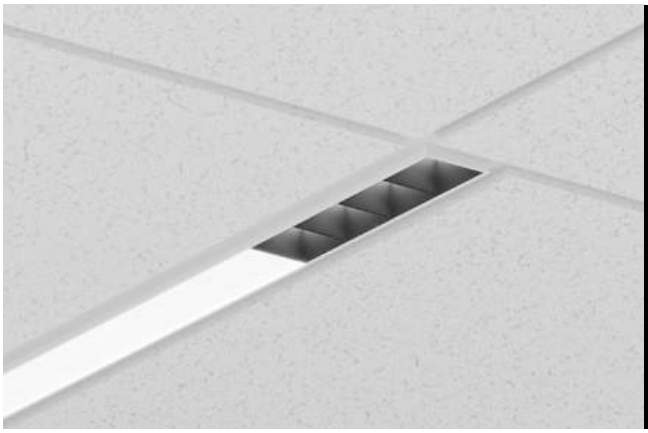
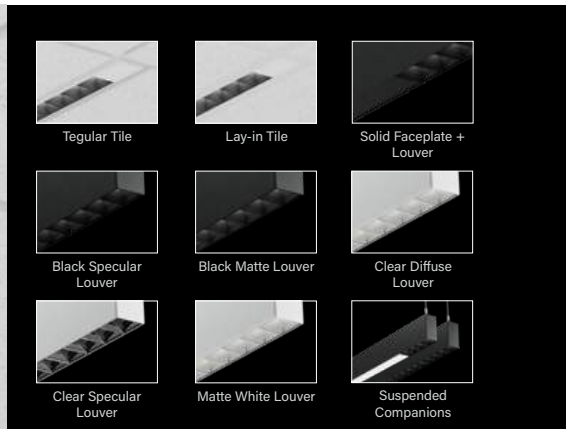
SAFETY US•CA
E348916

Seem® 1 Louver

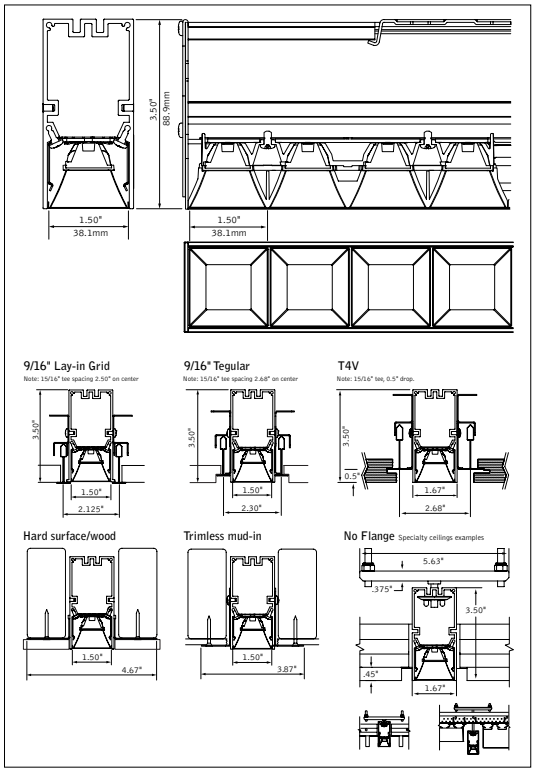
LED RECESSED WITH ID+ TECHNOLOGY

FOCAL POINT®





DIMENSIONAL DATA



FEATURES

Nominal 1.5" narrow extruded aluminum linear direct LED illumination with louver and high-performance optics.

Frosted acrylic lenses provide uninterrupted illumination, without pixels or shadows.

Deeply regressed louver cells provide 60° cut-off from light source to promote visual comfort.

Diversity of louver finishes to tailor how the light is perceived and experienced, from nearly invisible light sources with a striking transition to warmly illuminated louver cells with a smooth transition.

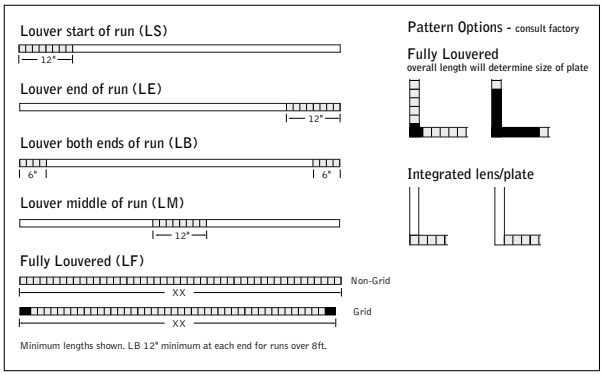
Choice of output levels and light distributions support multiple applications, from highly focused task lighting to ambient lighting.

Individual units and continuous runs in 1" lensed or faceplate increments, and 6" louvered increments.

Highly configurable system enables self-service creation of customized products with standard lead times.

fixture: project:

STANDARD LOUVER CONFIGURATION EXAMPLES



Minimum lengths shown. LB 12" minimum at each end for runs over 8ft.

SPECIFICATIONS

LED System

Proprietary linear LED module incorporates premium LEDs on a robust platform to achieve excellent thermal management. LEDs are placed to promote a uniform appearance. Available in 2700K, 3000K, 3500K or 4000K with both 80 and 90 CRI options. LED modules and drivers are replaceable from below. Color accuracy <3 SDCM.

Construction

One piece extruded aluminum housing. 20 Ga. steel end caps. Housing for new construction applications. XFW acceptable for use with wood, consult factory for Type IC availability. 8' unit weight: 15lbs.

Optic

60-degree cut-off to louvered light source and its image. Lensed reflectors fabricated of 24 Ga. steel finished in High Reflectance White powder coat. Extruded acrylic lens .085" thick with frosted finish, up to 8' continuous.

Electrical

Luminaires are pre–wired with factory installed branch circuit wiring and over-molded quick connects. Standard 120-277V constant current driver includes 0-10V analog dimming. Power factor > .9.

Emergency

Emergency output - 10 watts for 90 minutes. Louvered maximum mounting height (LC, SC) = 26.4ft, lensed maximum mounting height (BC, FC) = 18ft.

Labels

UL and cUL listed. Suitable for Dry or Damp Locations, indoor use only.

Finish

Polyester powder coat applied over a multi-stage pre–treatment.

Lumen Maintenance

Linear Source

Reported:	L70 at >61,000 hours	Calculated: L70 at 470,000 hours
	L90 at >61,000 hours	L90 at 115,000 hours

Louvered Sources

Reported:	L70 at >54,000 hours	Calculated: L70 at 138,000 hours
	L90 at 43,000 hours	L90 at 43,000 hours

Derived from EPA TM-21 calculator. Based on typical conditions, consult factory for additional data.

Reliability

At Focal Point, our products are designed to stand the test of time. Each luminaire is engineered using superior components, manufactured with the utmost care and rigorously tested. Contact us for reliability data.

Warranty

LED system rated for operation in ambient environments up to 25°C. 5-year limited warranty.

DISTRIBUTIONS

	NFL	FL1	FL2	WFL	LMC
Beam Spread	20°	29°	43°	67°	68°
Spacing Criteria	0.36	0.50	0.70	0.98	1.18

PERFORMANCE CHARTS

See page 4

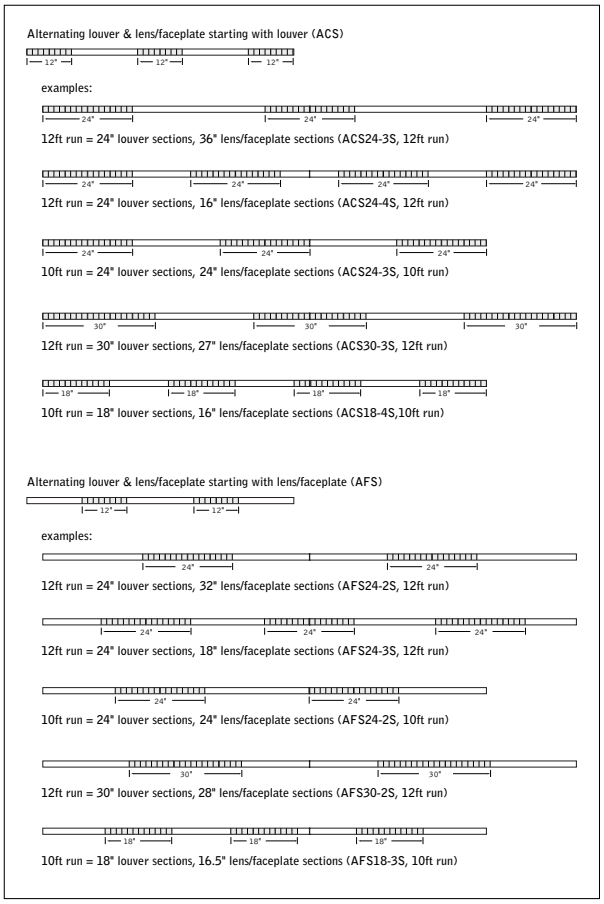
Focal Point LLC reserves the right to change specifications for product improvement without notification.

STANDARD CONFIGURATION ORDERING

		FSM1C
Luminaire Series		
Seem 1 with louver	FSM1C	
Shielding		_____
Batwing lens + Louver	BC	
Flush lens + Louver	FC	
Solid faceplate + Louver	SC	
Louver only	LC	
Louver Configuration (Specify total length of louver in inches for run length. Example: 36" of Louver at start of run = LS36)		_____
Louver start or end of run (6" increments, 12" min.)	LS_ or LE_	
Louver both ends of run (12" increments, split equally) (Runs over 8ft must contain min. 24" of louver)	LB_	
Louver middle of run (12" increments) (12" Louver increments. Min 24" of lens or faceplate, split equally.)	LM_	
Fully Louvered (LC shielding only, length matches run length) (2.5" plate required on each end for grid options)	LF	
Lumen Output		
LUMEN OUTPUT OPTIONS (specify value for each distribution. Example: 625DN-1000 DL)		
250 Lumens per foot (Consult factory for available options)	250	
375 Lumens per foot	375	
500 Lumens per foot	500	
625 Lumens per foot	625	
750 Lumens per foot	750	
875 Lumens per foot	875	
1000 Lumens per foot	1000	
Direct Lensed Distribution (625 lumens max. Use "0DN" for SC & LC options.) (Consult Factory for LH1 & D11 with BC & FC for 375 & 500 lm/ft.)	____DN	_____
Direct Louvered Distribution	____DL	_____
Color Temperature		_____
2700K, 80CRI **or** 90 CRI	27K **or** 927K	
3000K, 80CRI **or** 90 CRI	30K **or** 930K	
3500K, 80CRI **or** 90 CRI	35K **or** 935K	
4000K, 80CRI **or** 90 CRI	40K **or** 940K	
Circuit		_____
Single Circuit	1C	
Dual Circuit (FC & BC shielding only)	2C	
Voltage		_____
120/277 UNV Volt	UNV	
347 Volt (LD1 driver only)	347	
Control System & Dimming Level		_____
0-10V - 10% Dimming	LD1	
0-10V - 1% Dimming	L11	
Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming	LH1	
DALI 1% Dimming	D11	
Ceiling Configuration		_____
Std. 15/16" Lay-in or Tegular	G1 or T1	
Std. 9/16" Lay-in or Tegular	G2 or T2	
9/16" Slot-tee Tegular	G3	
Tall 15/16" Lay-in or Tegular	G4 or T4	
Tall 15/16" Tegular for specialty ceilings (0.5" drop)	T4V	
Tall 9/16" Lay-in or Tegular	G5 or T5	
Node 9/16" Tegular	T6	
No Flange for specialty ceilings (Ex. slat, panel, cloud systems.)	NF	
Mud-in Trimless	XFF	
Non-Drywall Hard Surface	XFN	
Hard Surface, Wood	XFW	
Distribution		_____
Narrow Flood	NFL	
Flood 1	FL1	
Flood 2	FL2	
Wide Flood	WFL	
Louvered Mixing Chamber	LMC	
Factory Options		
Chicago Plenum	CP	_____
Emergency Circuit	_EC	_____
Emergency Battery Pack (5' min. length with LC shielding. Consult facotry for integrated options.)	_EM	_____
6' Flex Whip	FW	_____
Louver Finish		_____
Matte Black	BK	
Black Specular	BS	
Clear Diffuse	CD	
Clear Specular	CS	
Matte White	WH	
Housing & Faceplate Finish		_____
Matte Black	BK	
Titanium Silver	TS	
Matte White	WH	
Luminaire Length		_____
Total luminaire/row length (12" increments; 6" increments for LF. 4' minimum run length.)	_ft _in	

fixture: project:

TAILORED LOUVER CONFIGURATION EXAMPLES



SPECIFICATIONS
See page 2

DISTRIBUTIONS

	NFL	FL1	FL2	WFL	LMC
Beam Spread	20˚	29˚	43˚	67˚	68˚
Spacing Criteria	0.36	0.50	0.70	0.98	1.18

PERFORMANCE CHARTS
See page 4

Focal Point LLC reserves the right to change specifications for product improvement without notification.

TAILORED CONFIGURATION ORDERING

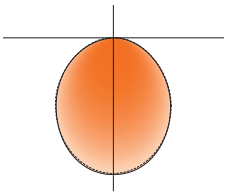
		FSM1C
Luminaire Series		
Seem 1 with louver	FSM1C	
Shielding		_____
Batwing lens + Louver	BC	
Flush lens + Louver	FC	
Solid faceplate + Louver	SC	
Louver Configuration (Specify length of each louver segment in 6" increments, 12" minimum*, and the total number of louver segments in the run. Example: 24" louver segments, 4 segments total = ACS24-4S *Consult factory for 6" segment availability.)		_____
Alternating louver & lens/faceplate starting with louver (Min. 3 segments per run.)	ACS_-_S	
Alternating louver & lens/faceplate starting with lens/faceplate (Min. 2 segments per run.)	AFS_-_S	
Lumen Output (Consult factory for available lumen outputs based on specified Louver Configuration)		
LUMEN OUTPUT OPTIONS (specify value for non-distribution. Example: 625DN-1000DL)		
250 Lumens per foot	250	
375 Lumens per foot	375	
500 Lumens per foot	500	
625 Lumens per foot	625	
750 Lumens per foot	750	
875 Lumens per foot	875	
1000 Lumens per foot	1000	
Direct Lensed Distribution (625 lumens max. Use "0DN" for SC & LC options.) (Consult Factory for LH1 & D11 with BC & FC for 375 & 500 lm/ft.)	____DN	_____
Direct Louvered Distribution	____DL	_____
Color Temperature		_____
2700K, 80CRI **or** 90 CRI	27K **or** 927K	
3000K, 80CRI **or** 90 CRI	30K **or** 930K	
3500K, 80CRI **or** 90 CRI	35K **or** 935K	
4000K, 80CRI **or** 90 CRI	40K **or** 940K	
Circuit		_____
Single Circuit	1C	
Dual Circuit (FC & BC shielding only)	2C	
Voltage		_____
120/277 UNV Volt	UNV	
347 Volt (LD1 driver only)	347	
Control System & Dimming Level		_____
0-10V - 10% Dimming	LD1	
0-10V - 1% Dimming	L11	
Lutron Hi-Lume EcoSystem (LDE1) - 1% Dimming	LH1	
DALI 1% Dimming	D11	
Ceiling Configuration		_____
Std. 15/16" Lay-in or Tegular	G1 or T1	
Std. 9/16" Lay-in or Tegular	G2 or T2	
9/16" Slot-tee Tegular	G3	
Tall 15/16" Lay-in or Tegular	G4 or T4	
Tall 15/16" Tegular for specialty ceilings (0.5" drop)	T4V	
Tall 9/16" Lay-in or Tegular	G5 or T5	
Node 9/16" Tegular	T6	
No Flange for specialty ceilings (Ex. slat, panel, cloud systems.)	NF	
Mud-in Trimless	XFF	
Non-Drywall Hard Surface	XFN	
Hard Surface, Wood	XFW	
Distribution		_____
Narrow Flood	NFL	
Flood 1	FL1	
Flood 2	FL2	
Wide Flood	WFL	
Louvered Mixing Chamber	LMC	
Factory Options		
Chicago Plenum	CP	_____
Emergency Circuit	_EC	_____
Emergency Battery Pack (Consult facotry for available options.)	_EM	_____
6' Flex Whip	FW	_____
Louver Finish		_____
Matte Black	BK	
Black Specular	BS	
Clear Diffuse	CD	
Clear Specular	CS	
Matte White	WH	
Housing & Faceplate Finish		_____
Matte Black	BK	
Titanium Silver	TS	
Matte White	WH	
Luminaire Length		_____
Total luminaire/row length (12" increments; 6" increments for LF. 4' minimum run length.)	_ft _in	

4' PERFORMANCE CHART - LENSED DISTRIBUTIONS

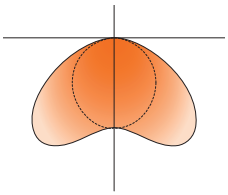
Shielding	Lumens per Foot	Delivered Lumens	Tested System Watts	LPW
Batwing/ Flush Lens	250LF	1000	10	98
	375LF	1500	15	104
	500LF	2000	19	106
	625LF	2500	25	103

Based on 3500k, 4' length. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%.

PERFORMANCE CURVES



4' Flush Lens



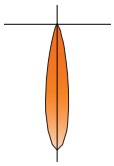
4' Batwing Lens

4' PERFORMANCE CHART - LOUVERED DISTRIBUTIONS

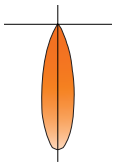
Distribution	Lumens per Foot	Tested System Watts	LPW
WFL	250	11.0	92
	375	14.7	101
	500	19.3	106
	625	24.3	105
	750	28.3	107
	875	32.6	107
	1000	37.0	108

Based on 4' luminaire, 3500K, 80 CRI, Matte Black baffle. Lumen output may vary +/- 5%. Actual wattage may vary +/- 5%

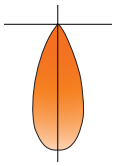
PERFORMANCE CURVES



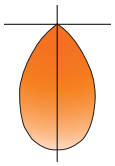
Narrow Flood (NFL)



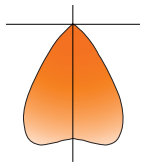
Flood 1 (FL1)



Flood 2 (FL2)



Wide Flood (WFL)



Louvered Mixing Chamber (LMC)

SEEM 1 LOUVER LUMEN MULTIPLIER TABLE

Lens Color Temperature & CRI

Color Temperature	Multiplier
2700K, 80+ CRI [27K]	0.96
2700K, 90+ CRI [927K]	0.79
3000K, 80+ CRI [30K]	1.00
3000K, 90+ CRI [930K]	0.82
3500K, 80+ CRI [35K]	1.00
3500K, 90+ CRI [935K]	0.84
4000K, 80+ CRI [40K]	1.01
4000K, 90+ CRI [940K]	0.86

Louver Color Temperature & CRI

Color Temperature	Multiplier
2700K, 80+ CRI [27K]	0.95
2700K, 90+ CRI [927K]	0.80
3000K, 80+ CRI [30K]	0.97
3000K, 90+ CRI [930K]	0.83
3500K, 80+ CRI [35K]	1.00
3500K, 90+ CRI [935K]	0.85
4000K, 80+ CRI [40K]	1.03
4000K, 90+ CRI [940K]	0.87

Louver Distribution

Distribution	Multiplier
Narrow Flood [NFL]	1.34
Flood 1 [FL1]	1.14
Flood 2 [FL2]	1.21
Wide Flood [WFL]	1.00
Louvered Mixing Chamber [LMC]	0.97

Louver Finish

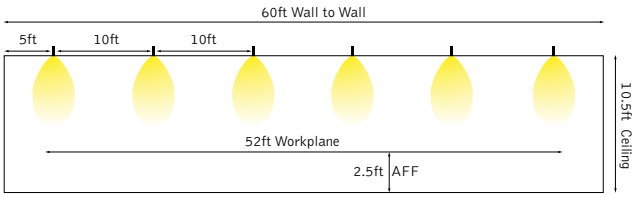
Color	Multiplier
Matte Black [BK]	1.00
Black Specular [BS]	1.00
Clear Diffuse [CD]	1.07
Clear Specular [CS]	1.10
Matte White [WH]	1.11

How To Use Lumen Multipliers

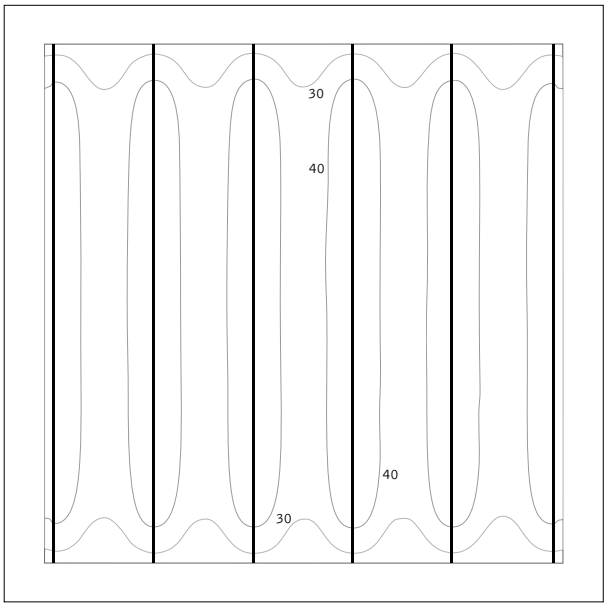
Formula: (Lumen Output Value) x (Color Temperature & CRI) x (Distribution) x (Finish)

Louver Example: FSM1CBS-1000DL-930K-NFL-BS
(1000) x (0.83) x (1.34) x (1.00) ≈ 1112.2 lm (estimated delivered lumens)

SEEM 1 LOUVER APPLICATION EXAMPLE - FULLY LOUVERED



Workplane Illuminance



Average Illuminance = 38 fc

Lighting Power Density (LPD) = 0.38

Seem 1 Louver with fully louvered direct illumination is a powerful and efficacious solution for open working environments. Workplanes benefit from 32 footcandles or more and superior uniformity with a lighting power density of less than 0.38 while maintaining luminaire on-center spacing of 8 feet or greater.

Calcluation Details

Room Area:	60ft x 60ft
Calculation Area:	52ft x 52ft
Ceiling Height:	10.5ft
Luminiare Spacing:	10ft OCS
Workplane Height:	2.5ft AFF
Reflectances:	80/50/20
Light Loss Factor:	0.9

Luminaire Details

Shielding:	Fully Louvered, Wide Flood
Lumens per foot:	375 Direct
Louver finish:	Matte Black

Installation		Lumens/ft	Louver Distribution	LPD (Watts/ft²)	Workplane	
Ceiling Height	On-center Spacing				Average Footcandles	Uniformity (avg. to min.)
9FT	8FT	250LF	WFL	0.34	33.5	2.00
			LMC		32.4	1.94
10.5FT			WFL		32.7	1.94
			LMC		31.6	1.94
10.5FT	10FT	375LF	**WFL**	**0.38**	**38.7**	**1.99**
			LMC		37.2	1.96

X Series

Project:	Type:
Product Code:	Date:

V121324

3" Surface Mount Cylinder

- Versatile, small diameter surface mount cylinder
- Installs Directly to a surface or recessed mounted junction box, ideal for areas with limited ceiling height & plenum space restrictions
- Wet Listed & IP65 rated

CYLINDER

Mount
Surface

Size
Diameter: 3.5"
Height: 6.5", 9"

Canopy
Standard, Flangeless

Trims
Standard, Snoot, Wall Wash, Decorative

Finish
White, Black, Brushed Aluminum, Bronze, Custom

LIGHT OUTPUT & DISTRIBUTION

Lumens (Power)
Downlight: 750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (14.3W)
Adjustable: 750 lm (9.5W), 1000 lm (12.5W)

Color Quality
93 CRI, 2-step SDCM

Color Temperature
2700K 3000K 3500K
4000K Warm Dim (3000K–1800K)
Tunable White (4000K–1800K)
Tunable White (6500K–2700K)

Beam Spread
20° Narrow Spot
30° Spot
40° Flood
50° Wide Flood

Lighting Type
Downlight Adjustable

POWER & CONTROLS

Input Voltage
120/277V

Dimming
0-10V (120/277V): 1%
TRIAC/ELV (120V): 1%
DALI-2 (120/277V): 0.1%

SPECIALTY LENS

Hexcell Louver

RATINGS & CERTIFICATIONS

Wet Location / IP65 Rated Configurations Available

NSF Listed (White and Black Finish Only)

DarkSky Approved (Downlight with non-decorative trims only, CCT less than or equal to 3000K)

WARRANTY

5 year limited warranty; 50,000 hours

DMF LIGHTING 1118 E. 223rd St. Carson, CA 90745 323.934.7779 info@dmflighting.com dmflighting.com

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X Series Cylinder

3" Surface Mount

PRODUCT BUILDER

CYLINDER	XCS	**XCS**	Surface Mount Cylinder					
SHAPE	R	**R**	Round					
SIZE		**6**	6.5 Inch	**9**	9 Inch			
CANOPY		**S**	Standard	**F**	Flangeless [1]			
LIGHT OPTIONS		**D**	Downlight ◈	**A**	Adjustable [2]			
LUMENS DOWN		**07**	750 lm	**10**	1000 lm	**12**	1250 lm [3]	**15**	1500 lm [3]
BEAM SPREAD DOWN		**NS**	Narrow Spot (20°)	**SP**	Spot (30°)	**FL**	Flood (40°)	**WF**	Wide Flood (50°) [3]
SPECIALTY LENS		**0**	None ◈	**H**	Hex Louver [2,5]				
CCT		**27**	2700K [6]	**30**	3000K [6]	**35**	3500K	**40**	4000K
		3W	Warm Dim [4,6]	**T1**	Tunable White [7] (4000K-1800K)	**T2**	Tunable White [7] (6500K-2700K)		
FINISH [8]		**WH**	White	**BK**	Black	**BA**	Brushed Aluminum		
		BZ	Bronze	**CC**	Custom Color				
DIMMING		**O**	0-10V	**T**	TRIAC/ELV	**D**	DALI-2 [9]		
EMERGENCY	00	**00**	None						
TRIM		**S**	Standard	**N**	Snoot [3] (Black Only)	**W**	Wall Wash [3]		
		O	Decorative: Open [3]	**Y**	Decorative: Hyperbolic [3]	**F**	Decorative: Float [3]		

◈ *Required for Wet Location/IP65 rating*

[1] *3" Round Junction Box Extension required for installation, reference detail on page 5*
[2] *Only available in 750 or 1000lm*
[3] *Not available in Adjustable*
[4] *Only available in 1000 lm; not available in Narrow Spot beam spread*
[5] *Not available with DALI-2, Decorative or Wall Wash trims*
[6] *Required for Dark Sky compliance*
[7] *Only available in DALI-2 dimming, 1000lm for Downlight, 750lm for Adjustable*
[8] *For Marine Grade Select CC*
[9] *For Downlight: Only available in 1000 lm with Warm Dim or Tunable White CCT and 1250 lm with Static CCT*
For Adjustable: Only available in 1000 lm with Warm Dim or Static CCT and 750lm Tunable White

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X Series Cylinder
3" Surface Mount

DOWNLIGHT MODULE PERFORMANCE

Based on 93 CRI, 3000K Downlight Module + Standard White Trim (S) Configuration
(Please refer to IES files for other trim types)

		STATIC CCT				WARM DIM	T1 TUNABLE WHITE	T2 TUNABLE WHITE
LED CHIP		CREE 93 CRI				Bridgelux 93 CRI		
SDCM		2-STEP				3-STEP		
		07	10	12	15	10	10	10
NS	Lumens	843	1099	1221	1418	N/A		
	LPW [1]	93.6	89.4	87.2	98.5			
	CBCP [2]	4005	5224	5804	6738			
	UGR [3]	13.5	14.4	14.8	15.3			
SP	Lumens	801	1045	1161	1348	857	840	991
	LPW	89	85	82.9	93.6	69.7	68.3	80.6
	CBCP	2730	3560	3956	4593	2520	2053	2422
	UGR	13.9	14.9	15.2	15.7	14.2	16.8	15.9
FL	Lumens	813	1061	1179	1369	870	842	994
	LPW	90.4	86.3	84.2	95	70.7	68.5	80.8
	CBCP	1755	2289	2543	2953	1877	1587	1873
	UGR	13.9	14.8	15.2	15.7	14.2	16	15.2
WF	Lumens	807	1052	1169	1357	863	825	974
	LPW	89.6	85.5	83.5	94.2	70.1	67.1	79.1
	CBCP	1120	1461	1623	1885	1198	1296	1529
	UGR	15.6	16.5	16.9	17.4	15.8	14.9	16.8

	STATIC				WARM DIM		T1 TUNABLE WHITE			T2 TUNABLE WHITE		
CCT	2700K	3000K	3500K	4000K	1800K	3000K	1800K	3000K	4000K	2700K	3000K	6500K
MULTIPLIER	0.93	1	1.05	1.07	0.05	1	0.7	1	1.12	0.96	1	1.07

HEX LOUVER MULTIPLIER	0.6

[1] LPW: Lumens per watt
[2] CBCP: Center beam candlepower
[3] UGR: Unified glare ratio (0.7/0.5/0.2, 4H/8H)

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X Series Cylinder

3" Surface Mount

SUMMARY

	STATIC CCT	WARM DIM	TUNABLE WHITE
CCT	2700K, 3000K, 3500K, 4000K	3000K - 1800K	4000K - 1800K; 6500K - 2700K
LUMENS	750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (14.3W)	1000 lm (12.0W)	Downlight: 1000lm (14.3W), Adjustable: 750lm (12.5W)
EFFICACY	79 lm/W, 80 lm/W, 87 lm/W, 105 lm/W	83 lm/W	60lm/W, 70 lm/W
COLOR QUALITY	93 CRI[1], 2-step SDCM	93 CRI[1], 3-step SDCM	93 CRI[1], 3-step SDCM
BEAM SPREAD	Narrow Spot (20°), Spot (30°), Flood (40°), Wide Flood (50°)	Spot (30°), Flood (40°), Wide Flood (50°)	Spot (30°), Flood (40°), Wide Flood (50°)
DIMMING	0-10V (120/277V): 1% TRIAC/ELV (120V): 1% DALI-2 (120/277V): 0.1%	0-10V (120/277V): 1% TRIAC/ELV (120V): 1% DALI-2 (120/277V): 0.1%	DALI-2 (120/277V): 0.1%
LED CHIP	Cree	Bridgelux	Bridgelux
LISTINGS	ENERGY STAR® qualified[2], California Title 24 2019 JA8 compliant, UL Listed for Wet Location, UL Certified US·CA, Declare, RoHS compliant, NSF/ANSI 2 listed, suitable for splash-zone[3], DALI-2 Compliant, Compliant to FCC Title 47 Part 15; Class B, Dark Sky Compliant[4]		

[1] Tested in accordance to IESNA LM-79-2008
[2] Refer to ENERGY STAR Certified light fixtures database
[3] This product is evaluated in accordance to NSF/ANSI 2 for Splash Zone having designated trim finishes
[4] Dark Sky approved is only applicable to CCT Options less than or equal to 3000K

ADDITIONAL

INPUT VOLTAGE: 120/277V, 50/60Hz

MAX INPUT CURRENT (120V): 0.11 amps

MAX INPUT CURRENT (277V): 0.05 amps

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

LIFETIME: 50,000 hours at 70% lumen maintenance

WARRANTY: 5 year limited warranty

CYLINDER: Extruded aluminum

SIZE: 6.5", 9"

FINISH: White, Black, Bronze, Brushed Aluminum, Custom Color

INSTALLATION:

- **STANDARD CANOPY:** Compatible with most 3" octagonal, 4" octagonal, 3" round and 4" round boxes
- **FLANGELESS CANOPY:** Only compatible with 3" round junction box extension

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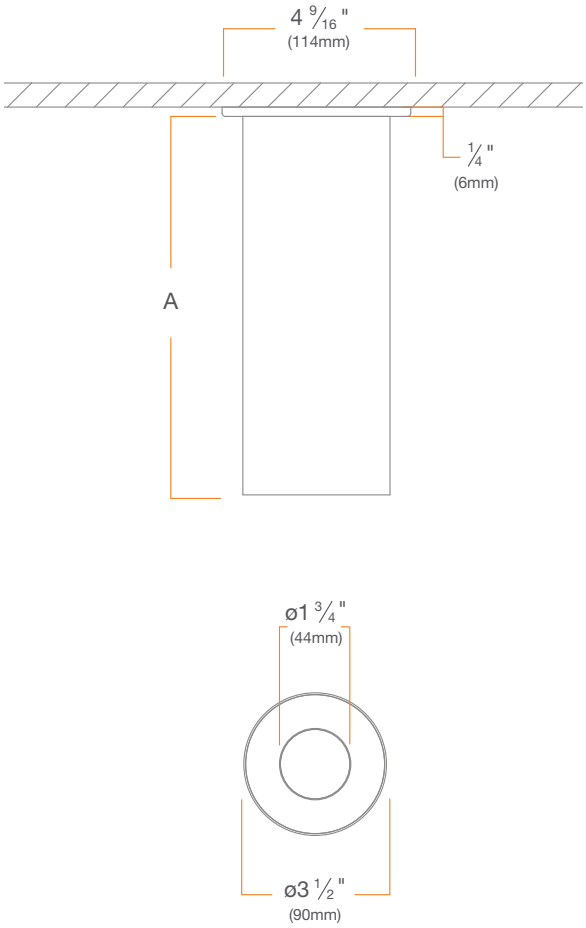
X Series Cylinder

3" Surface Mount

CYLINDER DIMENSION

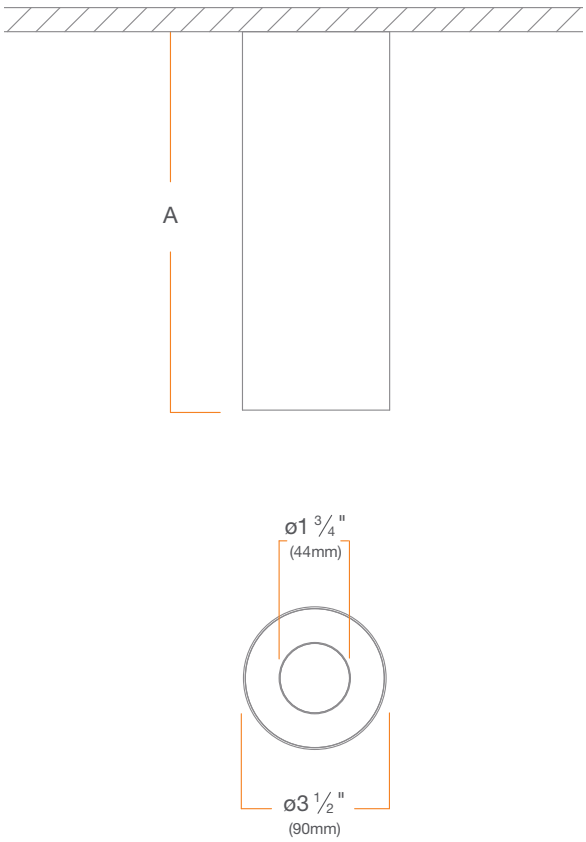
3" Surface Mount, Standard Canopy

XCSR9S



3" Surface Mount, Flangeless Canopy *

XCSR9F



A
6.5" [165 mm]
9" [229 mm]

** Only compatible with 3" Round Junction Box Extension*

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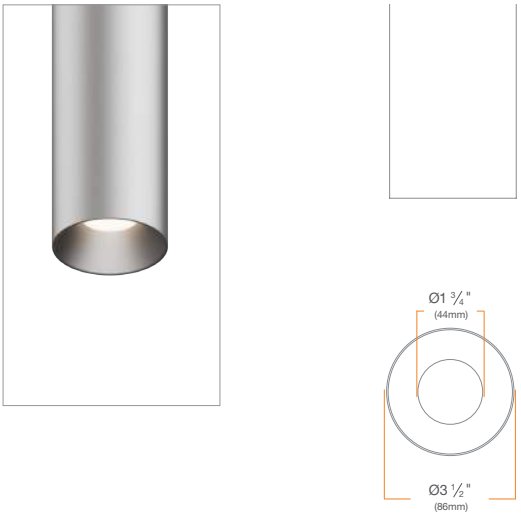
X Series Cylinder

3" Surface Mount

TRIMS + DOWNLIGHT MODULE

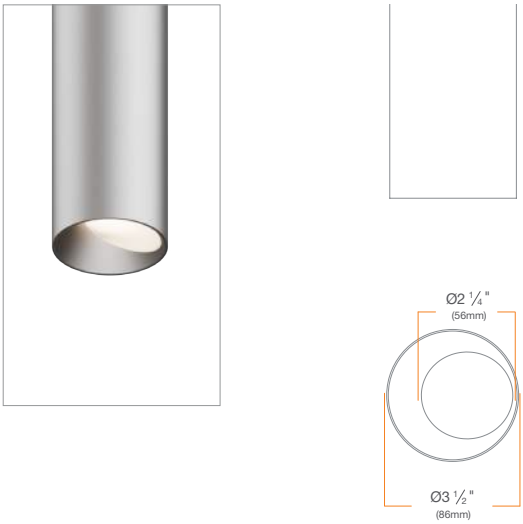
Standard Trim

XCCX-S



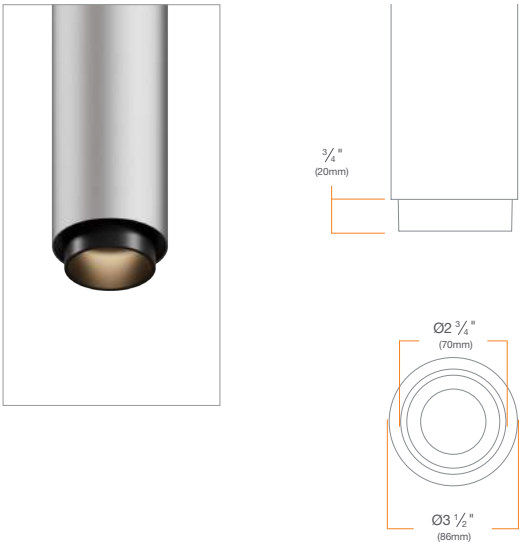
Wall Wash Trim

XCCX-W



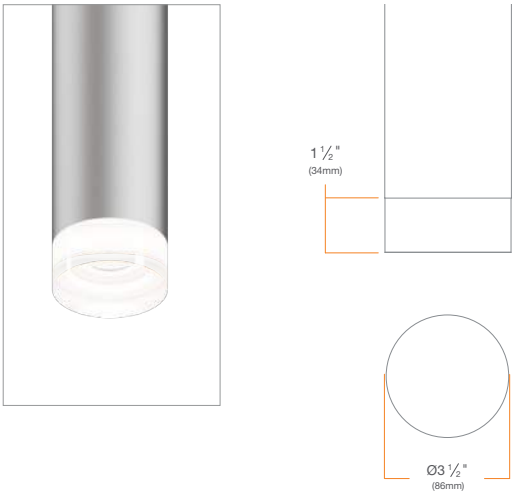
Snoot Trim

XCCX-N



Decorative Float Trim

XCCX-F



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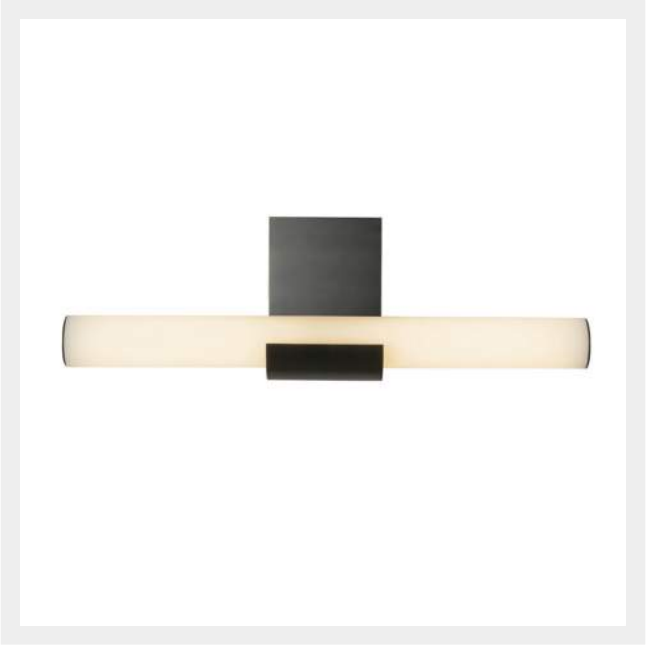
alora

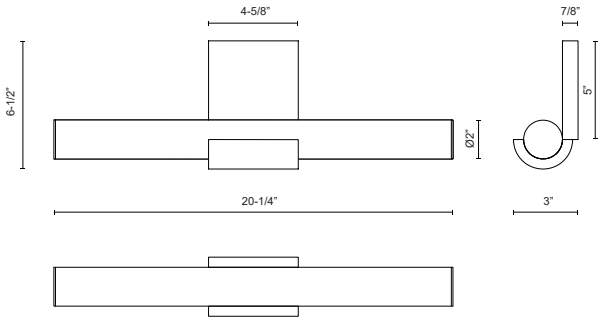
P. 1.855.855.8926
CANADA:19054 28TH Avenue Surrey - BC V3Z 6M3
USA: 3035 E. Lone Mountain Rd - Las Vegas, NV, 89081



APOLLO
WV353020

FIXTURE DIMENSIONS	W20-1/4" x H6-1/2" x E3"
HEIGHT FROM CENTER	4"
EXTENSION	3"
LIGHT SOURCE	LED with DC Driver
WATTAGE	13W
TOTAL LUMENS	860lm
DELIVERED LUMENS	505lm*
VOLTAGE	120V
COLOR TEMPERATURE	3000K
CRI (RA)	90CRI
DIMMABLE	Yes, TRIAC/ELV Dimmer (Not Included)
MATERIAL	Steel + Glass
SHADE DETAILS	Opal Glass Shade
ILLUMINATION DIRECTION	Omni-directional
INSTALL OPTIONS	Wall Mount, Up or Down
ADA COMPLIANT	YES
LOCATION	Damp
CEC TITLE 24 JA8	Yes, JA8-2022
CANOPY DIMENSIONS	W4-5/8" x H5" x E7/8"
PAINT FINISH	UB01; VB01;

[D - Diameter, L - Length, W - Width, H - Height, E - Extension]



AVAILABLE FINISHES:

WV353020UB
Urban Bronze

WV353020VB
Vintage Brass

*For complete warranty terms, please visit: www.aloralighting.com/warranty

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Intertek

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Downtown

Round Outdoor Ceiling Mount

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ FM-W47205 5"	❍ 3000K ❍ 3500K ❍ 4000K	❍ BK Black ❍ WT White	11.9W 11.9W 11.9W	900 925 950	607 647 618

Example: **FM-W47205-40-WT**

For custom requests please contact customs@waclighting.com

FEATURES

- Built in color temperature adjustability. Switch from 3000K/3500K/4000K
- Option to pre-select color temperature or adjust in the field
- ACLED driverless technology
- 5 Year warranty

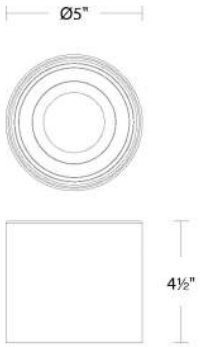
SPECIFICATIONS

Color Temp:	3500K,3000K,4000K
Input:	120 VAC,50/60Hz
CRI:	90
Dimming:	ELV: 100-10% ,TRIAC: 100-10%
Rated Life:	54000 Hours
Mounting:	Can be mounted on ceiling or wall in all orientations
Standards:	ETL, cETL,IP65,Title 24 JA8 Compliant Wet Location Listed
Construction:	Aluminum body, glass diffuser

FINISHES:

White Black

LINE DRAWING:



FM-W47205

PERFORMANCE iN LIGHTING | powered by GEWISS

PRODUCT CODE 071446
PROJECT
TYPE

BLIZ ROUND 30 HF

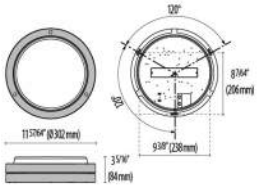
IP 65 | WET | 0-10 V | HF | cULus LISTED | ADAi

Part number	071446
Lampholder:	LED
Wattage:	30 W
Finishing:	GR-94 / Metallic grey / Textured
Degree of protection:	IP65
CRI:	80
Kelvin:	3000
Optic:	Symmetric Extra-Wide
Luminaire lumen output [lm]:	2178 lm
L:	L80
Lifetime:	60000 h
cULus:	
Voltage:	120/277 V
Min. ambient temperature [°C]:	-20
Max. ambient temperature [°C]:	35

Description

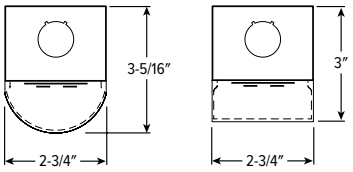
Ceiling- and wall- mount series. Fixtures consist of:
- Multi-step powder-coat painting process, optimized against UV rays and corrosion.
- Copper-free (<1%) precision die-cast aluminum housing and ring/faceplate.
- High transmittance, internally coated, pressed glass diffuser, thermally, and chemically quenched to strengthen the impact resistance and reduce the effect of rapid temperature changes.
- Custom molded, anti-aging gasket(s).
- Stainless steel external hardware.
- ustom MCPCB utilized to maximize heat dissipation and promote long LED life.
- 100% uniform diffused light emission.
- Input voltage: 120-277 V (50 / 60 Hz), integral 0-10 V dimming driver.
- Integral, high-frequency motion-sensor operating at a frequency of 5.8 GHz +/- 75 MHz (HF versions).
- The luminaire may be configured with numerous options and multiple standard finishes. Not all options are available in all configurations. Consult factory for more information about specification sheet details to build your light.
- Product meets Buy American Act (BAA) requirements within ARRA.
- 5-year warranty.

Technical drawings



75R | 75S LED Narrow Strip

Williams



75R Shown 75S Shown

CATALOG #:

TYPE:

PROJECT:

FEATURES

- Small fixture profile allows inconspicuous placement in coves or confined spaces
- Round and square lensed fixtures provide a clean look for architectural environments
- Row applications produce continuous light with minimal interruption between fixtures
- Diffuse acrylic lens enhances uniformity and minimizes glare
- Variety of mounting accessories for surface and suspended applications
- High-performance up to 157 lm/W
- Optional wireguard provides added protection
- Six standard finish options and a wide selection of custom colors complement the architectural elements of any space
- 2′, 3′, 4′, and 8′ lengths available
- Available on QuickShip
- Wireless in-fixture control solutions available
- Made Right Here® in the USA

SPECIFICATIONS

- HOUSING – 22-gauge die-formed C.R.S.
- SHIELDING – Diffuse acrylic standard. Frosted polycabonate available for 75R, specify FP Option.
- FINISH – 92% minimum average reflective white polyester powder coat bonded to phosphate-free, multi-stage pretreated metal. All parts painted after fabrication to facilitate installation, increase efficiency, and inhibit corrosion.
- ELECTRICAL – High-quality mid-power LED board. See fixture performance data for lumen maintenance. 25°C maximum ambient operating temperature. 40°C maximum ambient operating temperature with HA Option, lumen restrictions apply, see fixture performance data.
- MOUNTING – Surface (ceiling or wall) or suspended (hanging hardware required).
- LISTINGS –
  - cETLus conforms to UL STD 1598. Certified to CAN/CSA STD C22.2 No. 250.0. Suitable for damp locations
  - DesignLights Consortium qualified product. Not all versions of this product may be DLC qualified, see the DLC Qualified Products List at designlights.org/QPL.
  - Complies with the Buy American Act and other federal regulations. Request certification at hew.com/baa.
- WARRANTY – 5-year limited warranty, see hew.com/warranty.

ORDERING EXAMPLE: 75R - 4 - L85/835 - OPTIONS - CONTROL/DIM - UNV

ORDERING INFO

SERIES	LENGTH [1]	LUMENS [2]				CRI	CCT
		2′	3′	4′	8′		
75R Round lens	**2** 2′	**L15** 1,500lm	**L40** 4,000lm	**L30** 3,000lm	**L60** 6,000lm	**8** 80	**27** 2700K
75S Square lens	**3** 3′	**L25** 2,500lm	**L64** 6,400lm	**L50** 5,000lm	**L100** 10,000lm	**9** 90	**30** 3000K
	4 4′	**L32** 3,200lm		**L65** 6,500lm	**L130** 13,000lm		**35** 3500K
	8 8′ [3]	**L42** 4,200lm		**L85** 8,500lm	**L170** 17,000lm		**40** 4000K
				L100 10,000lm	**L200** 20,000lm		**50** 5000K

OPTIONS [4]

See page 3 for FINISH OPTIONS.

EM/10WLP	Low-profile 10-watt emergency battery [5]
EM/10WRM	Remote mount 10-watt emergency battery [6]
QC__	Quick-connect wiring harness [7]
WG-75	11-gauge white powder coat wireguard [8]
315	1-1/2″ ceiling spacer
VBY	(2) Y-hangers
VBY-2	(2) Y-hangers with 2′ chains
RA-75	Row aligner [9]
45AMB	(2) 45° adjustable mounting brackets [10]
HA	High ambient operating temperature, 40°C [11]
FP	Frosted polycarbonate lens for 75R
(L__)	Additional lower lumen packages available [12] Example: 7,000 nominal lumens = 75R-4-L85/835-**(L70)**
SP1	10kV surge protection, 120 or 277V
SP2	10kV surge protection, 208 or 240V
SP3	10kV surge protection, 347V

AIRCRAFT CABLES (EXAMPLE: ACF/D48) [13]

Prefix		Type		Length	
ACF/	Feeder	**D**	1″ grid & hardpan	**24**	24″
ACJ/	Joiner	**N**	9/16″ grid	**48**	48″
		S	Slot grid	**96**	96″

CONTROL [14]

See page 6 for ADDITIONAL CONTROL OPTIONS.

–	None
AVI-LVFA	Avi-on wireless fixture control [15]
AVI-LVFA-PIR	Avi-on wireless fixture control with high bay PIR motion and daylight sensor, bottom mount [16]
AVI-LVFA-CS2-PIR	Avi-on wireless fixture control with PIR motion and daylight sensor, bottom mount [17]
AWNR	Lutron Athena wireless node integral fixture control, RF only [18]
AWNS	Lutron Athena wireless node integral fixture control, RF with daylight and occupancy sensing [19]

DRIVER

See page 8 for ADDITIONAL DRIVER OPTIONS.

DIM	Driver with external 0-10V dimming wires
DRV	Driver without external dimming wires
DA	Driver with 12V auxiliary power, without external dimming wires [20]
DSR	Sensor-ready driver without external dimming wires (D4i DALI-2) [21]

VOLTAGE

120	120V
208	208V
240	240V
277	277V
UNV	120-277V
347	347V [22]

QUICKSHIP

75R-4-L50/835-QS-DIM-UNV	75S-4-L50/835-QS-DIM-UNV
75R-4-L50/840-QS-DIM-UNV	75S-4-L50/840-QS-DIM-UNV
75R-8-L100/835-QS-DIM-UNV	75S-8-L100/835-QS-DIM-UNV
75R-8-L100/840-QS-DIM-UNV	75S-8-L100/840-QS-DIM-UNV

NOTES

1 For actual length, see page 3 for FIXTURE DETAILS
2 Lumen output based on 80 CRI/3500K CCT. Actual performance may vary +/-5%, see page 2 for FIXTURE PERFORMANCE DATA. Additional lumen packages available, see options.
3 Ships with (2) 4′ lenses.
4 See page 4 for MOUNTING DETAILS.
5 Not available with 2′ fixtures.
6 See page 4 for MOUNTING DETAILS.
7 See page 3 for QUICK-CONNECT OPTIONS.
8 Shipped separately, field-installed.
9 Required when row mounting with aircraft cables.
10 Cord recommended, ships separately. See page 4 for MOUNTING DETAILS. Field-adjustable up and down in 7-1/2° increments.
11 Lumen restrictions apply. See page 2 for FIXTURE PERFORMANCE DATA.
12 Specify in increments of 100 nominal lumens. Option must be specified with next higher lumen package.
13 Units specified with aircraft cable require cord and RA-75 row aligner. See page 4 for MOUNTING DETAILS.
14 See page 4 for SENSOR & NODE PLACEMENT DETAILS. See page 5 for AVI-ON BLUETOOTH WIRELESS CONTROL DETAILS.
15 DA Driver only.
16 DA Driver only.
17 DA driver only.
18 DA and DSR Drivers only.
19 DA and DSR Drivers only.
20 Avi-on, Lutron Athena, and LV-ZLS05 Controls only.
21 Lutron Vive and Athena Controls only.
22 Not available with EM batteries, DA, or DSR drivers.

75R | 75S LED Narrow Strip

FIXTURE PERFORMANCE DATA

	LED PACKAGE	WATTAGE	DELIVERED LUMENS	EFFICACY (lm/W)	LUMEN MAINTENANCE [1]				AMBIENT TEMPERATURE [2]	
					L70	L80	L85	L90	EM	NO EM
2'	L15	10.8	1511	140	>72000	>72000	>72000	50,000	40	40
	L25	18.2	2470	136	>72000	>72000	>72000	50,000	40	40
	L32	21.3	2936	138	>72000	>72000	58,000	36,000	40	40
	L42	31.4	4124	132	>72000	>72000	58,000	36,000	35	40
3'	L40	28.2	3885	138	>72000	>72000	58,000	36,000	35	40
	L64	48.2	6259	130	>72,000	53,000	38,000	24,000	30	35
4'	L30	19.7	2916	148	>72000	>72000	>72000	50,000	40	40
	L50	33.0	4867	148	>72000	>72000	>72000	50,000	40	40
	L65	42.3	5994	142	>72000	>72000	58,000	36,000	40	40
	L85	56.2	8098	144	>72,000	53,000	38,000	24,000	35	40
	L100	68.3	9640	141	>72000	>72000	58,000	36,000	30	30
8'	L60	35.3	5520	157	>72000	>72000	>72000	50,000	40	40
	L100	65.9	9568	145	>72000	>72000	>72000	50,000	35	35
	L130	87.9	12353	141	>72000	>72000	58,000	36,000	35	35
	L170	112.4	16197	144	>72,000	53,000	38,000	24,000	35	35
	L200	136.5	19281	141	>72000	>72000	58,000	36,000	30	30

MULTIPLIER TABLES

	COLOR TEMPERATURE	
	CCT	CONVERSION FACTOR
80 CRI	2700K	0.97
	3000K	0.99
	3500K	1.00
	4000K	1.03
	5000K	1.06
90 CRI	2700K	0.80
	3000K	0.82
	3500K	0.83
	4000K	0.86
	5000K	0.89

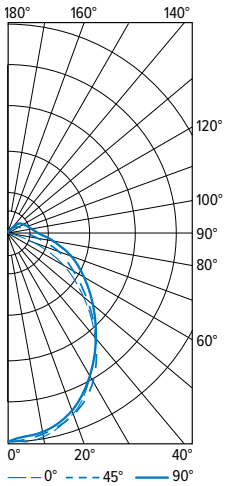
LENS	CONVERSION FACTOR
Standard	1.00
FP Option	0.95

- Photometrics tested in accordance with IESNA LM-79. Results based on 80 CRI/3500K CCT, average wattage for 120V through 277V input, and 25°C ambient temperature. Actual performance may vary +/-5%.
- To calculate lumen output in emergency mode, multiply the battery wattage by the efficacy.
- Use multiplier tables to calculate additional options.

[1] Predicted lumen maintenance calculated in accordance with IES TM-21 per Energy Star (R) TM-21 Calculator rev. 02.08.16.
[2] Maximum ambient operating temperature (°C) when specified with HA option.

PHOTOMETRY

75R-4-L85/835 Total Luminaire Output: 8098 lumens; 56.2 Watts | Efficacy: 144 lm/W | 80 CRI; 3500K CCT



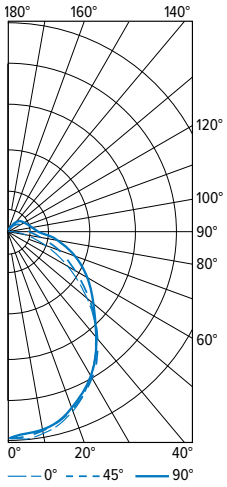
CANDLEPOWER DISTRIBUTION	VERTICAL ANGLE	HORIZONTAL ANGLE			ZONAL LUMENS
		0°	45°	90°	
	0	2594	2594	2594	
	5	2622	2585	2553	246
	15	2503	2497	2480	703
	25	2256	2306	2324	1059
	35	1915	2042	2111	1264
	45	1481	1673	1824	1281
	55	1003	1296	1488	1135
	65	620	942	1117	891
	75	267	630	775	613
	85	63	401	501	378
	90	9	311	407	
	95	1	249	329	225
	105	0	150	219	136
	115	0	94	149	83
	125	0	53	102	47
	135	0	28	63	24
	145	0	12	35	10
	155	0	6	16	3
	165	0	0	4	0
	175	0	0	0	0
	180	0	0	0	

LUMEN SUMMARY	ZONE	LUMENS	% FIXTURE
	0 - 30	2008	25
	0 - 40	3272	40
	0 - 60	5688	70
	0 - 90	7570	94
	90 - 120	443	6
	90 - 150	524	7
	90 - 180	527	7
	0 - 180	8098	100

PHOTOMETRY CONTINUED ON NEXT PAGE.

75R | 75S LED Narrow Strip

75S-4-L85/835 Total Luminaire Output: 8098 lumens; 56.2 Watts | Efficacy: 144 lm/ W | 80 CRI; 3500K CCT

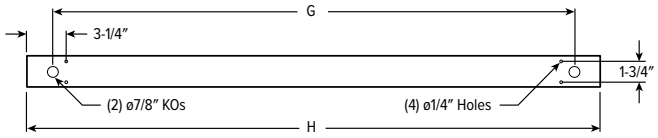


CANDLEPOWER DISTRIBUTION	HORIZONTAL ANGLE			ZONAL LUMENS
VERTICAL ANGLE	0°	45°	90°	
0	2732	2732	2732	
5	2756	2720	2682	258
15	2633	2611	2579	734
25	2351	2362	2323	1083
35	1969	2010	1965	1247
45	1516	1554	1583	1209
55	1053	1160	1291	1051
65	618	840	1022	826
75	270	542	745	563
85	47	323	491	332
90	0	246	390	
95	0	230	344	223
105	0	200	291	185
115	0	171	256	149
125	0	139	216	110
135	0	96	166	71
145	0	58	113	38
155	0	36	63	16
165	0	17	31	4
175	0	0	0	0
180	0	0	0	

LUMEN SUMMARY			
ZONE	LUMENS	% FIXTURE	
0 - 30	2075	26	
0 - 40	3321	41	
0 - 60	5581	69	
0 - 90	7301	90	
90 - 120	557	7	
90 - 150	777	10	
90 - 180	797	10	
0 - 180	8098	100	

FIXTURE DETAILS

BACKVIEW



	7/8" KOs (G)	ACTUAL FIXTURE LENGTH (H)
2'	18-3/8"	22-1/2"
3'	29-1/2"	33-9/16"
4'	40-1/2"	44-5/8"
8'	85-1/8"	89-1/4"

QUICK-CONNECT OPTIONS

Note: Quick-connect wiring required for row mounting. All QC harnesses contain (5) 16ga conductors plus ground.

DESIGNATION	NUMBER OF 16GA WIRES FACTORY CONNECTED (EXCLUDING GROUND)	WIRE COLOR/POWER SUPPLY FACTORY CONNECTIONS	TYPICAL USE
QCBW	2	Black, White	On/off switching (DRV) or line voltage dimming (DIM LINE)
QCRW	2	Red, White	Alternating circuits on/off switching (DRV) or line voltage dimming (DIM LINE)
QCBRW	3	Black, Red, White	On/off switching (DRV) or line voltage dimming when equipped with EM battery packs
QCBW/PK	4	Black, White, Purple, Pink	Single circuit with 0-10V low voltage dimming (DIM)
QCRW/PK	4	Red, White, Purple, Pink	Alternating circuits on/off switching with 0-10V low voltage dimming (DIM)
QCBRW/PK	5	Black, Red, White, Purple, Pink	On/off switching when equipped with EM battery packs and 0-10V dimming (DIM)
QCBW/RPK	5	Black, White, Red, Purple, Pink	On/off switching with 0-10v dimming and 0-10v tunable using shared common
QCUU	N/A	N/A	QC harness passes through fixture, but is not connected to it

FINISH OPTIONS

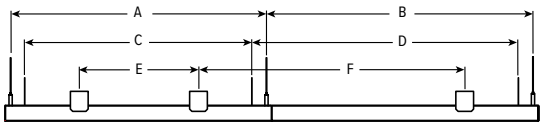
WHITE BLACK BRONZE NICKEL SILVER ALUM

For custom color, please specify RAL code or a manufacturer code with description. All custom colors other than RAL require two sample swatches, minimum 1" square.

75R | 75S LED Narrow Strip

MOUNTING DETAILS

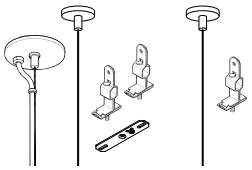
STAND ALONE SUBSEQUENT



MOUNTING LENGTH

	AIRCRAFT CABLE		VBY HANGER		315 SPACER	
	A	B	C	D	E	F
2′	21-1/2″	22-1/2″	19″	22-1/2″	10″	22-1/2″
3′	32-1/2″	33-9/16″	30-1/16″	33-9/16″	21″	33-9/16″
4′	43-5/8″	44-5/8″	41-1/4″	44-5/8″	32″	44-5/8″
8′	88-3/16″	89-1/4″	85″	89-1/4″	77″	89-1/4″

STANDARD HARDWARE FOR SUSPENDED PRODUCT (Grid and Hardpan)



Feeder/Stand-Alone Joiner

Notes:

- Fixtures are provided with adjustable length aircraft cables and mounting hardware, must specify.
- Electrical supply is brought into the feeder fixture, either as part of a row or as a stand-alone unit. Joiner fixtures complete the row.
- The feeder kits are standard with a 5″ canopy to cover the junction box and a 2″ canopy at the non-feed point. No J-box is required at non-feed points.

CORD FOR SUSPENDED PRODUCT

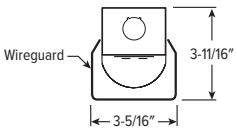
Units specified with aircraft cable require cord. Please specify cord type using ordering information below. Long fixture rows may require multiple feed points based on 18ga conductor size.

EXAMPLE: S2438D/W				
CORD TYPE	LENGTH	# OF COND.[1]	WIRE SIZE	COLOR
S	**24** 24″ **48** 48″ **96** 96″	**3** **4** **5** **6**	**8D** 18ga	**/W** White **/B** Black

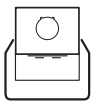
1 Includes (2) 22ga purple & pink dimming conductors

WG-75

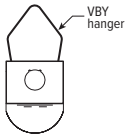
75R



75S



VBY



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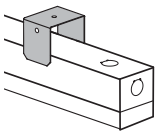
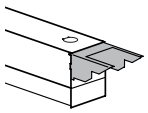
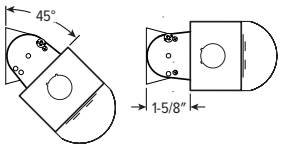


RA-75

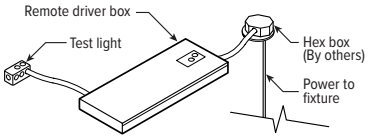


45AMB



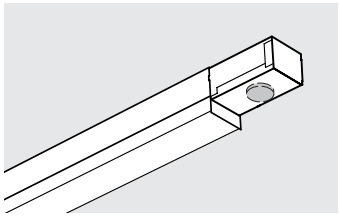
REMOTE MOUNT BATTERY

Max remote distance 50′.

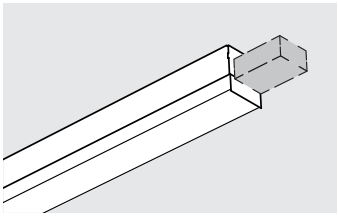


SENSOR & NODE PLACEMENT DETAILS

AVI-LVFA | AWNS | VDO | WS-FSP | LV-ZLS05



LV-OSFHU | SS-LSXR



SEE NEXT PAGE FOR CONTROL DETAILS.

75R | 75S LED Narrow Strip

AVI-ON BLUETOOTH WIRELESS CONTROL DETAILS

FEATURES

Simple

- Gateway-free distributed control
- Factory pre-commissioning
- Contractor friendly installation
- Occupancy/vacancy/daylight sensing

Scalable

- Virtually unlimited network size
- Spans small areas to large garages
- Flexible control strategies

Secure

- Optional cloud connectivity
- UL IoT platinum security rating
- DLC 5.0 compliant

COMMISSIONING & INSTALLATION TOOLS

Avi-on mobile apps provide intuitive, quick installation and commissioning. Pro tools are available to qualified installers. Live commissioning training and on-site or remote support by Avi-on must be ordered separately through Avi-on.

Commissioning Mobile App

Zone Scanner Web App

Commissioning Pro App

SYSTEM COMPONENTS

The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Avi-on is under license. Other trademarks and trade names are those of their respective owners.

ACCESSORIES

WALL STATIONS	
AVI-2401AC	Scene controller - numbered 1-4, 120-277VAC
AVI-2402BAT	Scene controller - numbered 1-4, battery powered
AVI-2401AC-2	Dimmer with presets - percentages, 120-277VAC
AVI-2402BAT-2	Dimmer with presets - percentages, battery powered
AVI-2401AC-3	On/off/dimming, 120-277VAC
AVI-2402BAT-3	On/off/dimming, battery powered

NETWORK	
AVI-RAB-LTE	Remote access bridge
AVI-KIT-NTM	Network time manager with battery backup
CEILING MOUNT SENSORS	
AVI-KIT-SEN-DUCM	PIR motion and ultrasonic sensor kit
AVI-KIT-SEN-ICM	PIR motion and photocell sensor kit

For load controllers and additional accessory info, see hew.com/avi-on

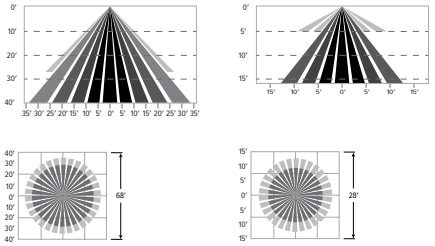
AVI-LVFA-PIR Avi-on wireless fixture control with high bay PIR motion and daylight sensor, bottom mount. DA Driver only.

SPECIFICATIONS	
TYPE	PIR Motion + Daylight
MOUNTING HEIGHT	8′ – 45′
LENS	Single lens detects high and low bay motion.
DETECTION ANGLE	360°
TEMPERATURE RANGE	-30° to 70°C
RELATIVE HUMIDITY	90 to 95% at 30°C
COMMISSIONING	App (iOS or Android)
SYSTEM REQUIREMENTS	Avi-On wireless fixture controls plus desktop and mobile apps
MANUFACTURER	Avi-On

SENSOR COVERAGE PATTERNS

Large motion
40′ height: ø68′ coverage

Small motion
15′ height: ø28′ coverage



SENSOR DETAIL

Dimensions: 2-5/16″ x 1-7/16″

75R | 75S LED Narrow Strip

AVI-LVFA-CS2-PIR Avi-on wireless fixture control with PIR motion and daylight sensor. DA Driver only.

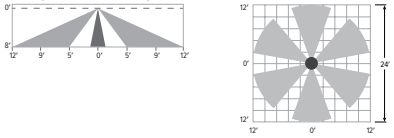
SPECIFICATIONS	
TYPE	PIR Motion + Daylight
MOUNTING HEIGHT	8′ – 10′
DETECTION ANGLE	360°
TEMPERATURE RANGE	-30° to 50°C
RELATIVE HUMIDITY	10 to 80% non-condensing
IP RATING	IP20
MANUFACTURER	Avi-On

avi-on Bluetooth® Lighting Controls

SENSOR COVERAGE PATTERNS

Side View

8′ height: ø24′ coverage



SENSOR DETAIL

Dimensions: 13/16″ x 2-1/4″

ADDITIONAL CONTROL OPTIONS

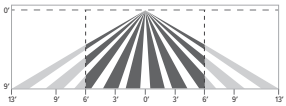
AWNS Lutron Athena wireless node integral fixture control, RF with daylight and occupancy sensing. DA and DSR Drivers only.

SPECIFICATIONS	
TYPE	Radio Frequency
MOUNTING HEIGHT	8′ – 12′
DETECTION ANGLE	360°
TEMPERATURE RANGE	0° to 55°C
RELATIVE HUMIDITY	0 to 90%, non-condensing
COMMISSIONING	Clear Connect gateway – Type X with app (iOS or Android)
MANUFACTURER	Lutron

LUTRON

SENSOR COVERAGE PATTERNS

9′ height: ø12′ coverage



Motion Sensor Coverage

CEILING HEIGHT	COVERAGE AREA (SQ FT)
8′	114
9′	144
10′	178
12′	256

SENSOR DETAIL

Dimensions: ø1-1/8″

ATHENA CONTROL OPTIONS

CATALOG NUMBER	DESCRIPTION
AWNR	Lutron Athena wireless node integral fixture control, RF only, for use with D4i DALI-2 or driver with 12V auxiliary power.
AWNS	Lutron Athena wireless node integral fixture control, RF with daylight and occupancy sensing, for use with D4i DALI-2 or driver with 12V auxiliary power.
AWNR-BL	Lutron Athena wireless node integral fixture control, RF only, for use with D4i DALI-2 or driver with 12V auxiliary power, black finish.
AWNS-BL	Lutron Athena wireless node integral fixture control, RF with daylight and occupancy sensing, for use with D4i DALI-2 or driver with 12V auxiliary power, black finish.

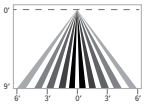
75R | 75S LED Narrow Strip

VDO Lutron Vive integral fixture control, RF with daylight and occupancy sensor (DFCSJ-OEM-OCC). DSR or LDE Drivers only. LDE drivers require driver interface

SPECIFICATIONS	
TYPE	PIR Motion + Daylight
MOUNTING HEIGHT	8′ – 12′
DETECTION ANGLE	360°
TEMPERATURE RANGE	0° to 55°C
RELATIVE HUMIDITY	0 to 90%, non-condensing
COMMISSIONING	App (iOS or Android)
MANUFACTURER	Lutron

SENSOR COVERAGE PATTERNS

9′ height: ø12′ coverage



Motion Sensor Coverage

CEILING HEIGHT	COVERAGE AREA (SQ FT)
8′	114
9′	144
10′	178
12′	256

SENSOR DETAIL

Dimensions: 2-11/16″ x 1″

VIVE CONTROL OPTIONS

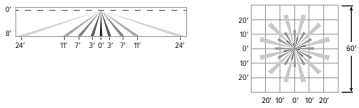
CATALOG NUMBER	DESCRIPTION
VRF	Lutron Vive integral fixture control, RF only (DFCSJ-OEM-RF), for use with sensor-ready driver
VDO	Lutron Vive integral fixture control, RF with daylight and occupancy sensor (DFCSJ-OEM-OCC), for use with sensor-ready driver
VRF/DBI	Lutron Vive integral fixture control, RF only (DFCSJ-OEM-RF) and digital link interface, for use with Lutron Hi-lume 1% EcoSystem dimming LED driver
VDO/DBI	Lutron Vive integral fixture control, RF with daylight and occupancy sensor (DFCSJ-OEM-OCC) and digital link interface, for use with Lutron Hi-lume 1% EcoSystem dimming LED driver

OCCWS-FSP-311-L_-120/277 Wattstopper PIR motion and daylight sensor, 120/277. Must specify lens: L2, L3, or L7. Factory installed.
OCCWS-FSP-211-L_-120/277 Wattstopper PIR motion and daylight sensor, 120/277. Must specify lens: L2, L3, or L7. Factory installed.
FSIR-100 Remote controller for 211 sensor. Please specify quantity required per project. Ordered and shipped separately.

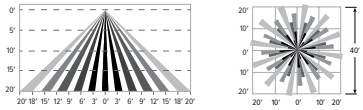
SPECIFICATIONS	
TYPE	PIR Motion + Daylight
MOUNTING HEIGHT	8′ – 40′
DETECTION ANGLE	360°
TEMPERATURE RANGE	-40° to 75°C
COMMISSIONING	311 Sensor: App (iOS or Android) 211 Sensor: FSIR-100 Remote

SENSOR COVERAGE PATTERNS

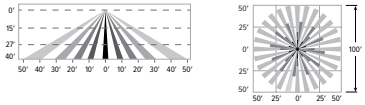
L2 8′ height: ø48′ coverage



L3 20′ height: ø40′ coverage



L7 40′ height: ø100′ coverage



SENSOR DETAIL

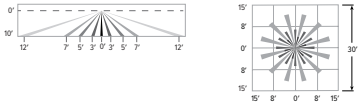
Dimensions
L2/L3: ø2-3/8″ | L7: ø3-1/4″

LV-ZLS05-ILW Leviton PIR motion and daylight sensor. DA Driver only. Adjustable via remote. Optional ZLS0R-RA1 remote controller available.
ZLSOR-RA1 Remote controller for ZLS05 sensor. Please specify quantity required per project. Ordered and shipped separately.

SPECIFICATIONS	
TYPE	PIR Motion + Daylight
MOUNTING HEIGHT	8′ – 10′
DETECTION ANGLE	120°
TEMPERATURE RANGE	-20° to 70°C
COMMISSIONING	DIP switches or optional remote: ZLSOR-RA1

SENSOR COVERAGE PATTERNS

10′ height: ø24′ coverage



SENSOR DETAIL

Dimensions: ø1-5/16″

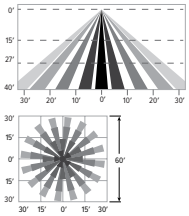
75R | 75S LED Narrow Strip

OCCLV-OSFHU-ITW-120-347 Leviton PIR motion sensor, 120-347V.

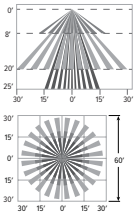
SPECIFICATIONS	
TYPE	PIR Motion
MOUNTING HEIGHT	8′ – 40′
LENS	Interchangeable high bay, low bay or aisle mask
DETECTION ANGLE	360°
TEMPERATURE RANGE	-10° to 71°C
RELATIVE HUMIDITY	20% to 90% non-condensing

SENSOR COVERAGE PATTERNS

High bay
40′ height: ø60′ coverage



Low bay
25′ height: ø60′ coverage



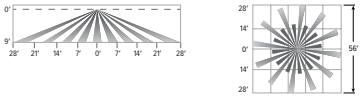
SENSOR DETAIL

OCCSS LSXR-10-120-277 Sensor Switch PIR motion sensor, 120-277V
OCCSS LSXR-10-347/480 Sensor Switch PIR motion sensor, 347/480V

SPECIFICATIONS	
TYPE	PIR Motion
MOUNTING HEIGHT	7′ – 15′
DETECTION ANGLE	360°
TEMPERATURE RANGE	-10° to 60°C
RELATIVE HUMIDITY	Up to 90% non-condensing

SENSOR COVERAGE PATTERNS

9′ height: ø56′ coverage



SENSOR DETAIL

ADDITIONAL DRIVER OPTIONS

Note: Lumen restrictions apply, consult product builder at hew.com/product-builder.

CATALOG NUMBER	DESCRIPTION
DRV	Driver prewired for non-dimming applications
DIM	Dimming driver prewired for 0-10V low voltage applications
DIM1	1% dimming driver prewired for 0-10V low voltage applications
DIM LINE	Line voltage dimming driver (TRIAC and ELV compatible, 120V only)
DIM TRC	Line voltage dimming driver (TRIAC compatible, 120V only)
DA	Driver with 12V auxiliary power
DSR	Sensor-ready driver (D4i DALI-2)
SD40	40% step-dimming driver
SD50	50% step-dimming driver
DALI	DALI dimming driver
LDE1	Lutron Hi-lume 1% EcoSystem dimming driver

cerno

36", dark stained walnut, frosted polymer

18", walnut, brushed brass

18", walnut, matte black with matte white

The Plura is a simple, straight forward fixture that is excellently executed. With the Plura it was about resolving the seams and edges and their relationships to one another. The result is a scalable fixture that has a sharp, sophisticated feel.

Nick Sheridan, Designer

walnut (CM-001)

dark stained walnut (CM-002)

white washed oak (CM-095)

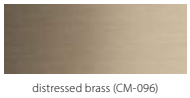
frosted polymer (CM-051)

matte black (CM-085) with matte white interior

brushed aluminum (CM-012)

brushed rose gold (CM-046)

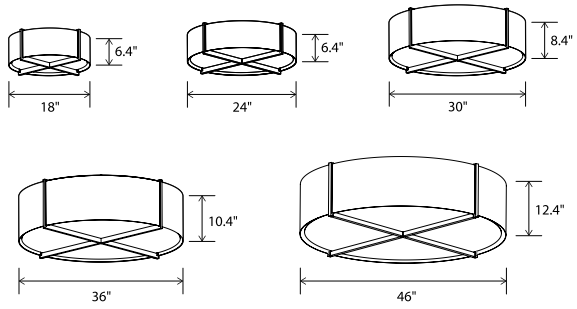
brushed brass (CM-047)



distressed brass (CM-096)

gloss white (CM-054)

Plura flush mount



Dimensions:
Plura 18: 18" Ø, 6.4"
Plura 24: 24" Ø, 6.4"
Plura 30: 30" Ø, 8.4""
Plura 36: 36" Ø, 10.4"
Plura 46: 46" Ø, 12.4"
Materials: solid wood, polymer
Product weight:
Plura 18: 5 lb
Plura 24: 6 lb
Plura 30: 9 lb
Plura 36: 13 lb
Plura 46: 20 lb

Integrated LED Specifications
Light output:
Plura 18 & 24: 1690 Lumens (source)
Plura 30, 36, & 46: 2815 Lumens (source)
Light color: 2700 K, 3000 K, 3500 K, or 4000 K
Color accuracy: 90+ CRI
Power usage:
Plura 18 & 24: 19.5 W
Plura 30, 36, & 46: 32.5 W
Dimmable (see driver below)

GU-24 Base Specifications
Light source:
Plura 18 & 24: 2x GU-24 base socket
Plura 30, 36, & 46: 4x GU-24 base socket
Lamping:
Plura 18 & 24: 2x GU-24 base self-ballasted bulbs, 18 W max each
Plura 30, 36, & 46: 4x GU-24 base self-ballasted bulbs, 18 W max each
Bulbs not included
Input voltage: 300 V AC max

Wood grain will vary
Specifications subject to change

Emergency backup option available upon request.

Also available in a pendant version.

MATERIAL & FINISH OPTIONS

Plura flush mount part # 08-100- - -

Size

18" Ø	**18**
24" Ø	**24**
30" Ø	**30**
36" Ø	**36**
46" Ø	**46**

Wood Body

walnut (CM-001)	**W**
dark stained walnut (CM-002)	**D**
white washed oak (CM-095)	**O**

Shade Material

frosted polymer (CM-051)	**F**
matte black (CM-085) with matte white interior	**B**
brushed aluminum (CM-012)	**A**
brushed rose gold (CM-046)	**G**
brushed brass (CM-047)	**R**
distressed brass (CM-096)	**D**
gloss white (CM-054)	**W**

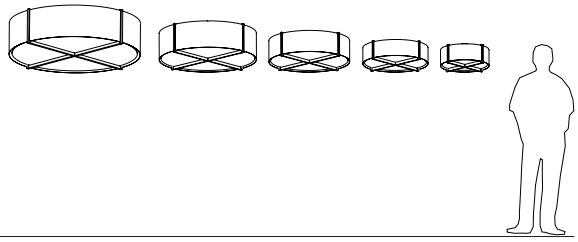
Lamping

2700 K LED	**27**
3000 K LED	**30**
3500 K LED	**35**
4000 K LED	**40**
GU-24 base sockets	**GU**

Driver (LED version only)

AC Input Voltage Range: 120-277 V 120 V input: TRIAC, ELV & 0-10 V dimmable 240 & 277 V input: only 0-10 V dimmable	**P1**

Includes: frosted polymer (CM-051)



⚠**WARNING.** California Proposition 65 Warning for California Consumers. This product can expose you to chemicals including wood dust and lead which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

BIRCH
FM53512

FLUSH MOUNT

PROJECT

FM53512-BK/CL
Black/Clear

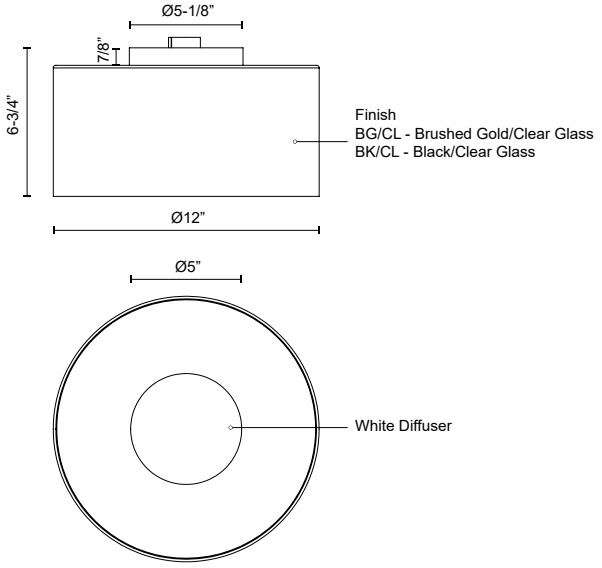
FM53512-BG/CL
Brushed Gold/Clear

DESCRIPTION

If warm candlelight is what you're after, look no further than the Birch Collection. Clear glass cylinders with frosted glass diffusers give the distinguished look of soft, lit candles for a clean, romantic feel that plays well in various spaces. Available in Brushed Gold or Powder-Coated Black

SPECIFICATION DETAILS

Fixture Dimensions	D12" x H6-3/4"
Light Source	DC LED WITH DRIVER
Wattage	13W
Total Lumens	1360lm
Delivered Lumens	1235lm
Voltage	120V
Color Temperature	3000K
CRI (Ra)	90CRI
Optional Color Temps	2700K - 5000K Available, Minimum Order Quantities Apply
LED Rated Life	50,000 hours
Dimming	100% - 10%, TRIAC or ELV Dimmer (Not Included)
Diffuser Details	White Diffuser (interior)
Glass Details	Clear Glass (exterior)
Location	Damp
Illumination Direction	Down
CEC Title 24 JA8	Yes, JA8-2022
Canopy Dimensions	D5-1/8" x H7/8"
Paint Finish	BG01; BK02;



* For custom options, consult factory for details.
* For warranty information, please visit www.kuzcolighting.com/warranty

KUZCO

CANADA: 19054 28TH AVENUE - SURREY, BC V3Z 6M3
USA: 3035 E. LONE MOUNTAIN ROAD - LAS VEGAS, NV 89081

WWW.KUZCOLIGHTING.COM

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COMMENT

Intertek

KUZCO
19054 28th Avenue
Surrey, BC, Canada
V3Z 6M3

T: 604 538 7162
F: 604 538 7196
W: Kuzcolighting.com

SUGGESTED DIMMERS FOR KUZCO LED WITH DC DRIVER PRODUCTS

Brand	Dimmer Model	Dimmer Type
Lutron	DVCL-153P	TRIAC/MLV
Lutron	SCL-153P	TRIAC/MLV
Leviton	IPL06-10Z	TRIAC/MLV
Lutron	DVELV-300P	ELV
Lutron	DVELV-303P	ELV
Lutron	SELV-300P	ELV
Lutron	SELVB-300-PR	ELV
Leviton	DSE06-10Z	ELV
Leviton	IPE04-1LZ	ELV
Leviton	VPE06-1LZ	ELV

BIRCH
WS53505

WALL

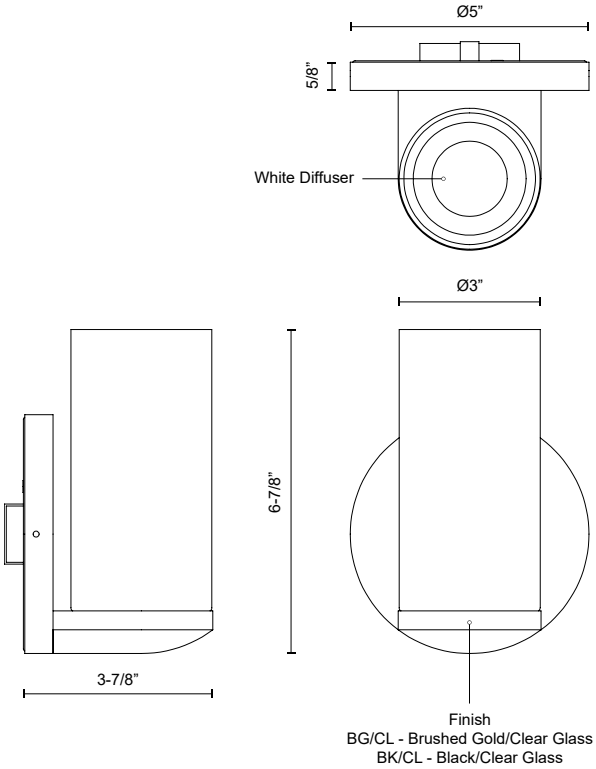
PROJECT

WS53505-BG/CL
Brushed Gold/Clear

WS53505-BK/CL
Black/Clear

DESCRIPTION

If warm candlelight is what you're after, look no further than the Birch Collection. Clear glass cylinders with frosted glass diffusers give the distinguished look of soft, lit candles for a clean, romantic feel that plays well in various spaces. Available in Brushed Gold or Powder-Coated Black



SPECIFICATION DETAILS

Fixture Dimensions	W3" x H6-7/8" x E3-7/8"
Light Source	DC LED WITH DRIVER
Wattage	11W
Total Lumens	935lm
Delivered Lumens	BG/CL-735lm; BK/CL-684lm;
Voltage	120V
Color Temperature	3000K
CRI (Ra)	90CRI
Optional Color Temps	2700K - 5000K Available, Minimum Order Quantities Apply
LED Rated Life	50,000 hours
Dimming	100% - 10%, TRIAC or ELV Dimmer (Not Included)
Diffuser Details	White Diffuser (interior)
Glass Details	Clear Glass (exterior)
ADA Compliant	Yes
Location	Damp
Illumination Direction	Up or Down
Mounting Style	Up or Down
CEC Title 24 JA8	Yes, JA8-2022
Canopy Dimensions	D5" x H5/8"
Paint Finish	BG02; BK02;

* For custom options, consult factory for details.
* For warranty information, please visit www.kuzcolighting.com/warranty

KUZCO

CANADA: 19054 28TH AVENUE - SURREY, BC V3Z 6M3
USA: 3035 E. LONE MOUNTAIN ROAD - LAS VEGAS, NV 89081

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COMMENT

Intertek

VISUAL COMFORT & CO. | ARCHITECTURAL COLLECTION
FORMERLY KNOWN AS TECH LIGHTING

VERSE™ 3" LED

FIXED AND WALL WASH DOWNLIGHTS

The VERSE 3" LED Fixed and Wall Wash Downlights offer a cost-effective alternative for residential, multifamily and hospitality applications without sacrificing aesthetics or quality. VERSE is IC-rated and provides a minimal profile without the need for a large housing. The LED subassembly and driver ship integrated with the housing which eliminates a second wiring step after the ceiling is installed.

- 950 lumens
- 2700K and 3000K; 90+ CRI
- Easy installation
- Light source is integrated as part of the housing
- One housing for round and square trim options
- 4.2" tall housing fits into shallow plenums
- Collar notches assist in the alignment of multiple housings
- By removing the LED module, the housing can be used as a standard junction box for pendants or other light fixtures
- IC-rated, airtight, wet-rated, certified for UL 514A standards, code compliant for use in fire-rated assemblies up to a maximum of 2 hours per International Building Code Section 714
- Patent pending

FIXED

WALL WASH

SPECIFICATIONS

	FIXED		WALL WASH	
	2700K	3000K	2700K	3000K
DELIVERED LUMENS	903	950	713	750
WATTS	9W			
EFFICACY	100	106	79	83
CRI	90+			
COLOR CONSISTENCY	3-step			
INPUT VOLTAGE	120V			
DIMMING[1]	Reverse phase, Forward phase, and Triac dimming down to 2% to 4% with several dimmers			
POWER SUPPLY	Constant current driver with .99 power factor and +80% efficiency			
OPTICS	Diffused lens provides 85° beam spread		Asymmetric Wall Wash	
CEILING APPEARANCE	Flanged up to 3/4" ceiling thickness			
CEILING APERTURE	4" ceiling cutout | 2" aperture			
HOUSING	IC Airtight; suitable up to R60 spray foam insulation			
CONSTRUCTION	Housing: Galvanized Steel Trims: Die-Cast Aluminum			
FINISH	White (field paintable)			
GENERAL LISTINGS	ETL listed. Wet-rated. Code compliant for use in fire-rated assemblies up to a maximum of 2 hours.			
CALIFORNIA TITLE 24	Registered CEC Appliance Database. Complies with CEC 2019 Title 24 Part 6 (JA8-2016, JA8-2019).			
L70	50,000 hours min			
WARRANTY[2]	5 years			

Ordering grids available on page 2.

[1]See visualcomfort.com for dimmer compatibility.
[2]Visit visualcomfort.com for specific warranty limitations and details.

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UPDATED 6/15/23

VISUAL COMFORT & CO. | ARCHITECTURAL COLLECTION

FORMERLY KNOWN AS TECH LIGHTING

VERSE™ 3" LED

FIXED AND WALL WASH DOWNLIGHTS

ORDERING INFORMATION

HOUSING

ITEM NUMBER	DESCRIPTION
V3R27	VERSE 3" NEW CONSTRUCTION | 2700K
V3R30	VERSE 3" NEW CONSTRUCTION | 3000K

Trims are required and must be ordered separately.
All housings are IC-rated, airtight, fire-rated, and wet-rated.
All modules are 120V.

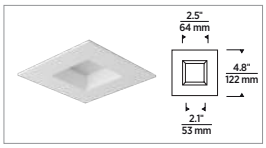
TRIM

ITEM NUMBER	DESCRIPTION
V3RDWH	VERSE 3" | ROUND | FIXED
V3RWWH	VERSE 3" | ROUND | WALL WASH
V3SDWH	VERSE 3" | SQUARE | FIXED
V3SWWH	VERSE 3" | SQUARE | WALL WASH

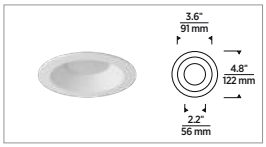
All trims are flanged white.

TRIMS

FIXED

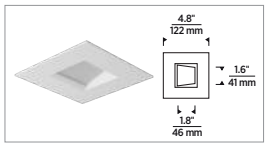


SQUARE FLANGED

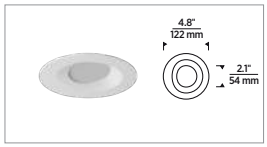


ROUND FLANGED

WALL WASH



SQUARE FLANGED



ROUND FLANGED

HOUSING

IC AIRTIGHT

Must be installed in a joist ceiling. Not compatible with grid ceilings.

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VISUAL COMFORT & CO. | ARCHITECTURAL COLLECTION
FORMERLY KNOWN AS TECH LIGHTING

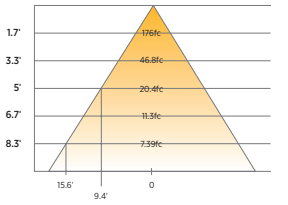
VERSE™ 3" LED

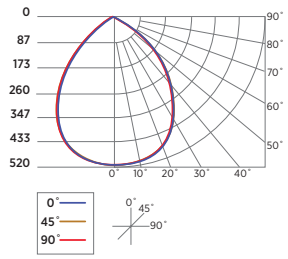
FIXED AND WALL WASH DOWNLIGHTS

PHOTOMETRICS

Description:	3" LED Downlight 3000K
Model:	Verse 9W Fixed
Input Power (Watts):	8.85
Input Power Factor:	0.99
Absolute Luminous Flux (Lumens):	936
Lumen Efficacy (Lumens per Watt):	105.7

ANGLE	0°	45°	90°
0°	509	509	509
5°	505	507	507
10°	501	503	501
15°	492	491	487
20°	475	470	465
25°	449	441	433
30°	413	402	394
35°	367	355	346
40°	312	300	291
45°	255	242	233
50°	190	177	168
55°	126	117	111
60°	79	72	69
65°	46	42	41
70°	25	22	22
75°	12	10	10
80°	5	4	4
85°	2	2	2
90°	0	0	0





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UNDER-CABINET LIGHT (GKUC21-609) by Minka George Kovacs

LED UNDER-CABINET - LIGHT BAR-FOR USE WITH UNDER-CABINET PRODUCTS.

Product Specification

Item #	GKUC21-609
Dimensions	Height: 1.25" Width: 1.00" Length: 21.00"

Additional product details

Vendor Item #	GKUC21-609
Category	Undercabinet
Subcategory	Fluorescent Undercabinet Lights
Finish	Silver
Style	Contemporary
Option	Dry Rated , LED
Glass Finish Or Style	White/Off-White
Location Rating	Dry Rated
Wattage	8w

Category	Led Fixtures
Finish	Silver
Style	Contemporary
Option	Dry Rated , ETL Approved
Glass	White
Shade	Acrylic
Number Of Bulbs	1 Bulbs
Bulb Dimmable	Yes
Bulb Hours	30000
Bulb Type	LED
Designer	LED Under-Cabinet
Introduction Date	07-21-2013 , 07/21/2013
Kelvin	2700
Length	21
Lumens / Light Output	712
Material	Aluminum+Acrylic
Order Minimum	1
Ship Carton Height	1.38
Ship Carton Length	24.5
Ship Carton Width	1
Ship Weight	0.49

Sold By	EA
Vendor Ship Method	UPS
Weight	0.35
ADA Compliant	No
Bulb CRI	96
Bulb Included	Yes
Carton Cubic Feet	0.02
Cartons Per Unit	1
CSA	No
Dark Sky	No
Delivered Lumens	448
Dry Rated	Yes
Energy Star	No
ETL	Yes
ETL Approved	Yes
Initial Lumens	712
Install Position	Horizontal/Vertical
Last Update	06/18/2019
Max Watt	8
Rated Life Hours	30000
Safety Rating	ETL
Slope	No
Title 24	No
UL	No
Unit Increments	1
Manufactured By	Minka George Kovacs

Included Items

Bulbs: (1) x 8 Watt LED

$61.20

Availability:
Manufacturer availability unknown.
This Item has been Discontinued. Please verify product pricing and availability with vendor prior to submitting any orders.

GEORGE KOVACS®

Image File Name: **GKUC-JB2-044.jpg**

LED Under-Cabinet - Junction Box-For Use With Under-Cabinet products.

Item #:	GKUC-JB2-044
UPC Code:	844349016687
Product Family Name:	LED Under-Cabinet
Finish:	White
Category:	COMPONENT
Category Type:	Under-Cabinet
Certification:	
Patents:	
Notes:	

MEASUREMENTS

Width:	4.75
Length:	2.63
Height:	.88
Extension:	
Height Adjustable:	NO
Min Overall Height:	
Max Overall Height:	
Slope:	NO
Wire Length:	
Chain Length:	
Safety Cable Included:	NO
Net Weight:	0.42
Canopy Width:	
Canopy Height:	
Canopy Length:	
Center to Bottom:	
Backplate Width:	
Backplate Height:	
Center to Top:	
Power:	

LAMPING

No. of Bulbs:	0
Max Bulb Wattage:	
Light Type:	
Socket:	
Dimmable:	NO

GLASS

Description:	
Material:	
Part No.:	
Quantity:	
Width:	
Height:	
Length:	

SHIPPING

Carton Width:	1.75
Carton Height:	5.63
Carton Length:	3.5
Carton Weight:	0.48
Carton Cubic Feet:	0.02
Small Package Shippable:	YES
Master Pack Width:	8.5
Master Pack Height:	9.63
Master Pack Length:	12.75
Master Pack Weight:	10.45
Master Cubic Feet:	0.604
Multi-Pack:	1
Master Pack:	20

GEORGE KOVACS®

Image File Name: **GKUC-MF-044.jpg**

LED Under-Cabinet - Flex Connector
For use with Under-Cabinet products

Item #:	GKUC-MF-044
UPC Code:	844349015468
Product Family Name:	LED Under-Cabinet
Finish:	White
Category:	COMPONENT
Category Type:	Under-Cabinet
Certification:	
Patents:	
Notes:	

MEASUREMENTS

Width:	
Length:	
Height:	
Extension:	
Height Adjustable:	NO
Min Overall Height:	
Max Overall Height:	
Slope:	NO
Wire Length:	
Chain Length:	
Safety Cable Included:	NO
Net Weight:	0.07
Canopy Width:	
Canopy Height:	
Canopy Length:	
Center to Bottom:	
Backplate Width:	
Backplate Height:	
Center to Top:	
Power:	

LAMPING

No. of Bulbs:	0
Max Bulb Wattage:	
Light Type:	
Socket:	
Dimmable:	NO

GLASS

Description:	
Material:	
Part No.:	
Quantity:	
Width:	
Height:	
Length:	

SHIPPING

Carton Width:	1.13
Carton Height:	6.25
Carton Length:	1.13
Carton Weight:	0.09
Carton Cubic Feet:	0.005
Small Package Shippable:	YES
Master Pack Width:	6.88
Master Pack Height:	14.0
Master Pack Length:	8.5
Master Pack Weight:	6.27
Master Cubic Feet:	0.474
Multi-Pack:	
Master Pack:	50

BIRCH
FM53509

FLUSH MOUNT

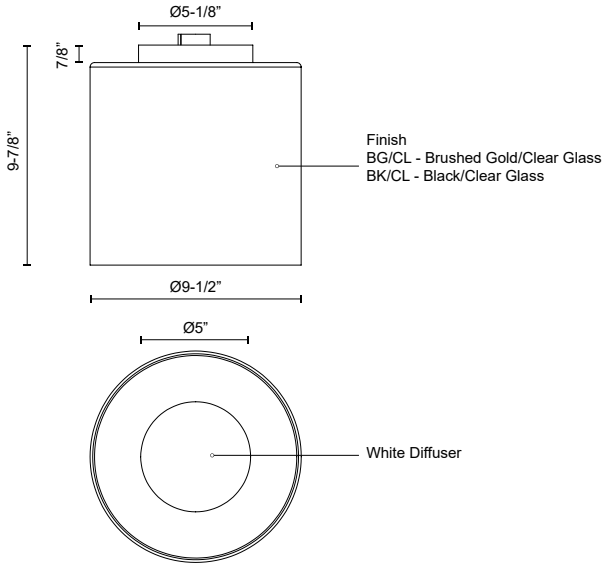
PROJECT

FM53509-BK/CL
Black/Clear

FM53509-BG/CL
Brushed Gold/Clear

DESCRIPTION

If warm candlelight is what you're after, look no further than the Birch Collection. Clear glass cylinders with frosted glass diffusers give the distinguished look of soft, lit candles for a clean, romantic feel that plays well in various spaces. Available in Brushed Gold or Powder-Coated Black



SPECIFICATION DETAILS

Fixture Dimensions	D9-1/2" x H9-7/8"
Light Source	DC LED WITH DRIVER
Wattage	13W
Total Lumens	1360lm
Delivered Lumens	1208lm
Voltage	120V
Color Temperature	3000K
CRI (Ra)	90CRI
Optional Color Temps	2700K - 5000K Available, Minimum Order Quantities Apply
LED Rated Life	50,000 hours
Dimming	100% - 10%, TRIAC or ELV Dimmer (Not Included)
Diffuser Details	White Diffuser (interior)
Glass Details	Clear Glass (exterior)
Location	Damp
Illumination Direction	Down
CEC Title 24 JA8	Yes, JA8-2022
Canopy Dimensions	D5-1/8" x H7/8"
Paint Finish	BG01; BK02;

* For custom options, consult factory for details.
* For warranty information, please visit www.kuzcolighting.com/warranty

KUZCO

CANADA: 19054 28TH AVENUE - SURREY, BC V3Z 6M3
USA: 3035 E. LONE MOUNTAIN ROAD - LAS VEGAS, NV 89081

WWW.KUZCOLIGHTING.COM

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COMMENT

Stockton LED Ceiling Fan
By Visual Comfort Fan

LUMENS
Call Us (877) 445-4486

Stockton LED Ceiling Fan
By Visual Comfort Fan

Product Options

Finish: Aged Pewter

Details

Number of Blades: 3
Blade Pitch: 19 degrees
Electronic low voltage (ELV) Dimmer
Dimmer Range: 100-10%
Fan Airflow (at high speed): 7916 CFM
Fan Electricity Use (at high speed): 32 Watts (excludes lights)
Fan Airflow Efficiency (at high speed): 246 CFM/Watt

Dimensions

Blade: Diameter 60"
Canopy: Diameter 5.5"
Fixture: Weight 17.9Lbs
Housing: Diameter 10.3"
Maximum Hanging: Length Adjustable To 13.1"

Lamp Type	LED Built-in
Total Lumens	1290
Total Watts	25.00
Volts	120
Color Temp	3000 (Soft White)
CRI	90
Equivalent Halogen, CFL or LED Bulb Can Be Used	No

Notes:

Prepared by:

Prepared for:
Project:
Room:
Placement:
Approval:

Additional Details

AirFlow: 7916 cfm
AirFlow Efficiency: 246 cfm/watt
Energy Use: 32 watts
Product URL:
https://www.lumens.com/stockton-led-ceiling-fan-by-visual-comfort-fan-MCF1983017.html
Rating: ETL Listed Damp

SUELO Adjustable Optics Vandal Resistant

inter·lux

IP68

4400 lb

General: Suelo is a family of round LED in-grades that includes a broad selection of specialty optics in multiple sizes and outputs, making it possible to find the perfect luminaire to illuminate outdoor architectural elements such as facades, columns as well as landscape and pathway lighting within the same product range.
The standard Suelo R provides maximum output and a selection of accessories to control the emission based on application needs. The Suelo PRO version has a more recessed optical chamber instead, to guarantee the best glare control without the need of any louver.
Lastly, Suelo is also available with a Dual Optic (Double, allowing to aim light at two different areas from one fixture) and in a Telescopic version, with an adjustable aluminum tube that elevates the fixture off the ground, to prevent growing vegetation from blocking the light.

Fixture Body: Open-pore Anodized and Powder Coated Die-Cast Aluminum.
Trim: Semi-Flush (Stainless Steel) Trim with Extra-clear Tempered glass.
Mounting/Casing: Black, ABS casings for Concrete installations. Vandal Resistant, secured with Hex or Torx screws (check installation instructions for details).
Drive-over: Up to 5,511 lbs.
Dimensions/Weight: 4.4" (1.61 lbs) – 6.7" (2.21 lbs) – 9.1" (6.61 lbs) – 12.1"/12.4" (17.6 lbs)

CC version: (4.4", 6.7") Remote 120-277V Constant Current driver 0-10V dimmable down to 0.1%. Less susceptible to voltage drop (up to 200' wiring distance); Fixtures need to be wired in series.
CV version: (4.4") Remote 120-277V Constant Voltage 24VDC. Driver options in 0-10V (typical dim level 10%, dry location) or Non-dim (wet location). Possibility to use higher wattage drivers and feed multiple fixtures with fewer wiring runs; fixtures need to be wired in parallel.
ID version: (9.1", 12.4", 12.1") Integral driver 120-277V dimmable 0-10V down to 1%.
Wattages: 8W / 9W (4.4") – 13W (6.7") – 33.6W (9.1") – 48.2W (12.1" & 12.4")
Cable: Fixture comes with 3.28' of power cable and built-in Aquastop® (anti-wicking) system

IP rating: IP67 for temporary submersion up to 3.3' of depth for up to a maximum of 1 hr.
IK rating: IK 10
ETL Certification: ETL, wet location

Optics: Adjustable. Available in Ultra Spot – Spot – Narrow Flood – Flood – Medium Wide Flood – Wide Flood.
Color temperatures: 2700K – 3000K – 4000K.
CRI: 80+

Lumen Maintenance: L70 projections tested at Tj 65° C and Ta 25°.
Warranty: 5-year Limited Warranty on fixtures. 1-year Limited Warranty on Remote Drivers.

4.4" SFSTVR (8W / 9W)

6.7" SFSTVR (13W)

9.1" SFSTVR (33.6W)

12.4" SFSTVR (48.2W)

Delivered Lumens*	4.4"	6.7"	9.1"	12.1" & 12.4"
USP	–	–	–	3209
SP	–	914	3123	4340
NFL	625	–	–	–
FL	559	1021	3069	4332
MWFL	–	1183	–	–
WFL	573	–	2979	4161

*Values shown for 3000K

Ordering Information (Required)[10]

Product	Trim	Type	Diameter	Wattage/Operation	Color Temp	Optic	+	Housing	Driver
SUR	SFSTVR								
SUR = Suelo R	SFSTVR = Semi-Flush St. Steel Vandal Resistant SFBTVR = Semi-Flush Brass Trim Vandal Resistant[1]	A = Adjustable AHC = Adjustable Honeycomb[3] ADL = Adjustable DarkLight[3]	44 = 4.4"	8 CC = 8W / Constant Current (630 mA) 9 CV = 9W / Constant Voltage (24 VDC)	27 = 2700K 30 = 3000K 40 = 4000K	USP = Ultra Spot[4] SP = Spot[5] NFL = Narrow Flood[6] FL = Flood MWFL = Medium Wide Flood[7] WFL = Wide Flood[8,9]		E98121 (4.4") E84933 (6.7") E83096 (12.1" & 12.4") E93099 (12.1" & 12.4") E83097 (12.4") E83098 (12.1")	**CC:** ECO30W-XXX SOLO50W-XXX SOLO100W-XXX **CV:** OT96-D010 OT96-JBX
			67 = 6.7"	13 CC = 13W / Constant Current (350 mA)					
			91 = 9.1"	34 ID = 33.6W / Integral 120/277VAC 0-10V dim					
	FTVR = Flush Trim Vandal Resistant (St. Steel)[2]		124 = 12.4"	48 ID = 48.2W / Integral 120/277VAC 0-10V dim					
			121 = 12.1"	48 ID = 48.2W / Integral 120/277VAC 0-10V dim					

[1] SFBTVR 6.7" ONLY
[2] FTVR 12.1" & 12.4" ONLY
[3] AHC & ADL 12.1" & 12.4" ONLY
[4] USP 12.1" & 12.4" ONLY
[5] SP N/A for 4.4"
[6] NFL 4.4" ONLY
[7] MWFL 6.7" ONLY
[8] WFL N/A for 6.7"
[9] WFL N/A for ADL 12.1" & 12.4"
[10] See page 2

linea light i-LED

410 381 1497 inter-lux.com answers@inter-lux.com
Inter-lux reserves the right to make technical changes without notice.

SUELO Adjustable Optics Vandal Resistant

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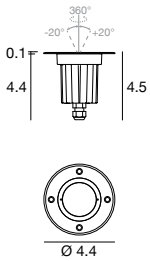
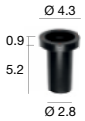
4.4" 8W / 9W



Housing

E98121
Recessed Housing



DRIVER OPTIONS (pick one)

C.C. Power supply options (remote only)

ECO30W-630
0-10V EldoLED
ECOdrive 30W
for 1-3 fixtures

SOLO50W-630
0-10V EldoLED
SOLOdrive 50W
for 1-4 fixtures

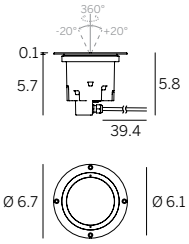
SOLO100W-630
0-10V EldoLED
SOLOdrive 100W
for 1-8 fixtures

C.V. Power supply options (remote only)

OT96-D010
Osram, 10% 0-10V dim, 96W, 24VDC, 120-277VAC, supplied in a Dry location enclosure

OT96-JBX
Osram, Non-dim 24VDC, 120-277VAC, Wet location

6.7" 13W



Housing

E84933
Recessed Housing

DRIVER OPTIONS (pick one)

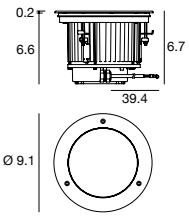
C.C. Power supply options (remote only)

ECO30W-350
0-10V EldoLED
ECOdrive 30W
for 1 fixture

SOLO50W-350
0-10V EldoLED
SOLOdrive 50W
for 1-2 fixtures

SOLO100W-350
0-10V EldoLED
SOLOdrive 100W
for 1-4 fixtures

9.1" 33.6W



Housing

E99794
Recessed Housing

Integral 120/277VAC 0-10V dim Driver

SUELO Adjustable Optics Vandal Resistant

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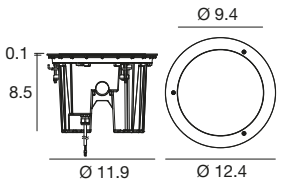
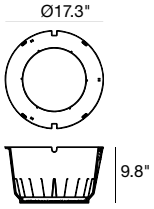
12.4" 48.2W

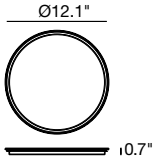


Housing

E83096
Recessed Housing

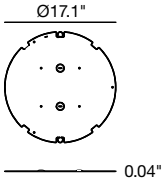


E83098
Concrete pour cover
(required)

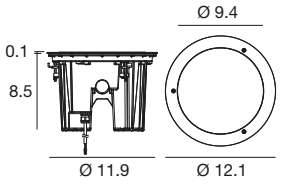


Integral 120/277VAC 0-10V dim Driver

E93099
Housing bottom plate
(optional)

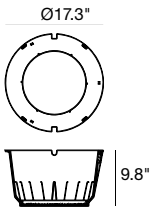


12.1" 48.2W

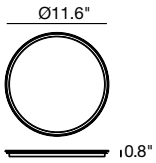


Housing

E83096
Recessed Housing

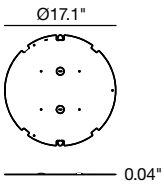


E83097
Concrete pour cover
(required)



Integral 120/277VAC 0-10V dim Driver

E93099
Housing bottom plate
(optional)



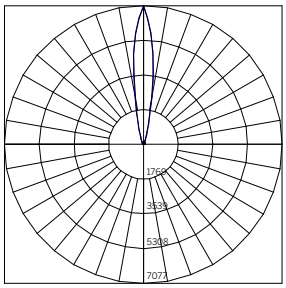
SUELO Adjustable Optics Vandal Resistant

inter·lux

SUR-SFSTVR-A-...-SP-...
Delivered Lumens - Spot

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	-	883
	30	-	921
	40	-	972

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	-	1.00



Beam Angle (0-180) = 15.7
Beam Angle (90-270) = 16.3

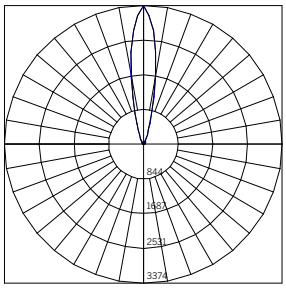
CONE OF LIGHT - 13W 3000K SPOT
SUR-SFSTVR-A-67-13-CC-30-SP*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	18	5.5
18	22	5.0
16	28	4.4
14	36	3.9
12	49	3.3
10	71	2.8
8	111	2.2
6	197	1.7
4	442	1.1
2	1769	0.6

SUR-SFSTVR-A-...-NFL-...
Delivered Lumens - Narrow Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	629	-
	30	629	-
	40	679	-

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	1.00	-



Beam Angle (0-180) = 20.0
Beam Angle (90-270) = 20.1

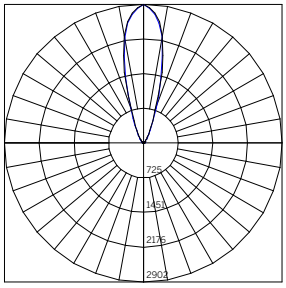
CONE OF LIGHT - 8W 3000K NARROW FLOOD
SUR-SFSTVR-A-44-8-CC-30-NFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	8	7.0
18	10	6.3
16	13	5.6
14	17	4.9
12	23	4.2
10	34	3.5
8	53	2.8
6	94	2.1
4	211	1.4
2	844	0.7

SUR-SFSTVR-A-...-FL-...
Delivered Lumens - Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	560	983
	30	560	1024
	40	605	1082

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	0.55	1.00



Beam Angle (0-180) = 29.7
Beam Angle (90-270) = 30.8

CONE OF LIGHT - 13W 3000K FLOOD
SUR-SFSTVR-A-67-13-CC-30-FL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	7	10.6
18	9	9.5
16	11	8.5
14	15	7.4
12	20	6.4
10	29	5.3
8	45	4.2
6	81	3.2
4	181	2.1
2	726	1.1

*Polar Plot and Cone of Light are applicable to part number noted; use Multiplication Factor table to approximate other models or refer to online photometry.

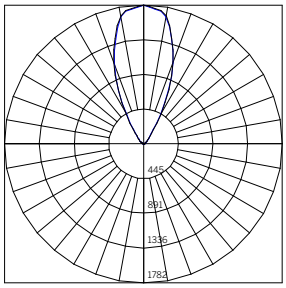
SUELO Adjustable Optics Vandal Resistant

inter·lux

SUR-SFSTVR-A-...-MWFL-...
Delivered Lumens - Medium Wide Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	-	1137
	30	-	1024
	40	-	1251

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	-	1.00



Beam Angle (0-180) = 46.3
Beam Angle (90-270) = 46.7

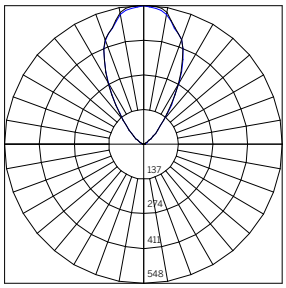
CONE OF LIGHT - 13W 3000K MEDIUM WIDE FLOOD
SUR-SFSTVR-A-67-13-CC-30-MWFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	4	17.1
18	6	15.4
16	7	13.7
14	9	12.0
12	12	10.3
10	18	8.6
8	28	6.8
6	50	5.1
4	111	3.4
2	446	1.7

SUR-SFSTVR-A-...-WFL-...
Delivered Lumens - Wide Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	572	-
	30	572	-
	40	618	-

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	1.00	-



Beam Angle (0-180) = 60.6
Beam Angle (90-270) = 60.2

CONE OF LIGHT - 8W 3000K WIDE FLOOD
SUR-SFSTVR-F-44-8-CC-30-WFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	1	23.4
18	2	21.0
16	2	18.7
14	3	16.4
12	4	14.0
10	5	11.7
8	9	9.3
6	15	7.0
4	34	4.7
2	137	2.3

*Polar Plot and Cone of Light are applicable to part number noted; use Multiplication Factor table to approximate other models or refer to online photometry.

YOSEMITE LED INTEGRAL

IP66 RATED

DATE:	PROJECT:	TYPE:

CATALOG NUMBER LOGIC:

**120v only.*

CATALOG NUMBER LOGIC	
Example: YO - LED - TR - x130 - WW - BLP - 9 - 11 - CV - INC - MT	
MATERIAL	
Aluminum	
SERIES	
YO - Yosemite	
SOURCE	
LED - Chip on Board Technology	
HOUSING	
TR - Integral Driver	
LED TYPE	
x130 - 23W LED/2700K	x113 - 34W LED/2700K
x131 - 23W LED/3000K	x114 - 34W LED/3000K
x133 - 23W LED/4000K	x116 - 34W LED/4000K
OPTICS	
WW - Wall Wash	
FINISH (See page 2 for full-color swatches)	
Standard Finishes (BZP, BZW, BLP, BLW, WHP, WHW, SAP, VER)	
Premium Finish (ABP, AMG, AQW, BCM, BGE, BPP, CAP, CMG, CRM, HUG, NBP, OCP, RMG, SDS, SMG, TXF, WCP, WIR)	
Also available in RAL Finishes	
LENS TYPE	
9 - Clear (Standard)	
SHIELDING	
11 - Honeycomb Baffle	
ACCESSORIES	
CV - Cutoff Visor	
CS - Cutoff Snoot	
BD - Adjustable Barn Boors	
CONTROL OPTION	
ELV - Dimming Driver (For use with Electronic Low Voltage Dimmer)	
INC - Dimming Driver (For use with Incandescent Dimmer)	
0-10 - Dimming Driver (For use with 0-10 Dimmer)	
INPUT VOLTAGE	
MT - 120-277 VAC	

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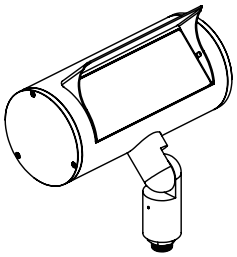
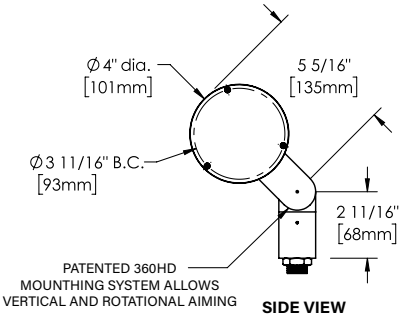
YOSEMITE LED INTEGRAL — IP66 RATED

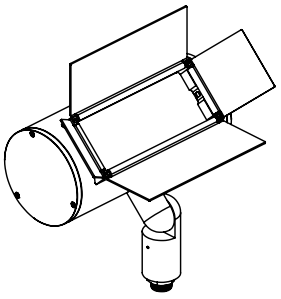
DATE:	PROJECT:	TYPE:



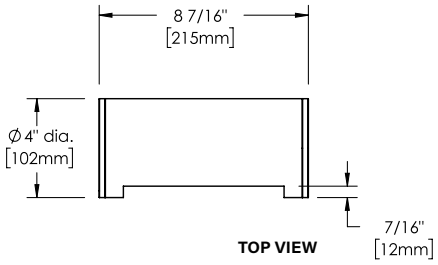
CUTOFF VISOR



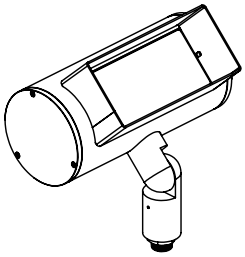
SIDE VIEW



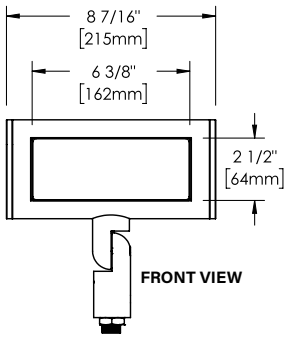
BARN DOOR



TOP VIEW



CUTOFF SNOOT



FRONT VIEW

STANDARD FINISHES

Satin Black (BLP)

Satin Bronze (BZP)

Satin White (WHP)

Satin Aluminum (SAP)

Black Wrinkle (BLW)

Bronze Wrinkle (BZW)

White Wrinkle (WHW)

Verde (VER)

Click Here to view larger, full-color swatches of all available finishes on our website.

PREMIUM FINISHES

Cascade Mtn. Granite (CMG)

Rocky Mtn. Granite (RMG)

Sierra Mtn Granite (SMG)

Aleutian Mtn Granite (AMG)

Textured Forest (TXF)

Black Chrome (BCM)

Beige (BGE)

Weathered Copper (WCP)

Old Copper (OCP)

Hunter Green (HUG)

Antique Brass Powder (ABP)

Brown Patina Powder (BPP)

Sonoran Desert Sandstone (SDS)

Weathered Iron (WIR)

Clear Anodized Powder (CAP)

Cream (CRM)

Antique White (AQW)

Natural Brass Powder (NBP)

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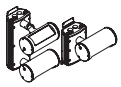
12/06/2022 SKU-1394
SUB-2845-00

YOSEMITE LED INTEGRAL — IP66 RATED

DATE:	PROJECT:	TYPE:

Accessories (Configure separately)



PM3DJ & PM3J

SPECIFICATIONS

ELECTRICAL	WATTAGE	23W or 34W LED
	WIRING	XLPE coated, 18AWG, 600V, 150° C rated and certified to UL 1569 standard.
	DRIVER	With one (1) 600mA or 900mA, Class II, constant current integral driver. 50/60Hz. >0.9 Power Factor,5A in-rush current (typical at 120VAC), ≤20%THD (nominal at 120VAC full load). Output over-voltage, over-current, and short circuit protection with auto recovery. Dimming driver for use with 0-10V, Incandescent, Standard TRIAC, or ELV dimmers. 1-100% range. *TRIAC/ELV dimming at 120VAC only
PHYSICAL	MATERIALS	Furnished in copper-free aluminum (6061-T6).
	BODY	Enclosed, water-proof wireway with machined end caps gasketed to create a water-tight seal for optical compartment.
	KNUCKLE	360HD Mounting System features a mechanical taperlock, allowing full 180° vertical adjustment without the use of aim-limiting serrated teeth. High temperature, silicone 'O' Ring provides water-tight seal and compressive resistance to maintain fixture position. Design withstands 73 lbs. static load prior to movement for optical alignment with a ½" pipe thread for mounting. Biaxial source control additionally provides 360° horizontal rotation in addition to vertical adjustment. Aim & Lock technology allows precision adjustment without the redundant tightening and loosening of knuckle screw. 360HD hardware is stainless steel with black oxide treatment for additional corrosion resistance.
	LENS	Shock-resistant, tempered glass lens is factory adhered to fixture cap and provides hermetically sealed optical compartment.
	LED	Integrated solid state system and modular design with electrical disconnects allow for easy field upgrade and maintenance. LM-80 certified. Minimum 50,000 hour rated life at 70% of initial lumens (L70). LED technology provides long life, significant energy reduction and exceptional thermal management.
	COLOR MANAGEMENT	Chip on board technology delivers natural white light. Exact color point conformity exceeds ANSI C78.377 standard. Module exceeds 80 CRI (RA>80, R9.16). Color point uniformity 2 SDCM color control for 2700K-4000K CCT.
	ACCESSORIES	Three (3) accessory options for optimum lighting control.
	HARDWARE	Tamper-resistant, stainless steel hardware. LOCK hardware is black oxide treated for additional corrosion resistance.
	FINSIH	StarGuard, our 15-stage chromate-free process cleans and conversion coats aluminum components prior to application of Class 'A' TGIC polyester powder coating and is RoHS compliant.
	WARRANTY	5-year limited warranty.
	CERTIFICATION & LISTING	UL tested to IESNA LM-79. UL Listed. Certified to CAN/CSA/ANSI Standards. RoHS compliant. Suitable for indoor or outdoor use, in wet locations, and for installation within 4' of the ground. IP65 Rated. Made in the USA with sustainable processes.

c UL us LISTED

RoHS

MADE IN THE USA

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12/06/2022 SKU-1394
SUB-2845-00

LAMP & DRIVER DATA

DATE:	PROJECT:	TYPE:

LM79DATA					L70 DATA
BK No.	**Delivered Lumens**	**CCT (Typ.)**	**CRI (Ra. Typ.)**	**InputWatts (Typ.)**	**Minimum Rated Life (hrs.) 70% of Initial Lumens (L70)**
x130	1884	2700K	80	23	50,000
x131	**1924**	**3000K**	**80**	**23**	**50,000**
x133	1965	4000K	80	23	50,000
x113	2611	2700K	80	34	50,000
x114	**2631**	**3000K**	**80**	**34**	**50,000**
x116	2744	4000K	80	34	50,000

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OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

THE L50 INCLUDES PATENTED OPTICAL DESIGN THAT DELIVERS THE WIDEST RANGE OF BEAM ANGLE OPTIONS FOR PRECISE COVE, WALL GRAZING, WALL WASHING OR LINE OF LIGHT APPLICATIONS. EXCLUSIVE FLIP TO FLAT™ HINGE DESIGN PROVIDES FLEXIBILITY WHEN MANAGING SMALL COVE DETAILS. TROV OFFERS SMOOTH, FLICKER FREE DIMMING DOWN TO 0%.

FEATURES :

- DIM TO 0%, ELV REVERSE PHASE
- 24 BEAM ANGLES
- MULTI-VOLT
- FLIP TO FLAT™
- 6 CCT OPTIONS
- 80+ AND 90+ CRI OPTIONS
- IP54 INTERIOR AND IP66 EXTERIOR OPTIONS

MODEL/ SIZE	INTERIOR/ EXTERIOR	LENGTH	POWER	CCT		CRI	VOLTAGE	OPTICS	
L50	I E	12″ 48″	02 04 06 08 10 12	**WHITE CCT** 22 27 30 35 40 50	**MONO COLOR** GR**** BL AM RD***	80 90* Blank For Color	MULT (120-277V)	**GRAZING** 9 x 9 9 x 17 9 x 29 9 x 59 15 x 15 15 x 23 15 x 35 15 x 65 **COVE** 120** Asym **LINE OF LIGHT** LOL	**WASHING** 25 x 25 25 x 33 25 x 45 25 x 75 39 x 9 55 x 25 40 x40 40 x 48 40 x 60 40 x 90 45 x 15 70 x 40 70 x 70

EXAMPLE: L50-I-48-10-27-90-MULT-15x65

*90 CRI not available in 2200K or 5000K **120 is only available with Exterior option. See L35 spec sheet for interior cove options. ***Red is not available in 12W or 10W. ****Green is not available in 12W.

PERFORMANCE	WATTS	OPTIC	LUMEN OUTPUT	EFFICACY
	2W	9˚x 29˚	158 lm/LF (519 lm/m)	79 lm/W
	4W	9˚x 29˚	389 lm/LF (1277 lm/m)	97 lm/W
	6W	9˚x 29˚	620 lm/LF (2035 lm/m)	103 lm/W
	8W	9˚x 29˚	864 lm/LF (2833 lm/m)	108 lm/W
	10W	9˚x 29˚	1046 lm/LF (3432 lm/m)	105 lm/W
	12W	9˚x 29˚	1217 lm/LF (3990 lm/m)	101 lm/W

ALL LUMEN DATA IS FROM 4000K 80CRI FIXTURES. PLEASE SEE PHOTOMETRY SPEC SHEET FOR ADDITIONAL LUMEN DATA.

COLOR RENDERING INDEX 80+, 90+

COLOR CONSISTENCY 2-STEP MACADAM ELLIPSE

LUMEN DEPRECIATION / RATED LIFE

WATTS	L70 @ 25C	L70 @ 50C	L90 @ 25C	L90 @ 50C
2W-12W	>150,000	>70,000	>50,000	>25,000

*CALCULATIONS FOR LED FIXTURES ARE BASED ON MEASUREMENTS THAT COMPLY WITH IES LM-80 TESTING PROCEDURES AND IES TM-21 CALCULATOR

* CALCULATIONS FOR LED FIXTURES ARE BASED ON MEASUREMENTS THAT COMPLY WITH IES LM-80 TESTING PROCEDURES AND IES TM-21 CALCULATOR

ELECTRICAL

POWER CONSUMPTION 2W*/LF (6.6W/M) ; 4W/LF (13.2W/M) ; 6W/LF (19.8W/M) ; 8W/LF (26.4W/M) ; 10W/LF (33W/M) ; 12W/FL (39.6W/M)
* 3W/LF (9.9W/M) at 220V -277V

MAX FIXTURE RUN LENGTH

	2W/LF		4W/LF		6W/LF		8W/LF		10W/LF		12W/LF	
Volts	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'
120	214	214	186	186	152	152	114	114	91	91	76	76
220	374	392	340	340	277	277	209	209	95	167	95	139
277	374	494	374	428	349	349	263	263	95	190	95	175

POWER FACTOR 4W, 6W, 8W, 10W, 12W >0.9, 2W<0.9

OPERATING VOLTAGE MULTIVOLT: 110-277VAC, 50/60 Hz

DRIVER INTEGRAL TO FIXTURE; DE-RATED POWER AND SYNCHRONOUS START-UP AT FULL BRIGHTNESS

STARTUP TEMPERATURE -40˚F TO 122˚F (-40˚C TO 50˚C)

OPERATING TEMPERATURE -40˚F TO 122˚F (-40˚C TO 50˚C)

STORAGE TEMPERATURE -40˚F TO 176˚F (-40˚C TO 80˚C)

NOTE: Information on this Spec Sheet is subject to change, please visit ecosenselighting.com/downloads/rise for the most updated information.

ECOSENSE®

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OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

CONTROL	**DIMMING**	110-277VAC, ELV TYPE 0.07%-100%, REVERSE PHASE, TRAILING EDGE ETC control systems require 0-10V control using Ecosense LDCM. TROV will not work with ETC phase dimmers.
PHYSICAL	**DIMENSIONS**	W 1.6" x H 2" x L 12"/48" ; (41.6mm x 50.5mm x 304.7mm/1201mm)
	HOUSING /LENS	EXTRUDED ALUMINUM; UV STABILIZED POLYCARBONATE; STAINLESS STEEL FASTENERS; PLASTIC ENDCAPS RUBBER OVERMOLD FOR CABLE ASSEMBLY
	WEIGHT	1.52LBS / 0.69KG (1FT) ; 4.95LBS / 2.25KG (4FT)
	CONNECTORS	INTEGRAL MALE/ FEMALE CONNECTORS
	ENVIRONMENT	INDOOR • ETL CERTIFIED FOR DRY/DAMP LOCATIONS IP54 OUTDOOR • ETL CERTIFIED FOR WET LOCATIONS IP66 IMPACT RATED TO IK10 Not intended to be used in water features such as waterfalls, fountains, etc.
	BEAM ANGLE	GRAZING, WASHING, COVE, ASYMMETRIC, LINE OF LIGHT
	MOUNTING OPTIONS	INTEGRAL MOUNTING AND ADJUSTABLE AIMING FROM 0˚-180˚ IN 15˚ INCREMENTS
FIXTURE RATING & CERTIFICATIONS	**ETL CERTIFIED** **RoHS COMPLIANT** **RCM CERTIFIED**	Intertek · RoHS COMPLIANT · Title 24 JA8-2016 *90 CRI models only
LIMITED WARRANTY	**5 YEARS**	

WIRING OPTIONS (MVOLT): 110-277VAC

Power Cable Assembly, TROV, Leader/Jumper, 10 foot	**CBL-3P-L-UNV-10***
Power Cable Assembly, TROV, Leader/Jumper, 50 foot	**CBL-3P-L-UNV-50***
Power Cable Assembly, TROV, Jumper, 5 foot	**CBL-3P-L-UNV-05****
Power Cable Assembly, TROV, Jumper, 1 foot	**CBL-3P-L-UNV-01****
Power Cable Assembly, TROV, Adjustable Jumper, 0" to 7"	**CBL-3P-L-UNV-ADJ**
Power Cable Assembly, TROV, Male and Female terminator caps	**CBL-3P-L-UNV-CAPS**

*Two (2) terminators are included with the 10' and 50' power cable. One Leader need per circuit/fixture run. Cables are not plenum rated.
** If using the 5' or 1' power cable assembly as a leader to power a run, one set of CBL-3P-L-UNV-CAPS will also be needed per cable.

0-10V CONTROL OPTIONS

100-120VAC / 277VAC Linear Dimming Control Module 0-10V - Plenum Rated **LDCM-PL-120-277-010V-GR**
All products come standard with ELV dimming capabilities. 0-10V Control options required for operation at 0-10V.

OPTIONAL ACCESSORIES

Mounting

Mounting Track and Clips Set, 48 Inch Track, 8 Clips	**MNT-L-TRKCLIP-48**	48" track and clips set will work with one 48" fixture or four 12" fixtures. (FOR INTERIOR USE ONLY)
Mounting Track and Clips Set, 12 Inch Track, 2 Clips	**MNT-L-TRKCLIP-12**	12" track will not work with 48" fixtures. (FOR INTERIOR USE ONLY)
Mounting Track Clip, TROV, Set of 2	**MNT-L-CLIP**	Clips needed = 12" fixtures need 1 set of 2 and 48" fixture needs 2 sets of 2.
90 Degree L bracket, TROV, Set of 2	**MNT-L-LBKT**	L-Brackets needed = 12" fixtures need 1 set of 2 and 48" fixture needs 1 set of 2.
Angle Locking Clip, TROV, Pack of 10	**MNT-L-ANGLOCK**	Angle Locks needed = 12" fixtures need 1 and 48" fixtures need 2. (Must order separately)
Mounting, Fine Adjustment Bracket, TROV	**MNT-L-FAB**	Fine Adjustment Brackets needed = 12" fixtures need 1 and 48" fixtures need 2.
*Fine Adjustment Bracket is highly recommended for Grazing Optics.		
Mounting, Fine Adjustment L-Bracket, TROV	**MNT-L-LFAB**	Fine Adjustment L-Brackets needed = 12" fixtures need 1 and 48" fixtures need 2.
*Fine Adjustment L-Bracket is recommended for Asymetric Optics when aiming is needed.		

Snap-on Lenses

Snap-on Lens, Frosted, 12 inch, L50	**LENS-L50-FROST-12**
Snap-on Lens, Frosted, 48 inch, L50	**LENS-L50-FROST-48**
Snap-on Lens, Clear, 12 inch, L50	**LENS-L50-CLEAR-12**
Snap-on Lens, Clear, 48 inch, L50	**LENS-L50-CLEAR-48**

Snap-on Lenses need = One 12" lens is needed per 12" fixture and one 48" lens is needed per 48" fixture. Snap on Lenses will not work with the asymmetric fixture. Clear lenses can be used to hold colored filters to customize the output color of any TROV fixture, except the ASYM. Color filters supplied by others.

Wall Mount Arm

Wall Mount Arm, 6 inch, TROV	**WMA-L-CA-06**
Wall Mount Arm, 12 inch, TROV	**WMA-L-CA-12**
Wall Mount Arm, 18 inch, TROV	**WMA-L-CA-18**
Wall Mount Arm, 24 inch, TROV	**WMA-L-CA-24**
Wall Mount Arm End Plate Set, TROV, Includes Left and Right	**WMA-L-END**
Wall Mount Arm Joiner Plate, TROV	**WMA-L-JNR**

Wall Mount Arms needed = For individual fixture installations two arms and one end set will be needed per fixture. For continuous run installation one end set will be needed per run. Each end set contains one left and one right end plate. One joining set will be needed per joint. One arm per fixture will be needed plus one extra arm to complete the run. For example: A 10ft run made with two 4ft and two 1ft fixtures will contain; 1 x WMA-L-END, 3 x WMA-L-JNR, and 5 x WMA-L-CA-12. Leader cables are not included with wall mount arms, end sets, or joiners sets.

Louvers

Louver, Asymmetric, 12 inch, L50	**LV-L50-ASYM-12**
Louver, Asymmetric, 48 inch, L50	**LV-L50-ASYM-48**
Louver, Symmetric, 12 inch, L50	**LV-L50-SYM-12**
Louver, Symmetric, 48 inch, L50	**LV-L50-SYM-48**
Louver, Honeycomb, 12 inch, L50	**LV-L50-HCOMB-12**
Louver, Honeycomb, 48 inch, L50	**LV-L50-HCOMB-48**

Louvers Needed = One 12" louver is needed per 12" fixture and one 48" louver is needed per 48" fixture. 48" louver is made up of four 12" louvers. Louvers cannot be used with the asymmetric fixture

ECOSENSE®

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FREEDOM TO CREATE™

TROV®

OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

OPTIONAL ACCESSORIES

Masking Plates

Masking Plate, 3 inch high, 12 inch, L50 & L35 ..... **MP-L50-3H-12**
Masking Plate, 3 inch high, 48 inch, L50 & L35 ..... **MP-L50-3H-48**

Masking Plates needed = One 12" plate is needed per 12" fixture and one 48" plate is needed per 48" fixture.

Landscape Stake

Landscape Stake, 6 inch, TROV, Set of 2 ..... **LS-L-STK-06**
Landscape Stake, 12 inch, TROV, Set of 2 ..... **LS-L-STK-12**
Landscape Stake, 18 inch, TROV, Set of 2 ..... **LS-L-STK-18**

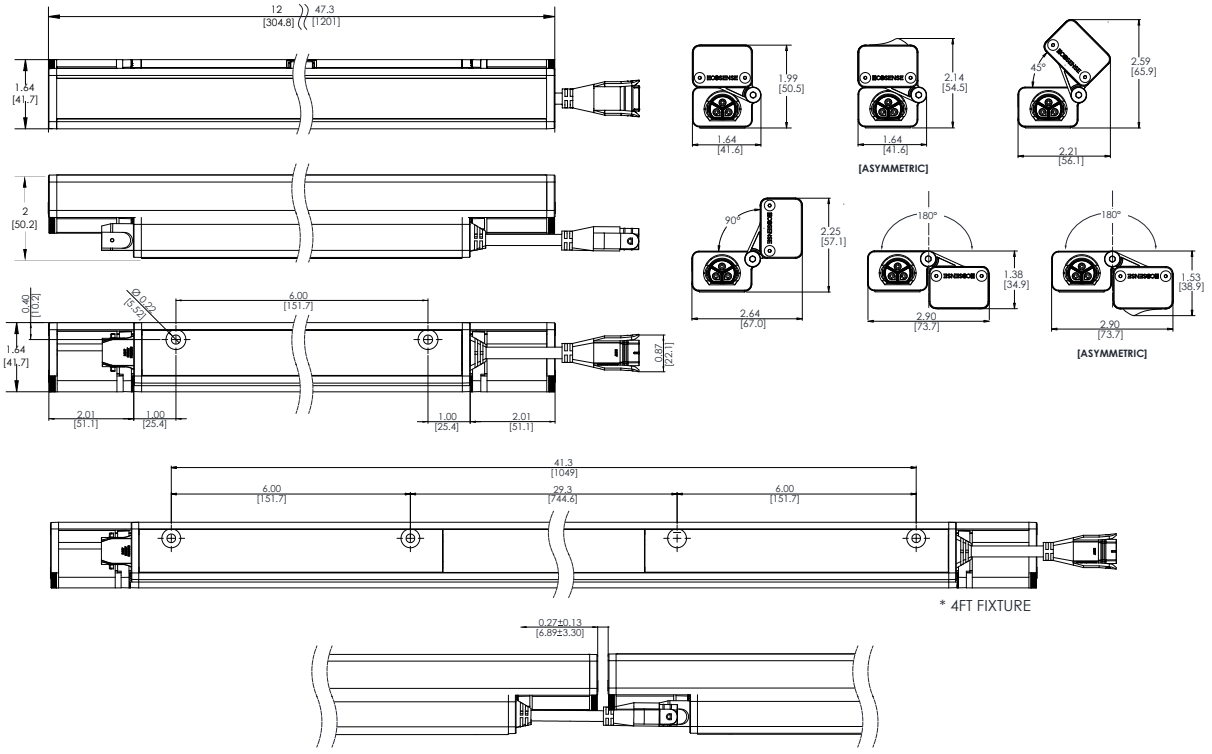
Landscape Stakes needed = 12" and 48" fixtures both need one set of 2.

Wire Box

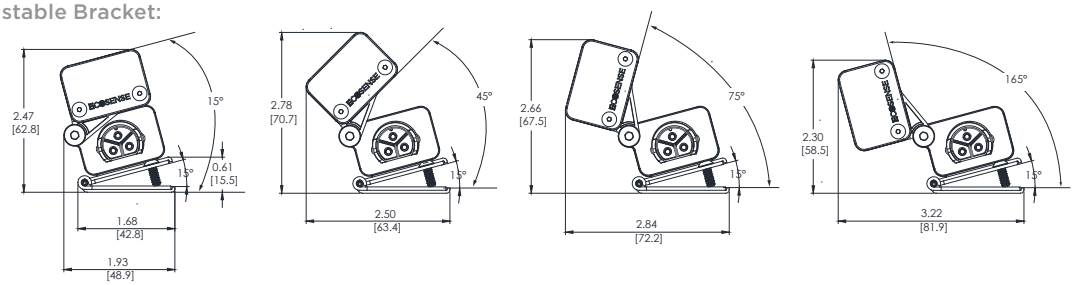
Conduit Connection, Wire Box, TROV, Interior Only, L50 .....**CC-L-WIREBOX**

Wire box can be used instead of a leader cable to start a run. 1/2" conduit fitting can attach directly to the box on one end and the fixture to the other.

DIMENSIONS + MOUNTING



Fine Adjustable Bracket:



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M Series Commercial

Project:	Type:
Product Code:	Date:

V 102423

4" Round Downlight

Versatile Solution for all spaces providing high quality lighting ranging from 750lm all the way up to 3500lm

Expedited Install with our easily adjustable universal housing and bar hanger systems allowing for application in most ceiling types

Enhanced Serviceability is achieved through interchangeable modules, optics, and trims, all of which allow for ease of maintenance and implementation of design changes below the ceiling plane

Seamless Integration with several control systems allowing two-channel control dimming options down as low as 0.1%

INSTALLATION

Ceiling Thickness
½" up to 2"

Ceiling Material
Drywall, Millwork

TRIMS

Aperture
4"

Shape
Round

Style
Standard, Hyperbolic, Pinhole, Wall Wash, Flangeless, Decorative

Finish
White, Black, Bronze, Clear Diffused, Warm Diffused, Custom

LIGHT OUTPUT & DISTRIBUTION

Module
Downlight

Lumens (Power)
750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (16.5W), 2000 lm (24.5W), 2500 lm (27.5W), 3000 lm (34.0W), 3500 lm (40.5W)

Color Quality
93+ CRI, 2-step SDCM

Color Temperature
2700K 3000K 3500K
4000K Warm Dim (3000-1800K)
Tunable White (4000–1800K) Tunable White (6500–2700K)

Beam Spread
Narrow Spot (15°) Wide Flood (60°)
Spot (25°) General (90°+)
Flood (40°)

POWER & CONTROLS

Input Voltage
120/277V

Dimming
0-10V (1%), DALI-2 (0.1%)

RATINGS & CERTIFICATIONS

Housing
RoHS Compliant

Module and Trim
UL Listed for Wet Location (Flanged Trims Only)
NSF Listed (White and Black Finish Only)

Warranty
5 year limited warranty; 50,000 hours

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M Series Commercial
4" Round Downlight

PRODUCT BUILDER | ROUND | DOWNLIGHT | 0-10V & DALI-2

HOUSING

PRODUCT CODE	
M4NCRN	4" Round Housing, New Construction, Non-IC Rated

LIGHT MODULE

PRODUCT CODE		LUMENS		CRI		CCT		BEAM SPREAD		DIMMING	
MD	Downlight Module	07	750 lm	9	93+ CRI	27	2700K	GA	General Ambient (90°+) [3]	O	0-10V
		10	1000 lm			30	3000K	NS	Narrow Spot (15°) [3]	D	DALI-2 [4]
		12	1250 lm			35	3500K	SP	Spot (25°)		
		15	1500 lm			40	4000K	FL	Flood (40°)		
		20	2000 lm			3W	Warm Dim (3000–1800K) [1]	WF	Wide Flood (60°)		
		25	2500 lm			T1	Tunable White (4000–1800K) [2]				
		30	3000 lm			T2	Tunable White (6500–2700K) [2]				
		35	3500 lm								

[1] *Only available in 1000 lm; not available in Narrow Spot beam spread*
[2] *Only available in 1000 lm, DALI-2 dimming; not available in Narrow Spot beam spread*
[3] *Only available in 750-2000 lm*
[4] *Only available in 1000 lm with Warm Dim or Tunable White CCT or 1250 lm with static CCT*

TRIM | STANDARD

PRODUCT CODE		FINISH		OPTION	
M4TRS	Standard Trim	WH	White	[Blank]	None
M4TRL	Wall Wash Trim [5,10]	BK	Black	FL	Flangeless [6,7]
M4TRP	Pinhole Trim [6,8,10]	BZ	Bronze		
M4TRH	Hyperbolic Trim [6,10]	CW	Clear Diffuse, White Flange		
		WW	Warm Diffuse, White Flange		
		CC	Custom Color		

TRIM | DECORATIVE

PRODUCT CODE	
M4TRSWHDOF	Decorative Open, Frosted [8,9]
M4TRSWHDCF	Decorative Closed, Frosted [8,9]
M4TRSWHDCC	Decorative Closed, Clear Frosted Side [8,9]
M4TRSWHDCCF	Decorative Closed, Clear Frosted Inside [8,9]

[5] *Recommended with Spot beam spread for Warm Dim & Tunable White CCT and Narrow Spot beam spread for all static CCT; available in 750-1250 lm only*
[6] *Only available in White, Black, Bronze or Custom Color finish*
[7] *Mud plate required for FL installation, except for wood ceiling*
[8] *Only available in 750-1000 lm*
[9] *Only available in General Ambient beam spread*
[10] *Available in 750-1500 lm only*

ACCESSORIES

M4XRMUD	Flangeless Mud Plate *(Required for Flangeless Trim drywall installation)*
M4KRTEMPLATE	Flangeless Wood Template (Recommended for Flangeless Trim wood installation)
MDLX-GA	Low Lumen (750-2000LM) Downlight Optic GA 90 Degree Beam Spread
MDLX-NS	Low Lumen (750-2000LM) Downlight Optic NS 15 Degree Beam Spread
MDLX-SP	Low Lumen (750-2000LM)Downlight Optic SP 25 Degree Beam Spread
MDLX-FL	Low Lumen (750-2000LM)Downlgiht Optic FL 40 Degree Beam Spread
MDLX-WF	Low Lumen (750-2000LM)Downlight Optic WF 60 Degree Beam Spread
MDHX-SP	High Lumen (2500LM-3500LM)Downlight Optic SP 25 Degree Beam Spread
MDHX-FL	High Lumen (2500LM-3500LM)Downlgiht Optic FL 40 Degree Beam Spread
MDHX-WF	High Lumen (2500LM-3500LM)Downlight Optic WF 60 Degree Beam Spread

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M Series Commercial
4" Round Downlight

PRODUCT BUILDER | ROUND | DOWNLIGHT | EMERGENCY LIGHTING

HOUSING

PRODUCT CODE		INSTALLATION		SHAPE		RATING		LUMEN		DIMMING		OPTION	
M4	4" Housing	NC	New Construction	R	Round	N	Non-IC	07	750 lm	O	0-10V for EM only	EM	Emergency driver, Integrated switch [1]
								10	1000 lm			EMS	Emergency driver, Remote switch
								12	1250 lm				
								15	1500 lm				
								20	2000 lm				
								25	2500 lm				
								30	3000 lm				
								35	3500 lm				

[1] *Integrated test switch required for both housing and trim*

LIGHT MODULE

PRODUCT CODE		LUMENS		CRI		CCT		BEAM SPREAD		DIMMING	
MD	Downlight Module	07	750 lm	9	93+ CRI	27	2700K	GA	General Ambient (90°+) [3]	A	Alternate
		10	1000 lm			30	3000K	NS	Narrow Spot (15°) [3]		
		12	1250 lm			35	3500K	SP	Spot (25°)		
		15	1500 lm			40	4000K	FL	Flood (40°)		
		20	2000 lm			3W	Warm Dim (3000–1800K) [2]	WF	Wide Flood (60°)		
		25	2500 lm								
		30	3000 lm								
		35	3500 lm								

[2] *Only available in 1000 lm; Not available in Narrow Spot beam spread*

[3] *Only available in 750-2000 lm*

TRIM | STANDARD

PRODUCT CODE		FINISH		OPTION	
M4TRS	Standard Trim	WH	White	[Blank]	None
M4TRL	Wall Wash Trim [4]	BK	Black	FL	Flangeless [5,6]
M4TRP	Pinhole Trim [5,10]	BZ	Bronze	EM	Integrated test switch [1,8,9]
M4TRH	Hyperbolic Trim [5]	CW	Clear Diffuse, White Flange		
		WW	Warm Diffuse, White Flange		
		CC	Custom Color		

TRIM | DECORATIVE

PRODUCT CODE	
M4TRSWHDOF	Decorative: Open, Frosted [7]
M4TRSWHDCF	Decorative: Closed, Frosted [7]
M4TRSWHDCC	Decorative: Closed, Clear Frosted Side [7]
M4TRSWHDCCF	Decorative: Closed, Clear Frosted Inside [7]

[4] *Recommended with Spot beam spread for Warm Dim & Tunable White CCT and Narrow Spot beam spread for all static CCT and available in 750-1250 lm only*

[5] *Only available in White, Black, Bronze or Custom Color finish*

[6] *Mud Plate required for FL Install except for wood ceiling*

[7] *Only available in 750-1000 lm in General Ambient beam spread*

[8] *Only available in Standard style*

[9] *Only available in White Clear Diffuse Warm Diffuse or Custom Color*

[10] *Only available in 750 or 1000 lm*

ACCESSORIES

M4XRMUD	Flangeless Mud Plate *(Required for Flangeless Trim drywall installation)*
M4KRTEMPLATE	Flangeless Wood Template *(Recommended for Flangeless Trim wood installation)*

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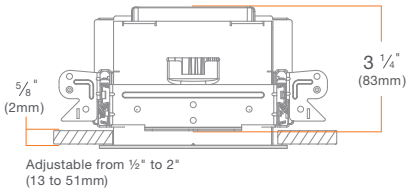
M Series Commercial
4" Round Downlight

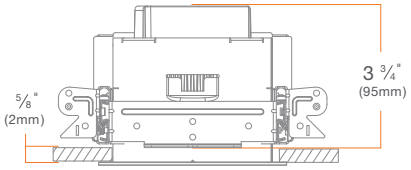
MODULE

750LM-1250LM



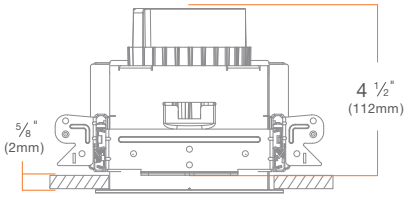
Adjustable from ½" to 2"
(13 to 51mm)

1500LM, DALI-2



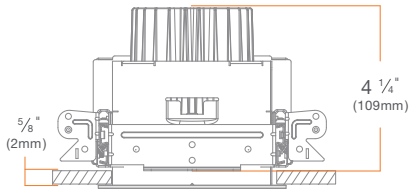
Adjustable from ½" to 2"
(13 to 51mm)

2000LM



Adjustable from ½" to 2"
(13 to 51mm)

2500LM-3500LM



Adjustable from ½" to 2"
(13 to 51mm)

PERFORMANCE SUMMARY

	STATIC CCT	WARM DIM	TUNABLE WHITE
CCT	2700K, 3000K, 3500K, 4000K	3000K - 1800K	4000K - 1800K; 6500K - 2700K
LUMENS (POWER)	750 lm (9.5W), 1000 lm(12.5W), 1250 lm(14.3W), 1500 lm (16.5W), 2000 lm(24.5W), 2500 lm(27.5W), 3000 lm(34.0W), 3500 lm(40.5W)	1000 lm (12.5W)	1000 lm (14.5W)
EFFICACY	77 lm/W, 80 lm/W, 87 lm/W, 91 lm/W, 82 lm/W, 91 lm/W, 89 lm/W, 87 lm/W	83 lm/W	71 lm/W
COLOR QUALITY	93+ CRI [1], 2-step SDCM	93+ CRI [1], 2-step SDCM	93+ CRI [1], 3-step SDCM
BEAM SPREAD	General Ambient (90°+), Narrow Spot (15°), Spot (25°), Flood (40°), Wide Flood (60°)	General Ambient (90°+), Spot (25°), Flood (40°), Wide Flood (60°)	General Ambient (90°+), Spot (25°), Flood (40°), Wide Flood (60°)
DIMMING	0-10V, DALI-2	0-10V, DALI-2	DALI-2
LED CHIP	Cree	Bridgelux	Bridgelux
LISTINGS	ENERGY STAR® qualified [2], UL Listed for Wet Location, UL Certified US·CA, Declare, RoHS compliant, NSF/ANSI 2 listed, suitable for splash-zone, DALI-2 Compliant		

[1] Tested in accordance to IESNA LM-79-2008
[2] Refer to ENERGY STAR Certified light fixtures database

ADDITIONAL

INPUT VOLTAGE: 120/277V, 50/60Hz

MAX INPUT CURRENT (120V): 0.350 amps

MAX INPUT CURRENT (277V): 0.165 amps

AC CONNECTOR: 6 pin Molex
DC CONNECTOR: Male 4-Pin Low Voltage Connector

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

WARRANTY: 5 year limited warranty; 50,000 hours at 70% lumen maintenance

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M Series Commercial
4" Round Downlight

HOUSING

New Construction M4NCRN

SUMMARY

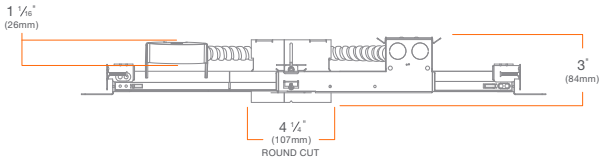
JUNCTION BOX: Equipped with 6 knockouts: two ½" and two ¾" trade size knockouts on top, two ½" trade size knockouts on side. Approved for 8 (four in, four out) #12 AWG 70°C.

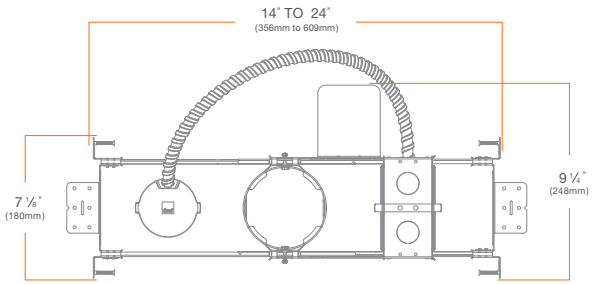
BAR HANGER MOUNTING: Adjustable Bar Hangers for 14"-24" joist spacing. Compatible with traditional joists, Armstrong™ ceiling, Hat Channel, T-Bar.

CEILING: ½" up to 2"

CUTOUT: 4 ¼" (107mm) round opening

WARRANTY: 5 year limited warranty





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M Series Commercial
4" Round Downlight

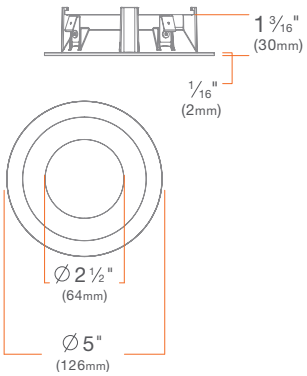
TRIMS

SUMMARY

CONSTRUCTION: Die-cast aluminum
DECORATIVE: Acrylic diffuser
INSTALLATION: Twist & Lock

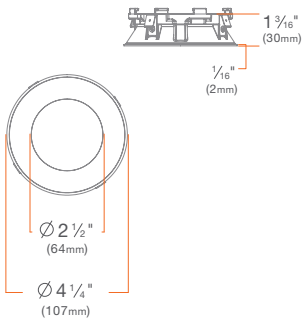
Standard

M4TRSWH



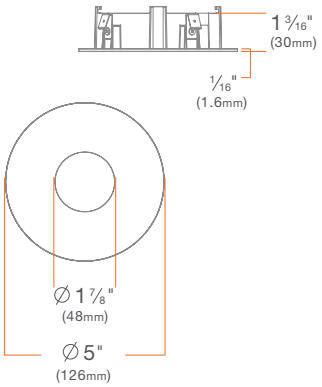
Flangeless

M4TRSWHFL



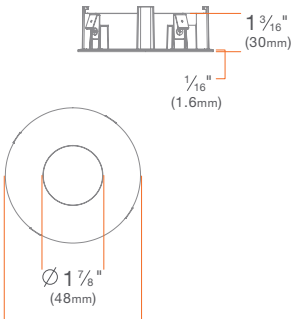
Pinhole

M4TRPWH



Flangeless Pinhole

M4TRPWHFL



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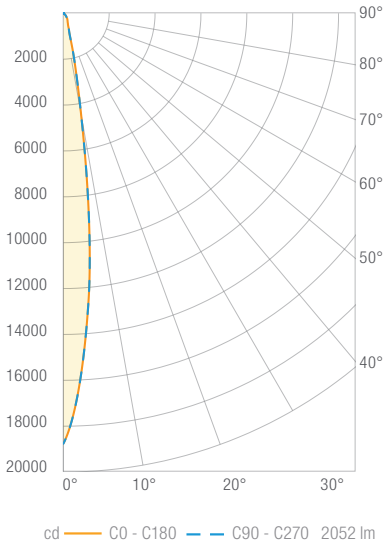
M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, Narrow Spot

MD20930NS | M4TRSWH



Luminous Intensity

Gamma	C 0˚
0º	18766
5º	12609
10º	4461
15º	1402
20º	682
25º	466
30º	372
35º	304
40º	221
45º	162
50º	116
55º	81
60º	53
65º	30
70º	13
75º	8
80º	5
85º	2
90º	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1625	79
0-40	1810	88
0-60	2010	98
0-90	2052	100
0-180	2052	100

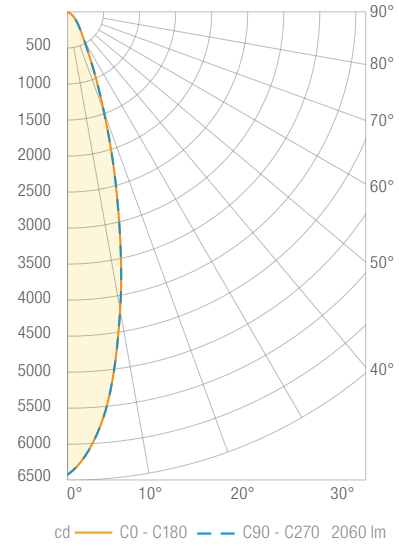
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	2085.2	0.7'
6'	521.3	1.5'
9'	231.7	2.2'
12'	130.3	2.9'

Beam Angle: 14°

MD 2000 lm, 3000K, Spot

MD20930SP | M4TRSWH



Luminous Intensity

Gamma	C 0˚
0º	6422
5º	5661
10º	4202
15º	2653
20º	1478
25º	799
30º	472
35º	319
40º	227
45º	166
50º	119
55º	82
60º	50
65º	29
70º	13
75º	8
80º	4
85º	2
90º	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1612	78
0-40	1817	88
0-60	2020	98
0-90	2060	100
0-180	2060	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	713.5	1.4'
6'	178.4	2.8'
9'	79.3	4.2'
12'	44.6	5.6'

Beam Angle: 26°

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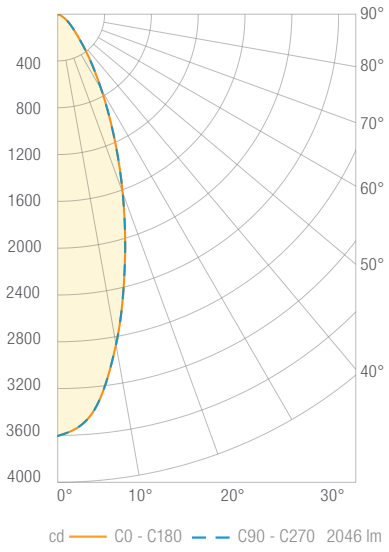
dmf

M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, Flood

MD20930FL | M4TRSWH



Luminous Intensity

Gamma	C 0°
0°	3604
5°	3418
10°	2867
15°	2215
20°	1620
25°	1123
30°	746
35°	487
40°	309
45°	204
50°	141
55°	98
60°	57
65°	34
70°	15
75°	10
80°	6
85°	3
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1438	70
0-40	1748	85
0-60	1998	98
0-90	2046	100
0-180	2046	100

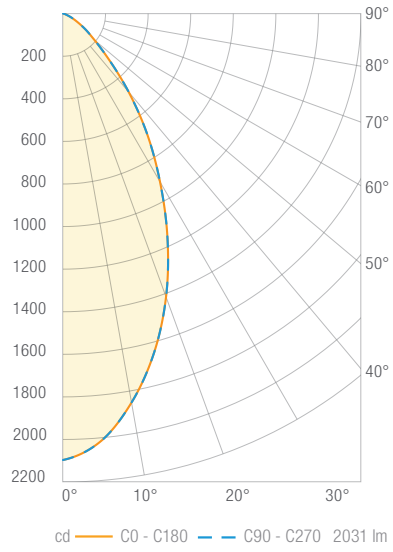
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	400.5	2.0'
6'	100.1	4.0'
9'	44.5	6.0'
12'	25.0	8.0'

Beam Angle: 37°

MD 2000 lm, 3000K, Wide Flood

MD20930WF | M4TRSWH



Luminous Intensity

Gamma	C 0°
0°	2096
5°	2018
10°	1855
15°	1651
20°	1416
25°	1162
30°	912
35°	689
40°	480
45°	307
50°	195
55°	129
60°	78
65°	45
70°	22
75°	12
80°	7
85°	4
90°	1

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1179	58
0-40	1605	79
0-60	1967	97
0-90	2031	100
0-180	2031	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	232.9	3.1'
6'	58.2	6.2'
9'	25.9	9.3'
12'	14.6	12.4'

Beam Angle: 55°

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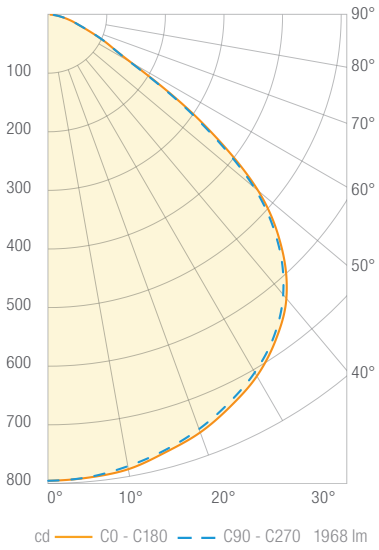
dmf

M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, General Ambient

MD20930GA



Luminous Intensity

Gamma	C 0°
0°	796
5°	793
10°	788
15°	773
20°	759
25°	737
30°	712
35°	677
40°	632
45°	564
50°	468
55°	318
60°	163
65°	103
70°	62
75°	41
80°	24
85°	11
90°	3

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	640	32
0-40	1067	54
0-60	1798	91
0-90	1968	100
0-180	1968	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	88.4	7.8'
6'	22.1	15.5'
9'	9.8	23.3'
12'	5.5	31.1'

Beam Angle: 105° x 104°

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Wall luminaire · Directed light

BEGA

Application
Wall mounted luminaire with directed light designed to be mounted at various heights for general purpose illumination or glare free illumination when below eye level.

Materials
Clear safety glass with matte finish
Marine grade, copper free (≤ 0.3% copper content) A360.0 aluminum alloy
High temperature silicone gasket
Mechanically captive stainless steel fasteners
Silicone applied robotically to casting, plasma treated for increased adhesion

NRTL listed to North American Standards, suitable for wet locations
Protection class IP 65

Weight: 3.1 lbs.

Electrical

Operating voltage	120-277V AC
Minimum start temperature	-30° C
LED module wattage	6.1 W
System wattage	8.0 W
Controllability	0-10V, TRIAC, and ELV dimmable
Color rendering index	Ra > 90
Luminaire lumens	459 lm
LED service life (L70)	60000 hrs

LED color temperature
☐ 4000K (K4)
☐ 3500K (K35)
☐ 3000K (K3)
☐ 2700K (K27)

BEGA can supply you with suitable LED replacement modules for up to 20 years after the purchase of LED luminaires - see website for details

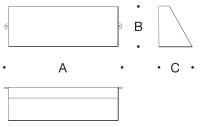
Finish
All BEGA standard finishes are matte, textured powder coat with minimum 3 mil thickness. BEGA Unidure® finish provides superior fade protection in Black, Bronze, and Silver. BEGA standard White is a super durable polyester powder. Optionally available RAL and custom color finishes provided in either polyester powder or liquid paint.

Available colors
☐ Black (BLK)
☐ Bronze (BRZ)
☐ Silver (SLV)
☐ White (WHT)
☐ RAL:
☐ CUS:

Type:
BEGA Product:
Project:
Modified:

Available options

☐ CUS	Custom finish
☐ FSC	Fusing
☐ MGU	Marine grade undercoat
☐ RAL	RAL finish



Wall luminaire · Directed light

		LED	A	B	C
B24372	ADA	6.1 W	$7^{7}/_{8}$	$4^{3}/_{8}$	$3^{3}/_{8}$

BEGA 1000 BEGA Way, Carpinteria, CA 93013 (805) 684-0533 info@bega-us.com

Due to the dynamic nature of lighting products and the associated technologies, luminaire data on this sheet is subject to change at the discretion of BEGA North America. For the most current technical data, please refer to bega-us.com
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Updated 08/27/24

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Downtown

Round Outdoor Ceiling Mount

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ FM-W47205 5"	❍ 3000K	❍ BK Black	11.9W	900	607
	❍ 3500K	❍ WT White	11.9W	925	647
	❍ 4000K		11.9W	950	618

Example: **FM-W47205-40-WT**

For custom requests please contact customs@waclighting.com

FEATURES

- Built in color temperature adjustability. Switch from 3000K/3500K/4000K
- Option to pre-select color temperature or adjust in the field
- ACLED driverless technology
- 5 Year warranty

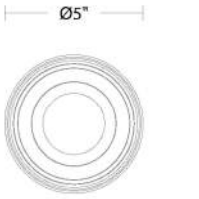
SPECIFICATIONS

Color Temp:	3500K,3000K,4000K
Input:	120 VAC,50/60Hz
CRI:	90
Dimming:	ELV: 100-10% ,TRIAC: 100-10%
Rated Life:	54000 Hours
Mounting:	Can be mounted on ceiling or wall in all orientations
Standards:	ETL, cETL,IP65,Title 24 JA8 Compliant
	Wet Location Listed
Construction:	Aluminum body, glass diffuser

FINISHES:

White Black

LINE DRAWING:



FM-W47205

WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. September 2024

VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

- Wet-rated VERSatile fixture encapsulated in polyurethane
- The polyurethane encapsulation provides optimal delivered lumens
- Features integrated metal endcaps
- Mounting options include a concealed or magnetic clip
- With an internal White Optics coating, the fixture achieves greater lumen output
- Durable anodized aluminum housings
- Consult factory for field assembly options

1 PRODUCT	2 WATTS/ FT	3 CCT	4 RATED	5 LENS	6 EXTERNAL LOUVER	7 WIRE IN/ OUT	8 CONN/ WIRE IN	9 CONN/ WIRE OUT	10 END CAP IN	11 END CAP OUT	12 WIRE COLOR	13 WIRE TYPE	14 MOUNTING	15 FINISH	16 LENGTH (IN)	17 EXACT/ OPTIMAL
VERS-06-SW																

Sample Part Number: **VERS-06-SW-5.0-30-DRY-ENC/TL-L1-BK-P1-BW-BW-STD-STD-BK-CL2-CC-BK-48"-E**

1 PRODUCT

VERS-06-SW

See following pages for compatible power supplies.

2 WATTS/FT

1.5	1.5W/ft
3.0	3.0W/ft
4.0	4.0W/ft
5.0	5.0W/ft
1.5HE	1.5W/ft HE
3.0HE	3.0W/ft HE
6.0HE	6.0W/ft HE

3 CCT

24	2400K
27	2700K
30	3000K
35	3500K
40	4000K

4 RATED

DRY	IP20
WET	IP67

5 LENS

ENC/CL	Encapsulated in Clear
ENC/TL	Encapsulated in Translucent

For representation of LED visibility, see Diode Visibility section on following pages.
For beam angles, see Photometric Performance section on following pages

6 EXTERNAL LOUVER

L1-WH	White Plastic
L1-BK	Black Plastic
L2-ST	Satin Anodized Aluminum
L2-BK	Black Anodized Aluminum
L2-WH	White Powder Coated Aluminum
N/A	No Louver

Plastic Louvers come in 12" lengths, multiple pieces will be used to match fixture length. Aluminum louvers come in maximum 98" lengths and will be cut to match fixture length.

7 WIRE IN/OUT

S1	Single 1 - End Feed
S2	Single 2 - Bottom Feed
S3	Single 3 - Left Side Feed
S4	Single 4 - Right Side Feed

P1	Pass Through 1 - End Feed
P2	Pass Through 2 - Bottom Feed
P3	Pass Through 3 - Left Side Feed
P4	Pass Through 4 - Right Side Feed

P2, P3, P4 options not compatible with external louver

8 CONN/WIRE IN

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

9 CONN/WIRE OUT

CLS	Closed End (No feed)

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire Out not needed to specify product. Typical selection is CLS or BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

10 END CAP IN

STD	Standard
CL	Clear

STD - End cap matches fixture finish chosen
Select CL for continuous runs

11 END CAP OUT

STD	Standard
CL	Clear

STD - End cap matches fixture finish chosen
Select CL for continuous runs

12 WIRE COLOR

WH	White
BK	Black

13 WIRE TYPE

CL2	Class 2
CL2P	Plenum Rated

CL2P only available with bare wire leads (BW)

14 MOUNTING

CC	Concealed Clip
MG	Magnet

15 FINISH

ST	Satin
BK	Black
BZ	Bronze
WH	White
CU	Custom

16 LENGTH (IN)

Fixture length min 12", max 98.43" not including end caps. Consult factory for lengths under 12".

17 EXACT/OPTIMAL

O	Optimal Illumination
E	Exact Specified Length

Exact fixtures are the exact length specified +0 – 1/8".
Optimal fixtures' length is rounded down with illumination end to end. See Exact/Optimal Fixture Length charts.

5 year warranty | Warranty only valid with QTL power supplies | Field modifications void warranty | Data subject to change, all data has +/- 5% tolerance

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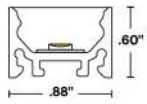
Specification subject to change. Rev-08-30-24

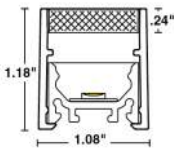
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

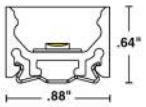
1 PRODUCT - DIMENSIONS



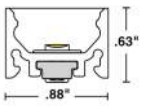
Profile



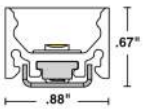
VERS-06 with L1/L2 Louver



Profile with concealed clip



Profile with magnetic clip



Profile with magnet mount clip
& magnetic mount accessory

2 DELIVERED LUMENS

[Calculated L70 = 40000 hrs]
Tested with VERS-06-SW-**-30-DRY

	1.5 W/FT		1.5HE W/FT		3.0 W/FT		3.0HE W/FT		4.0 W/FT		5.0 W/FT		6.0HE W/FT	
	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI
ENC/CL	139	96	185	97	242	96	335	96	286	96	347	96	575	96
ENC/TL	125	96	154	97	204	96	283	96	273	96	307	96	490	96

5 DIODE VISIBILITY

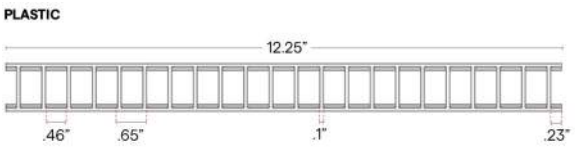
ENC/CL - Clear encapsulation

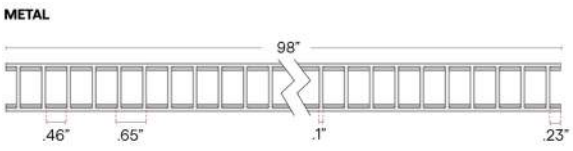
ENC/TL - Translucent encapsulation

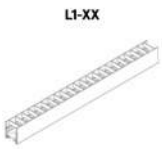
PHOTOMETRIC PERFORMANCE

Nominal beam spread shown, beam spread varies based on light engine. For more detailed information, see photometric data.

6 EXTERNAL LOUVER







Lumen Multiplier

WH	BK
0.70	0.54

Lumen Multiplier

WH	BK	ST
0.64	0.39	0.59

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VERS-ENCAPSULATED (06) STATIC WHITE

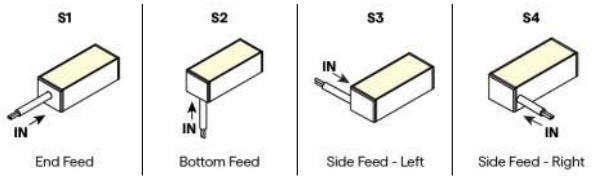
Linear Fixtures - Surface

TEMPERATURE RATINGS

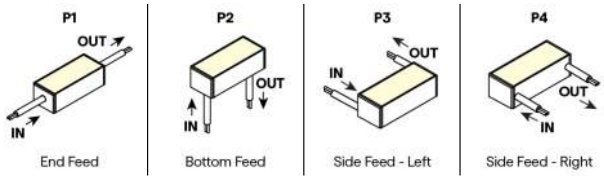
	1.5 W/FT		1.5 HE W/FT		3.0 W/FT		3.0 HE W/FT		4.0 W/FT		5.0 W/FT		6.0 HE W/FT	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Ambient Operating Temp - Surface	-4°F	130°F	-4°F	135°F	-4°F	120°F	-4°F	125°F	-4°F	115°F	-4°F	105°F	-4°F	105°F

7 WIRE INPUT/OUTPUT

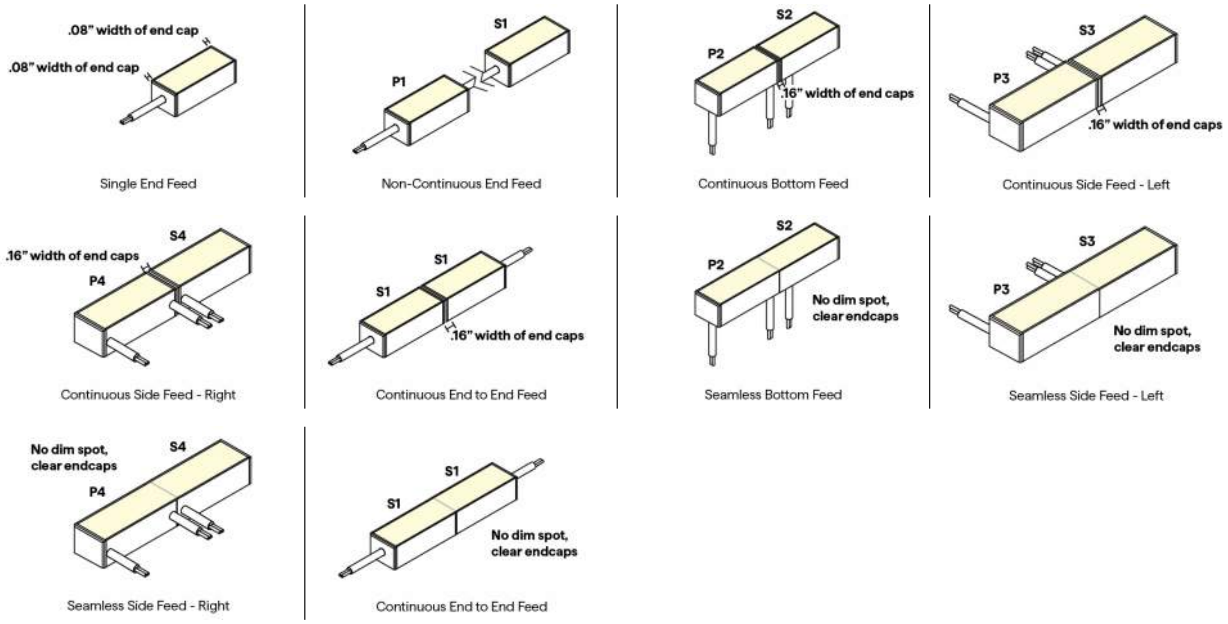
SINGLE (Input only)



PASS THROUGH (Input/Output)



CONFIGURATION OPTIONS



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VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

8/9 CONNECTOR/WIRE – IN/OUT

Connector/Wire In or Out not needed to specify product.

BW

Bare Wire 36"
Stranded 22 AWG

CON6/CON24

6" or 24" Overall
Wire Connector | 22 AWG
IP67 Rated, UL Listed

10/11 END CAP – IN/OUT

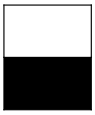
STD

End cap matches fixture finish chosen

CL

Clear end cap

12 WIRE COLOR



White

Black

14 MOUNTING

CC (CC-01)

Concealed Clip

2 pieces of hardware provided for 4' or less; 4 pieces of hardware provided for greater than 4'

To order separately use CC-01

Each clips comes with a #4 x 5/8" Flat Head screw.

CC (CC-02)

Louver Concealed Clip
Required if L1 or L2 Louver is selected

2 pieces of hardware provided for 4' or less; 4 pieces of hardware provided for greater than 4'

To order separately use CC-02

Each clips comes with a #4 x 5/8" Flat Head screw.

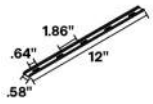
MG

Magnet Clip

One MG provided per foot

To order separately use MG-02

MMA-02



Magnet Mount
Accessory for MG-02

Sold separately, to order use MMA-02

Each clip comes with a #6 Flat Screw

Required when mounting to a non-magnetic surface

15 FINISH

Satin

Black

Bronze

White

Custom color available

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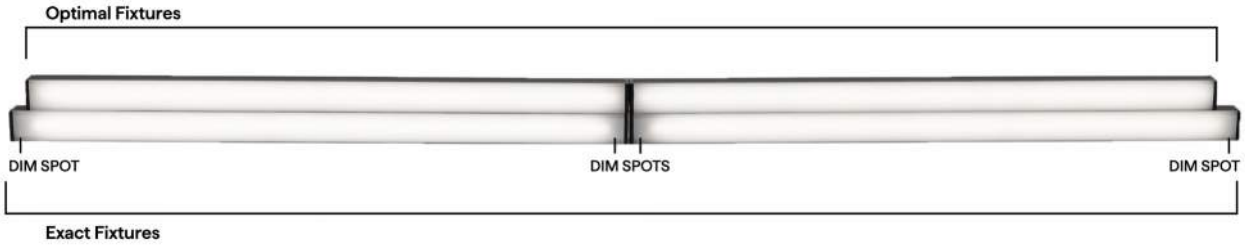
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

17 EXACT/OPTIMAL FIXTURE LENGTH

Exact fixtures are the exact length specified. Optimal fixtures' length is rounded down based on LED cut points to allow the fixture to be illuminated end to end. For runs with multiple fixtures that need to fill a specific length, it's recommended to order all optimal fixtures with an exact fixture at the end of the run.



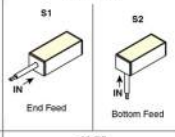
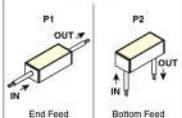
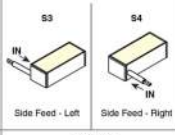
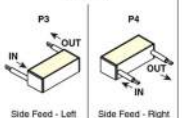
SW DRY LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	.5"
13"	.5"
14"	.5"
15"	.5"
16"	.5"
17"	.5"
18"	.5"
19"	.5"
20"	.5"
21"	.5"
22"	.5"
23"	.5"
24"	.5"
36"	.5"
48"	.5"
60"	.5"
72"	.5"
84"	.5"
96"	.5"

OPTIMAL LENGTH

Requested Nominal Length	S1 & S2		P1 & P2		S3 & S4		P3 & P4	
								
	End Feed	Bottom Feed	End Feed	Bottom Feed	Side Feed - Left	Side Feed - Right	Side Feed - Left	Side Feed - Right
12"	11.5"		11.75"		11.375"		11.375"	
13"	12.5"		12.75"		12.375"		12.375"	
14"	13.5"		13.75"		13.375"		13.375"	
15"	14.5"		14.75"		14.375"		14.375"	
16"	15.5"		15.75"		15.375"		15.375"	
17"	16.5"		16.75"		16.375"		16.375"	
18"	17.5"		17.75"		17.375"		17.375"	
19"	18.5"		18.75"		18.375"		18.375"	
20"	19.5"		19.75"		19.375"		19.375"	
21"	20.5"		20.75"		20.375"		20.375"	
22"	21.5"		21.75"		21.375"		21.375"	
23"	22.5"		22.75"		22.375"		22.375"	
24"	23.5"		23.75"		23.375"		23.375"	
36"	35.5"		35.75"		35.375"		35.375"	
48"	47.5"		47.75"		47.375"		47.375"	
60"	59.5"		59.75"		59.375"		59.375"	
72"	71.5"		71.75"		71.375"		71.375"	
84"	83.5"		83.75"		83.375"		83.375"	
96"	95.5"		95.75"		95.375"		95.375"	

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Specification subject to change. Rev-08-30-24

VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

SW WET LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	.5"
13"	.5"
14"	.5"
15"	.5"
16"	.5"
17"	.5"
18"	.5"
19"	.5"
20"	.5"
21"	.5"
22"	.5"
23"	.5"
24"	.5"
36"	.5"
48"	.5"
60"	.5"
72"	.5"
84"	.5"
96"	.5"

OPTIMAL LENGTH

Requested Nominal Length	S1 & S2 (S1: End Feed; S2: Bottom Feed)	P1 & P2 (P1: End Feed; P2: Bottom Feed)	S3 & S4 (S3: Side Feed - Left; S4: Side Feed - Right)	P3 & P4 (P3: Side Feed - Left; P4: Side Feed - Right)
12"	11.625"	11.75"	11.5"	11.375"
13"	12.625"	12.75"	12.5"	12.375"
14"	13.625"	13.75"	13.5"	13.375"
15"	14.625"	14.75"	14.5"	14.375"
16"	15.625"	15.75"	15.5"	15.375"
17"	16.625"	16.75"	16.5"	16.375"
18"	17.625"	17.75"	17.5"	17.375"
19"	18.625"	18.75"	18.5"	18.375"
20"	19.625"	19.75"	19.5"	19.375"
21"	20.625"	20.75"	20.5"	20.375"
22"	21.625"	21.75"	21.5"	21.375"
23"	22.625"	22.75"	22.5"	22.375"
24"	23.625"	23.75"	23.5"	23.375"
36"	35.625"	35.75"	35.5"	35.375"
48"	47.625"	47.75"	47.5"	47.375"
60"	59.625"	59.75"	59.5"	59.375"
72"	71.625"	71.75"	71.5"	71.375"
84"	83.625"	83.75"	83.5"	83.375"
96"	95.625"	95.75"	95.5"	95.375"

SW-HE DRY LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	1"
13"	0.5"
14"	1"
15"	0.5"
16"	1"
17"	0.5"
18"	1"
19"	0.5"
20"	1"
21"	0.5"
22"	1"
23"	0.5"
24"	1"
36"	1"
48"	1"
60"	1"
72"	1"
84"	1"
96"	1"

OPTIMAL LENGTH: highlighted rows are closest to requested nominal length

Requested Nominal Length	S1 & S2 (S1: End Feed; S2: Bottom Feed)	P1 & P2 (P1: End Feed; P2: Bottom Feed)	S3 & S4 (S3: Side Feed - Left; S4: Side Feed - Right)	P3 & P4 (P3: Side Feed - Left; P4: Side Feed - Right)
12"	10.5"	10.75"	10.375"	10.375"
13"	12.5"	12.75"	12.375"	12.375"
14"	12.5"	12.75"	12.375"	12.375"
15"	14.5"	14.75"	14.375"	14.375"
16"	14.5"	14.75"	14.375"	14.375"
17"	16.5"	16.75"	16.375"	16.375"
18"	16.5"	16.75"	16.375"	16.375"
19"	18.5"	18.75"	18.375"	18.375"
20"	18.5"	18.75"	18.375"	18.375"
21"	20.5"	20.75"	20.375"	20.375"
22"	20.5"	20.75"	20.375"	20.375"
23"	22.5"	22.75"	22.375"	22.375"
24"	22.5"	22.75"	22.375"	22.375"
36"	34.5"	34.75"	34.375"	34.375"
48"	46.5"	46.75"	46.375"	46.375"
60"	58.5"	58.75"	58.375"	58.375"
72"	70.5"	70.75"	70.375"	70.375"
84"	82.5"	82.75"	82.375"	82.375"
96"	94.5"	94.75"	94.375"	94.375"

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Specification subject to change. Rev-08-30-24

VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

SW-HE-WET LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	1"
13"	0.5"
14"	1"
15"	0.5"
16"	1"
17"	0.5"
18"	1"
19"	0.5"
20"	1"
21"	0.5"
22"	1"
23"	0.5"
24"	1"
36"	1"
48"	1"
60"	1"
72"	1"
84"	1"
96"	1"

OPTIMAL LENGTH: highlighted rows are closest to requested nominal length

Requested Nominal Length	S1 & S2 (S1 End Feed, S2 Bottom Feed)	P1 & P2 (P1 End Feed, P2 Bottom Feed)	S3 & S4 (S3 Side Feed - Left, S4 Side Feed - Right)	P3 & P4 (P3 Side Feed - Left, P4 Side Feed - Right)
12"	10.625"	10.875"	10.625"	10.625"
13"	12.625"	12.875"	12.625"	12.625"
14"	12.625"	12.875"	12.625"	12.625"
15"	14.625"	14.875"	14.625"	14.625"
16"	14.625"	14.875"	14.625"	14.625"
17"	16.625"	16.875"	16.625"	16.625"
18"	16.625"	16.875"	16.625"	16.625"
19"	18.625"	18.875"	18.625"	18.625"
20"	18.625"	18.875"	18.625"	18.625"
21"	20.625"	20.875"	20.625"	20.625"
22"	20.625"	20.875"	20.625"	20.625"
23"	22.625"	22.875"	22.625"	22.625"
24"	22.625"	22.875"	22.625"	22.625"
36"	34.625"	34.875"	34.625"	34.625"
48"	46.625"	46.875"	46.625"	46.625"
60"	58.625"	58.875"	58.625"	58.625"
72"	70.625"	70.875"	70.625"	70.625"
84"	82.625"	82.875"	82.625"	82.625"
96"	94.625"	94.875"	94.625"	94.625"

COMPATIBLE POWER SUPPLIES

See power supplies cut sheets for more information. Data subject to change, all data has +/- 5% tolerance.

DIM TO LEVEL	INDOOR		OUTDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Dim to Black	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	QOM-DC+CAP QOM-PH	QOM-DC+CAP QOM-PH
0.1%	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V
1%	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
10%	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle	Q-HEX-mini-DC Q-SET-mLED	

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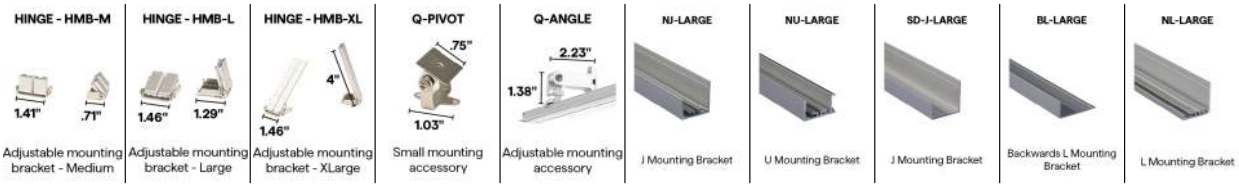
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

DIMMING PROTOCOL	INDOOR		OUTDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Non-Dim	QTM-eLED+CAP QTM-eLED-ND QZ-ND	QTM-eLED+CAP QTM-eLED-ND QZ-ND	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65
Phase	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q-HEX-mini-DC Q-SET-QZ-PH/0-10V Q-SET-mLED QOM-DC+CAP QOM-PH QZ-PH/0-10V	Q-SET-QZ-PH/0-10V QOM-DC+CAP QOM-PH QZ-PH/0-10V
0-10V	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V
Lutron Athena	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN		
ECO System	QTM-eLED(E)	QTM-eLED(E)		
DMX	QZ-DMX	QZ-DMX	Q-SET-QZ-DMX QZ-DMX	Q-SET-QZ-DMX QZ-DMX
DALI-2: DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
SCENE App Dimmed	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle		

COMPATIBLE MOUNTING ACCESSORIES



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Specification subject to change. Rev-08-30-24

MINI ACCENT 12V

5111

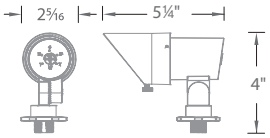
WAC
LANDSCAPE LIGHTING

Fixture Type:

Catalog Number:

Project:

Location:



PRODUCT DESCRIPTION

Landscape mini accent luminaire. One fixture replaces all older halogen landscape accent lights

FEATURES

- Continuously Adjustable Beam Angles. Indexed at 10º, 25°, 40°, 50°
- Continuously Adjustable brightness control. Indexed at 1W, 2W, 4W, 6W, 7W
- IP66 rated, Protected against high-pressure water jets
- Solid diecast brass or corrosion resistant aluminum
- Factory sealed water tight fixtures
- Constant output for 9V-15V input
- Can be used as an uplight or downlight
- 2700K or 3000K color temperature
- Mounting stake, detachable shroud, 6' lead wire and direct burial gel filled wire nuts included
- MLV dimmable with remote MLV dimmers

SPECIFICATIONS

Input:	9 -15VAC
Power:	1W to 7W / 2VA -10.5VA
Brightness:	45 lm to 365 lm
Beam Angle:	10° to 50°
CRI:	85
Rated Life:	70,000 hours

ORDERING NUMBER

		Color Temp		Finish	
5111	*Mini Accent 12V*	**27** **30**	*2700K Warm White* *3000K Pure White*	**BK** **BZ** **BBR** **WT**	*Black on Aluminum* *Bronze on Aluminum* *Bronze on Brass* *White on Aluminum*

5111-30____

Example: **5111-30BBR**

waclighting.com
Phone (800) 526.2588
Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive
Port Washington, NY 11050

Central Distribution Center
1600 Distribution Ct
Lithia Springs, GA 30122

Western Distribution Center
1750 Archibald Avenue
Ontario, CA 91760

WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. MAR 02 2021

MINI ACCENT 12V

5111

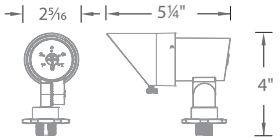
WAC
LANDSCAPE LIGHTING

Fixture Type:

Catalog Number:

Project:

Location:



PRODUCT DESCRIPTION

Landscape mini accent luminaire. One fixture replaces all older halogen landscape accent lights

FEATURES

- Continuously Adjustable Beam Angles. Indexed at 10º, 25°, 40°, 50°
- Continuously Adjustable brightness control. Indexed at 1W, 2W, 4W, 6W, 7W
- IP66 rated, Protected against high-pressure water jets
- Solid diecast brass or corrosion resistant aluminum
- Factory sealed water tight fixtures
- Constant output for 9V-15V input
- Can be used as an uplight or downlight
- 2700K or 3000K color temperature
- Mounting stake, detachable shroud, 6' lead wire and direct burial gel filled wire nuts included
- MLV dimmable with remote MLV dimmers

SPECIFICATIONS

Input:	9 -15VAC
Power:	1W to 7W / 2VA -10.5VA
Brightness:	45 lm to 365 lm
Beam Angle:	10° to 50°
CRI:	85
Rated Life:	70,000 hours

ORDERING NUMBER

		Color Temp		Finish	
5111	*Mini Accent 12V*	**27**	*2700K Warm White*	**BK**	*Black on Aluminum*
		30	*3000K Pure White*	**BZ**	*Bronze on Aluminum*
				BBR	*Bronze on Brass*
				WT	*White on Aluminum*

5111-30____

Example: **5111-30BBR**

waclighting.com
Phone (800) 526.2588
Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive
Port Washington, NY 11050

Central Distribution Center
1600 Distribution Ct
Lithia Springs, GA 30122

Western Distribution Center
1750 Archibald Avenue
Ontario, CA 91760

WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. MAR 02 2021

MINI ACCENT 12V

5111

WAC
LANDSCAPE LIGHTING

Accessories

Accent Snoot		**5111-SNOOT-BK** **5111-SNOOT-BZ** **5111-SNOOT-BBR**	*Black on Aluminum* *Bronze on Aluminum* *Bronze on Brass*	*Shields lamp and reduces glare*
5" Long Shroud		**5111-LSHR-BK** **5111-LSHR-BZ** **5111-LSHR-BBR**	*Black on Aluminum* *Bronze on Aluminum* *Bronze on Brass*	*Reduce glare. Ideal for downlighting application*
Additional Stake		**9000-ST9-BZ**	*Bronze*	*Durable PVC stake*
Surface Mount Flange/Stake		**5000-SCP-BZ** **5000-SCP-BBR** **5000-SCP-BK**	*Bronze on Aluminum* *Bronze on Brass* *Black on Aluminum*	*Includes three 7 inch threaded stainless steel stabilizing pins for ground mounting or surface mounts with four screws or over a junction box*
Guardian Mount		**9000-SP9-BZ**	*Stainless Steel*	*Heavy duty stainless steel spike to position fixture* *Formed from a single piece of metal*
Gutter Mount Bracket		**5000-GM-BZ** **5000-GM-Bk**	*Stainless Steel*	*Stainless Steel universal mounting bracket for gutter mounting fixture*
Tree Mount Junction Box		**5000-TCP-BZ** **5000-TCP-BK**	*Bronze on Aluminum* *Black on Aluminum*	*Bronze on Aluminum box with Stainless steel mounting screws. Two ½" NPT threaded holes*
Optics		**LENS-16-AMB** *Amber* **LENS-16-GRN** *Green* **LENS-16-RED** *Red* **LENS-16-BLU** *Blue*	**LENS-16-FR** *Frosted* **LENS-16-SPR** *Spread* **LENS-16-BEL** *Elongating*	*Enhances saturation of florals and foliage*
Extension Rods		**5000-X04-BZ** *4 in* **5000-X04-BK** *4 in* **5000-X08-BZ** *8in* **5000-X08-BK** *8 in* **5000-X12-BZ** *12 in* **5000-X12-BK** *12 in*	**5000-X18-BZ** *18 in* **5000-X18-BK** *18 in* **5000-X24-BZ** *24 in* **5000-X24-BK** *24 in*	*Extends distance between Accent light and Surface Mount Canopy, Stake, or Tree Mount box*
Rod L-Coupler		**5000-LCO-BZ**	*Bronze*	

Magnetic Transformers

Stainless Steel, 12-15V output, IP65 rated, UL 1838 listed
See transformer spec sheet for details and its accessories

9075-TRN-SS	**9150-TRN-SS**	**9300-TRN-SS**	**9600-TRN-SS**
75W Max	*150W Max*	*300W Max*	*600W Max*

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Mod

6" Outdoor Wall Sconce 3000K

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ WS-W65607 6"	3000K	❍ BK Black ❍ BZ Bronze ❍ GH Graphite ❍ WT White	12W	1165	553

Example: **WS-W65607-WT**

For custom requests please contact customs@waclighting.com

FEATURES

- Weather resistant powder coat finish
- Low profile with effective path illumination
- Light engine is factory sealed for maximum protection from the elements
- Driver concealed within the fixture
- 5 year warranty

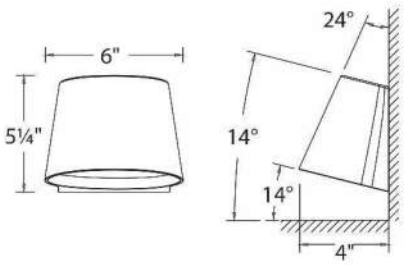
SPECIFICATIONS

Color Temp:	3000K
Input:	120-277V,50/60Hz
CRI:	90
Dimming:	ELV: 100-5% , 0-10V: 100-10%,TRIAC: 100-10%
Rated Life:	70000 Hours
Mounting:	Can be mounted on wall in all orientations
Standards:	ETL, cETL,IP65,Title 24 JA8 Compliant,ADA Wet Location Listed
Construction:	Aluminum hardware with glass diffuser

FINISHES:

White Bronze Graphite Black

LINE DRAWING:



WS-W65607

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

- Wet rated extreme temperature static white LED strip
- Suitable for saunas and steam rooms
- Ambient or mounting surface temperature must not be lower than -40° or higher than 195°F

1 V/WATTS	2 RATED	3 CCT - LUMENS/CRI	4 CONNECTOR/WIRE IN	5 CONNECTOR/WIRE OUT	6 WIRE COLOR	7 WIRE TYPE	8 ILLUMINATED LENGTH

Sample Part Number: **SW-XT24/3.0-WET-30-BW-BW-WH-CL2-48"**

1 V/WATTS

SW-XT24/3.0

Voltage: 24VDC
Wattage: 3.0W/ft
See following pages for compatible power supplies.

2 RATED

WET	IP67

3 CCT - LUMENS/CRI

27	2700K	238/91
30	3000K	261/92
35	3500K	271/92
40	4000K	274/91

4 CONNECTOR/WIRE IN

BW	Bare Wire (Standard 24")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 24", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

5 CONNECTOR/WIRE OUT

BW	Bare Wire (Standard 24")
CLS	Closed End (No feed)
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire Out not needed to specify product. Typical selection is CLS or BW.
BW: Standard length is 24", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

6 WIRE COLOR

WH	White
BK	Black

7 WIRE TYPE

CL2	Class 2

8 ILLUMINATED LENGTH

2"-360"	2" increments

5 year warranty | Warranty only valid with QTL power supplies | Field modifications must comply with QTL's installation methods otherwise warranty is null & void | All data has +/- 5% tolerance | UL Listed | Title 24 - JA8-2019 Strips: WET rated, 2700K and above

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

3 CCT – LUMENS/CRI - DELIVERED LUMENS

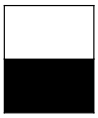
[Calculated L70 = 140000 hrs]
Tested with SW-XT24/3.0-DRY

CCT	Lumen/ft	Luminous Efficacy	CRI Ra	CRI R9	TM30 Rf	TM30 Rg
2700K	238	81 Lm/W	91	50	90	100
3000K	261	89 Lm/W	92	54	90	98
3500K	271	93 Lm/W	92	58	90	98
4000K	274	94 Lm/W	91	53	86	93

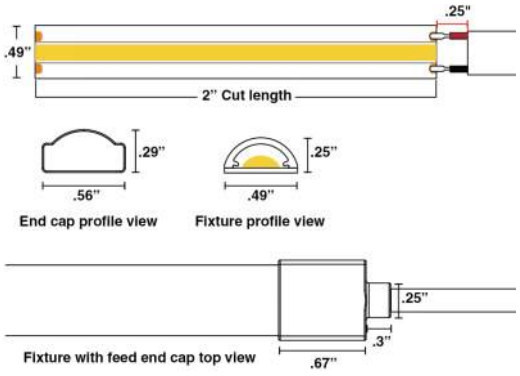
4/5 CONNECTOR/WIRE – IN/OUT

Connector/Wire In or Out not needed to specify product. Standard configuration is BW for Wire In and CLS for Wire out

6 WIRE COLOR



8 ILLUMINATED LENGTH - DIMENSIONS



SW-XT24/3.0

LED Strips - Static White Extreme Temperature

COMPATIBLE EXTRUSIONS

The lenses in these extrusions are only rated for applications below 150°F.
Extrusions without lenses are useful for shielding, glare control, and improving aesthetics.

	WIDE	ROND	TORQ	TRE3	LALO	TALO	ARKA	TELA	VEVE	FLUR	EMBD	LATO	MDIN	OPTI	THIN
DRY															
DMP															
WET	✓ NO LENS			✓ WITH LENS	✓ NO LENS	✓ WITH OR WITHOUT LENS					✓ WITH OR WITHOUT LENS EXCLUDES 30°, 45°, 60° LENS				

COMPATIBLE POWER SUPPLIES

See power supplies cut sheets for more information. Data subject to change, all data has +/- 5% tolerance. Power supply must be located outside of sauna or steam room.

DIM TO LEVEL	INDOOR	OUTDOOR
	SW-XT	SW-XT
Dim to Black	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	QOM-DC+CAP QOM-PH
0.1%	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V
1%	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
10%	Non-Dim Power Supply with SW App Dongle	Q-HEX-mini-DC Q-SET-mLED

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

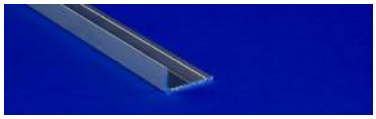
DIMMING PROTOCOL	INDOOR	OUTDOOR
	SW-XT	SW-XT
Non-Dim	QTM-eLED+CAP QTM-eLED-ND QZ-ND	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65
Phase	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q-HEX-mini-DC Q-SET-QZ-PH/0-10V Q-SET-mLED QOM-DC+CAP QOM-PH QZ-PH/0-10V
0-10V	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V
Lutron Athena	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN	
ECO System	QTM-eLED(E)	
DMX	QZ-DMX	Q-SET-QZ-DMX QZ-DMX
DALI-2: DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
SCENE App Dimmed	Non-Dim Power Supply with SW App Dongle	

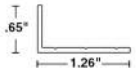
COMPATIBLE MOUNTING ACCESSORIES

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

RoHS COMPLIANT





- Backwards L bracket with no reveal, creating the least amount of cutoff
- Surface mount from the bottom, ideal for illuminating pre-existing cove applications
- Mounts the MICRO 5 family of fixtures, LED light engines, and SHIELD
- Paintable finish
- Intended for indoor use only
- Mounting clips conveniently preinstalled for hassle-free installation
- Durable anodized aluminum

1 PRODUCT	2 FINISH	3 MOUNTING	4 LENGTH (IN)
BL-MICRO			

Sample Part Number: **BL-MICRO-ST-SST-08-48"**

1 PRODUCT

BL-MICRO

2 FINISH

ST	Satin
BK	Black

3 MOUNTING

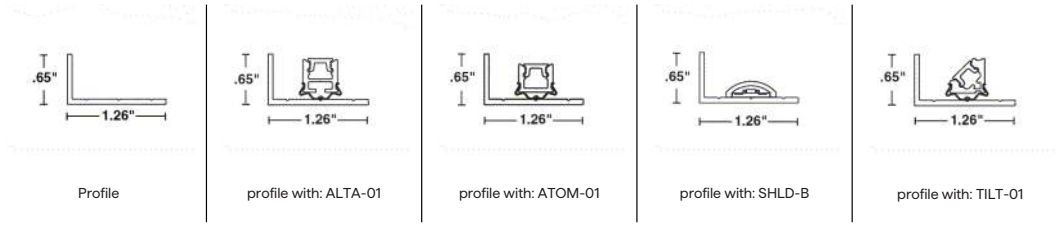
SST-08	Stainless Steel Clip
WSC-02	White Snug Clip
VHB	VHB Tape
N/A	No Clip (For Light Engine)

Mounting clips preinstalled
See MOUNTING COMPATIBILTY CHART for more information

4 LENGTH (IN)

1" increments from 2" - 98.43"
Tolerance +0.0/-0.5"
Light engine ordered separately

1 PRODUCT - DIMENSIONS WITH RECOMMENDED PROFILES



Profile | profile with: ALTA-01 | profile with: ATOM-01 | profile with: SHLD-B | profile with: TILT-01

Field modifications must comply with Q-Tran's installation methods otherwise warranty is null & void | Surface mount

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

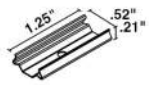
2 FINISH

Satin

Black

3 MOUNTING

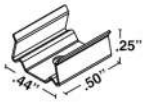
SST
(SST-08)



Stainless Steel Clip

To order separately use SST-08

WSC
(WSC-02)



White Snug Clip

To order separately use WSC-02

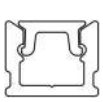
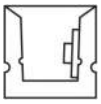
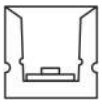
VHB TAPE
(TAPE-VHB-IP67-5)

Sold separately

10MM wide VHB Tape

To order separately use TAPE-VHB-IP67-5

COMPATIBILITY CHART

	 ATOM	TILT	 WALA	 WAVE	NEXUS	ALTA	ANYBEND	SHIELD-B	LIGHT ENGINE
Lens Notes	Works with: ATOM-01, ATOM-03	Works with: TILT-01				Works with: ALTA-01, ALTA-03			
SST-08 Stainless Steel Clip	✓	✓				✓			
WSC-02 White Snug Clip			✓	✓	✓		✓		
VHB	✓	✓	✓	✓	✓		✓		
N/A								✓	✓

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

LIGHT ENGINE COMPATIBILITY CHART

Order Separately

LED Strips No extrusion	STATIC WHITE (SW)	STATIC WHITE INDIVIDUALLY ADDRESSABLE (SW-IA)	STATIC WHITE STOCKING DISTRIBUTOR (SD-SW)	STATIC WHITE HIGH EFFICACY (SW-HE)	STATIC WHITE HIGH EFFICACY PLUS (SW-HE+)	STATIC WHITE EXTREME TEMP (SW-XT)	DYNAMIC WHITE HIGH EFFICACY (DW-HE)	WARM DIM (WD)	STATIC COLOR (SC)	RGB	RGBW	RGBW HIGH EFFICACY (RGBW-HE)
DRY	✓ W/FT: 1.5, 3.0, 4.0, 5.0	✓ W/FT: 5.0	✓ W/FT: 1.0, 2.0, 4.0, 6.0	✓ W/FT: 1.5, 3.0, 6.0, 9.0	✓ W/FT: 3.0, 6.0		✓ W/FT: 1.5, 2.5, 4.0	✓ W/FT: 6.0	✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0, 8.0
DMP	✓ W/FT: 1.5, 3.0, 4.0, 5.0			✓ W/FT: 1.5, 3.0, 6.0					✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0
WET	✓ W/FT: 1.5, 3.0, 4.0, 5.0		✓ W/FT: 1.0, 2.0, 4.0, 6.0	✓ W/FT: 1.5, 3.0, 6.0	✓ W/FT: 3.0, 6.0	✓ W/FT: 3.0		✓ W/FT: 6.0	✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0

ACCESSORY COMPATIBILITY CHART

Order Separately | Only Compatible with DRY

LED Strips No extrusion		STATIC WHITE (SW)	STATIC WHITE INDIVIDUALLY ADDRESSABLE (SW-IA)	STATIC WHITE STOCKING DISTRIBUTOR (SD-SW)	STATIC WHITE HIGH EFFICACY (SW-HE)	STATIC WHITE HIGH EFFICACY PLUS (SW-HE+)	STATIC WHITE EXTREME TEMP (SW-XT)	DYNAMIC WHITE HIGH EFFICACY (DW-HE)	WARM DIM (WD)	STATIC COLOR (SC)	RGB	RGBW	RGBW HIGH EFFICACY (RGBW-HE)
SHIELD-B	S	✓ W/FT: 1.5, 3.0, 4.0, 5.0		✓ W/FT: 2.0, 4.0, 6.0						✓ W/FT: 5.0			
	M		✓ W/FT: 5.0			✓ W/FT: 3.0, 6.0		✓ W/FT: 1.5, 2.5	✓ W/FT: 6.0		✓ W/FT: 6.0		✓ W/FT: 4.0
	L				✓ W/FT: 1.5, 3.0, 6.0							✓ W/FT: 6.0	

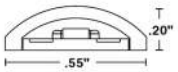
BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

COMPATIBLE SHIELD

Order separately | See SHIELD cut sheet for more information

Profile - S

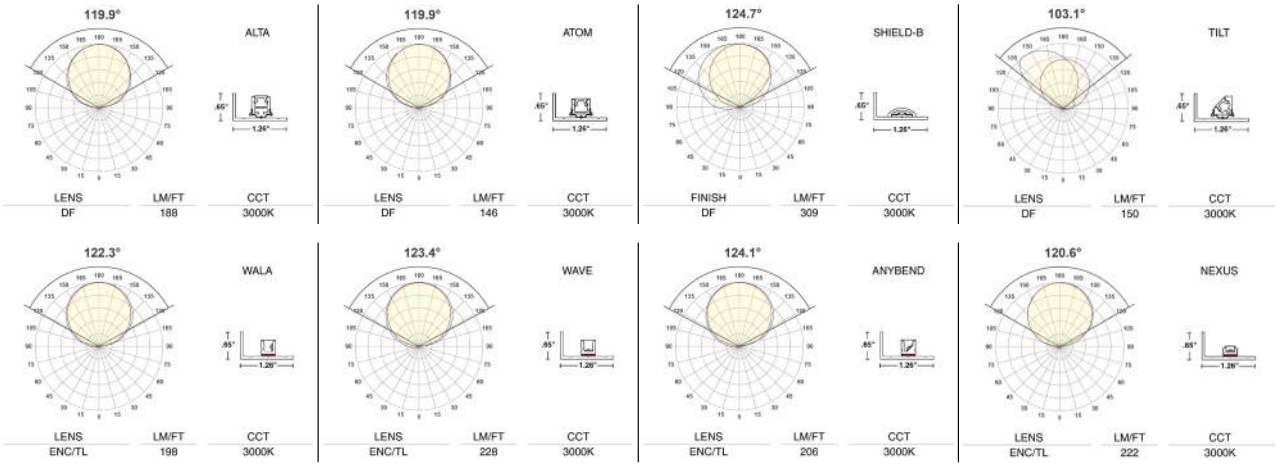


Profile - M

Profile - L

PHOTOMETRIC PERFORMANCE

Tested with SW24/4.0 at 3000K



QZ-PH/0-10V

24V DC Power Supply - 30W-288W

- Versatile Class 2 LED driver controlled with phase (forward or reverse) or 0-10V dimming down to 0.1%
- Pulse Width Modulation (PWM) output provides smooth flicker-free dimming
- 24VDC constant voltage output
- Available in various wattage options: 30W, 60W, 96W, 192W, and 288W
- Housing is listed for indoor or outdoor use

1 PRODUCT	2 WATTAGE	3 PRIMARY VOLTAGE	4 SECONDARY VOLTAGE	5 CONTROL	6 COLOR
QZ		UNV	24V	PH/010	

Sample Part Number: **QZ-60W-UNV-24V-PH/010-BK**

1 PRODUCT

QZ	

2 WATTAGE

30W	
60W	
96W	
192W	
288W	

3 PRIMARY VOLTAGE

UNV	Universal (120-277V)

4 SECONDARY VOLTAGE

24V	

5 CONTROL

PH/010	Phase or 0-10V dimming

6 COLOR

WH	White (Standard)
BK	Black Powder Coat Finish

COMPATIBLE LEDS

STATIC WHITE

SW24/1.5-4.0	✓
SW24/5.0, SW-HE, SW-HE+	✓
SD-SW24/1.0-4.0	✓
SD-SW24/6.0	✓
SW-IA	
SW-XT	✓

OTHER

DW-HE Tunable Applications	
DW-HE Warm Dim Applications	
WD	✓
SC	✓
RGB	
RGBW, RGBW-HE	

SHEETS

Q-SHEETS SW	✓
Q-SHEETS DW Tunable Applications	
Q-SHEETS DW Warm Dim Applications	
Q-SHEETS RGB	
Q-SHEETS RGBW	

MICRO 5

MICRO 5-SW	✓
MICRO 5-DW Tunable Applications	
MICRO 5-DW Warm Dim Applications	
MICRO 5-RGB	

PRODUCT INFORMATION

- Vertical or horizontal surface mount
- Constant voltage output
- PH/010 Dimming:
  - Phase dimming: works with forward phase / leading edge, MLV and Reverse phase / trailing edge, ELV, TRIAC dimmers
  - Dimming range: 0.1% - 100%
  - 0-10V dimming
  - 1-10V dimming
  - 10V PWM
  - Potentiometer
  - Flicker-free dimming
  - PWM (high frequency) output reduces visible flicker
- IP66 Rated
- Follows recommended practices of IEEE standard P1789 to mitigate flicker-induced health risks
- Suitable for dry, damp and wet locations
- Suitable for indoor & outdoor use
- Primary voltage - universal (110-277V)
- Wide operating temperature range: -40˚F to +140˚F
- UL, cUL listed
- Type HL rated
- Compliant to FCC Part 15B
- 5 year warranty

QZ-PH/0-10V

24V DC Power Supply - 30W-288W

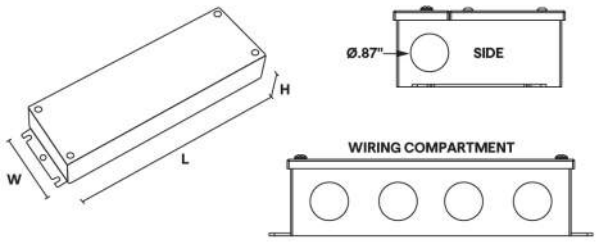
VOLTAGE DROP CHART

Wiring from power supply to light fixture must be two conductor cable

VDC	Load Wattage (W)	Distance from PS for 5% Voltage Drop								
		10 AWG	12 AWG	14 AWG	16 AWG	18 AWG	20 AWG	22 AWG	24 AWG	26 AWG
24	15	913	574	361	227	143	90	55	35	22
	30	456	287	181	114	71	45	28	17	11
	60	228	143	90	57	36	22	14	9	5
	80	171	108	68	43	27	17	10	7	4
	96	143	90	56	35	22	14	9	5	3

1 PRODUCT - DIMENSIONS

Size	Length (in)	Width (in)	Height (in)
30W	6.5	3.75	1.58
60W	7.5	3.75	1.58
96W	8.68	3.75	1.58
192W	10.94	4.33	1.77
288W	11.87	4.33	1.77



2 TECHNICAL INFORMATION

Wattage	Primary Voltage	Secondary Voltage	Secondary Current
30W	110-277V	24VDC	1.25 A
60W	110-277V	24VDC	2.5 A
96W	110-277V	24VDC	1x4 A
192W	110-277V	24VDC	2x4 A
288W	110-277V	24VDC	3x4 A

QZ-PH/0-10V

24V DC Power Supply - 30W-288W

SPECIFICATIONS

Input	
Input Voltage (Vrms)	110-277V
Input Current, max (Arms)	3.3A @ 110V
Inrush Current, max* (Apk)	43A@277V
Input Frequency (Hz)	50/60
Input Power (W)	330

Output	
Output Voltage, nom (V)	24
Output Current (A)	288W, 3×4A @ 24V
Output Power (Wmax)	288W

Environmental	Min	Nom	Max
THD (%)	-	-	20
PF (%)	0.94	-	-
Working Temp (°F)	-	-	140
IP Rating	66	-	-

*-200us event

PROTECTIONS

- Short Circuit Protection (SCP)
- Over Loading Protection (OLP)
- Over Temperature Protection (OTP)
- I/P-O/P: 1.88KVAC
- I/P-O/P: 100MΩ / 500VDC / 77°F / 70%RH

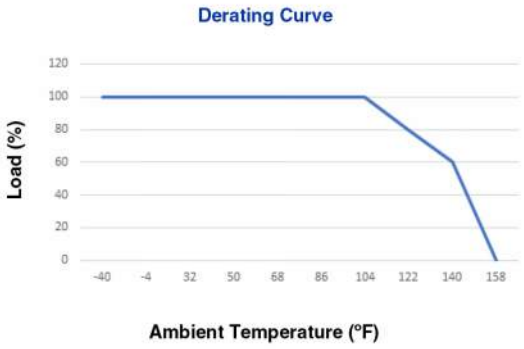
COMPLIANCE

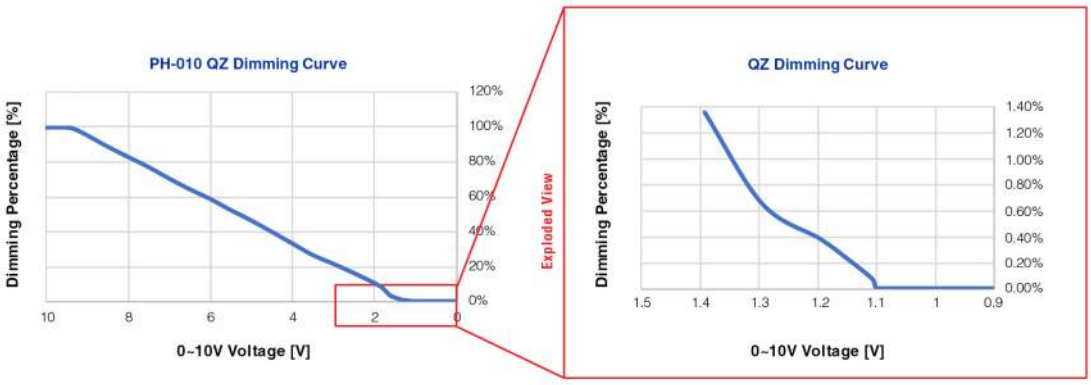
- EMI/RFI
  - FCC 47 CFR Part 15 Subpart B
- Certified
  - UL8750

6 COLOR

Black Powder Coat Finish

White (Standard)

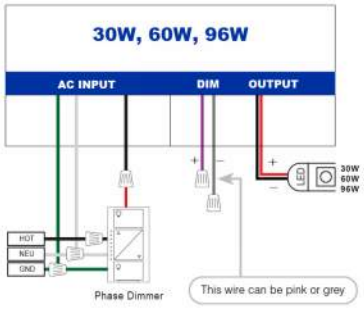


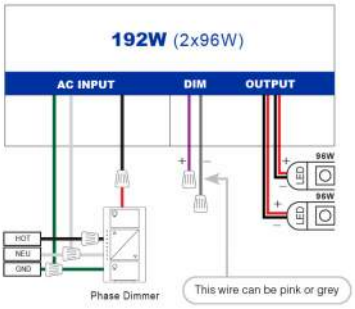


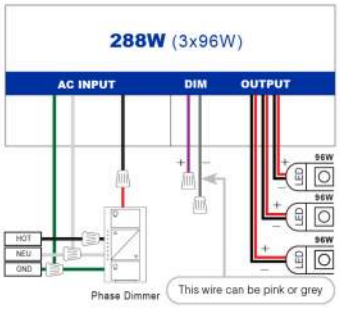
QZ-PH/0-10V

24V DC Power Supply - 30W-288W

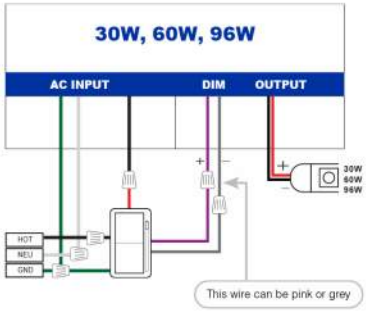
PHASE DIMMING

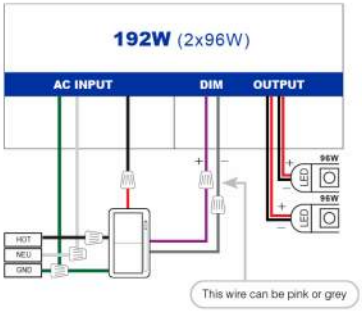


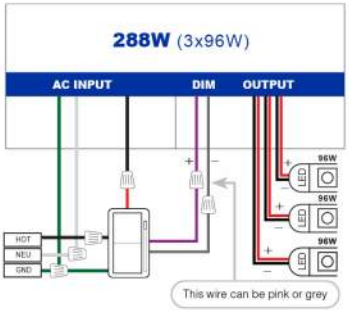




0-10V DIMMING

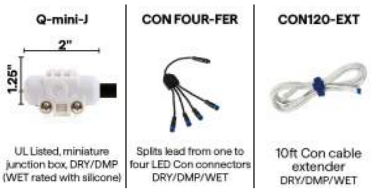






Wiring from power supply to light fixture must be two conductor cable

COMPATIBLE WIRING ACCESSORIES



SECTION 310000 EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Maintain temporary erosion and sedimentation control.
2. Locate existing utilities.
3. Accomplish indicated and required stripping, excavation, filling, compaction, and rough grading as required for construction of structures, general site grading, utility construction, sidewalk, parking lot and roadway construction and the construction of miscellaneous improvements.
4. Provide Dewatering
5. Remove and dispose of materials from the site, which are either not approved for use or are in excess of that required.
6. Import any additional required materials.
7. Coordinate earthwork operations with the other work of the project.

B. Work shall be in accordance with the 2020 City of Seattle Standard Specifications, Divisions 2 through 9, and the 2020 City of Seattle Standard Plans, except as modified herein.

1.2 RELATED SECTIONS

A. Coordinate related work specified in other parts of the Project Manual, including but not limited to Division 01 and the following:

Section 31 10 00	Site Clearing
Section 31 25 00	Temporary Erosion and Sediment Control
Section 33 40 00	Storm Drainage

1.3 REFERENCES

A. Reference Standards: This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in

References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

COS	City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)
COS Standard Plans	City of Seattle Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans)
DR01-2017	Right-of-Way Opening and Restoration Rule (ROWORR)
DR10-2021	Construction Storm Water Control Technical Requirements Manual (Dec 2021)
TCM	Traffic Control Manual for In-Street Work, latest edition (TCM).
Geotechnical Report	Project Geotechnical Report.
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by use of the Sand Equivalent Test.
ASTM C136-93	Test Methods for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 2487-92	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System);
ASTM D698-91	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-Kg) Rammer and 12-inch (305-mm) Drop.
ASTM D1557-91	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-Kg) Rammer and 18-inch (457-mm) Drop.
ASTM D2922-91	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D3017-88	Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow depth).

1.4 SUBMITTALS

A. Test Reports: Geotechnical Engineer will submit the following reports directly to the Architect/Owner and shall copy the Contractor in accordance with Division 1:

1. Analysis of soil materials, whether procured on or off site, and including fill, backfill, and borrow materials.

2. Verification of each footing subgrade.
3. Compressive strength or bearing test reports.

1.5 QUALITY ASSURANCE

A. Construction Monitoring and Testing:

1. The Owner will secure and pay for the services of a Geotechnical engineer to classify existing soil materials, to recommend and to classify proposed borrow materials when necessary, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing.
2. Contractor shall be responsible for coordination of all required testing and shall furnish copies of test reports to the Architect.
3. The Geotechnical Engineer will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications.
4. The Contractor shall remove surface material at locations designated by the Architect and provide such assistance as necessary for sampling and testing.
5. Tests will be made by the Geotechnical Engineer for the following items:
    a. Moisture content
    b. Gradation
    c. Density in-place - ASTM D2922, or equivalent.
    d. Moisture-density relationships - ASTM D698 & ASTM 1557
    e. Any re-testing that is required because the initial test showed that the work did not comply with these Contract Documents shall be provided and paid for at the Contractor's sole expense.
6. The Contractor shall make arrangements for the Geotechnical Engineer to be on site to observe the following activities:
    a. Preconstruction meeting
    b. Temporary excavation cut slopes
    c. Placement and compaction of structural fill and common fill.
    d. Installation of bedding material and utility trench backfill.
    e. Placement subgrades for off-site street restoration.
    f. Placement of pavement subgrades.

1.6 SITE CONDITIONS

A. Protection of Existing Improvements: Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing vegetation and improvements not indicated for removal. Restore any site improvements, including but not limited to landscaping, pavement, walks, structures, fences and planters, damaged by this work to their original condition, as acceptable to Owner. Restore to original grades and conditions, areas adjacent to site disturbed or damaged as a result of site preparation and demolition work.

B. Traffic:

1. Do not interfere with or close public ways without permission of governing authorities. Do not interfere with adjacent private facilities.

C. Site Utilities:

1. Advise utility companies of excavation activities before starting excavations. Locate and identify underground utilities passing through work area before starting work.
2. Coordinate all utility shutoffs with Seattle Public Utilities (SPU), Seattle Transportation Department (SDOT), and Seattle Fire Department (SFD) and private utility companies. Coordinate work with Division 01 requirements.
3. Coordinate utility locating, shutoffs and meter readings with utility companies. Verify that all appropriate services have been disconnected. (Contractor shall pay for all fees and costs associated with utility locating, disconnects, capping, line and meter removals).
4. Do not shut off or cap utilities without advance notice and written approval from the Owner.
5. If underground utilities are encountered in locations other than indicated, immediately advise utility Owners before proceeding. Amend project record documents to show actual locations.
6. Protect existing utilities indicated to remain.
7. All earthwork, including trenching and backfill of the irrigation system, mechanical, & electrical utilities is the responsibility of the General Contractor.

D. Objectionable Noises: Conform with local governing requirements regarding noise control. See Division 01 Section for additional information on allowable noise limits.

E. Maintain vehicular and pedestrian traffic routes in accordance with local rules and regulations: See Division 1 Section for additional requirements.

1. Ensure minimum interference with roads, streets, alleys, sidewalks, and adjacent facilities.
2. Do not close or obstruct streets, fire lanes, sidewalks, alleys or passageways without permission from authorities having jurisdiction.

3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

1.7 DEWATERING SYSTEM DESCRIPTION

A. Dewatering shall consist of the design, furnishing, installation, operation, maintenance and removal of a dewatering system(s) to achieve proper completion of all work performed under this Contract.

B. The contractor shall obtain required permits for disposal of collected water from dewatering systems. Permits may be required from the City of Seattle and/or King County.

C. The Contractor shall furnish, install, operate and remove any and all additional machinery and equipment necessary to keep excavations free from water during construction, and shall dewater and dispose of the water so as not to cause Injury to public or private property, or to cause a nuisance or a menace to the public. The Contractor shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all emergencies, including power outage and flooding, and shall have available at all times competent workers for the continuous and successful operation of the dewatering systems. These systems shall not be shut down between shifts, on holidays, or weekends or during work stoppage without written permission from the Owner.

D. The control of groundwater shall be such that softening of the bottom of excavations, or formation of “quick” conditions or “boils” during excavation shall not occur. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.

E. During excavating, construction of structures, installing of pipelines, placing of working base, and trench backfill, the placing and setting of concrete, and prior to the acceptance of the work or any portion of the work, excavations shall be free of water. The Contractor shall control surface runoff so as to prevent entry or ponding of water in excavations or on other isolated areas of the site.

F. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the dewatering system for this Contract.

G. Any method of dewatering shall include securing the area from unauthorized access.

1.8 DIMENSIONS AND LAYOUTS

A. The Contractor will be responsible for furnishing, setting and marking all line location stakes. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work and shall be on site at all times when work requiring control is being performed, together with all necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at no additional cost to the Owner, for the purpose of verifying layout and certifying the accuracy of work on the site.

B. The Contractor is responsible for preserving all benchmarks and stakes and is required to replace any stakes or benchmarks that are displaced or missing.

C. The Contractor is responsible for review of all utility purveyor and City records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all utilities at Contractor's own expense. The Contractor is to notify the Owner's Representative immediately if underground utilities not shown on record documents are encountered.

PART 2 - PRODUCTS

2.1 APPROVAL OF FILL MATERIALS

A. Approval of Fill Material: All material which is proposed to be used as fill shall be graded and tested for moisture content and compactability. Gradation and test results shall be submitted for review and approved by the Geotechnical Engineer prior to placement of fill. The Contractor shall submit a sample of the proposed material at least 72 hours before the material is to be approved for use on-site. The existing site material is sensitive to moisture & will be difficult to re-use in wet weather as indicated in the Geotechnical Engineering Report. (Refer to Geotechnical Engineering Report included with these specifications). The Contractor has the option to use on site material for common fill, however, use of on-site material must meet specifications and is subject to the approval of the Geotechnical engineer. If on-site material is not suitable for common fill, the Contractor shall import an acceptable common fill conforming to these specifications at no additional cost to the Owner.

2.2 STRUCTURAL FILL

A. Structural Fill:

1. All fill placed under footings, trenches, slab-on-grade floor, roadways, sidewalks, walkways, and all other paved areas shall be “structural fill” as defined herein, unless specified otherwise for particular applications.

2. Structural fill shall be imported clean granular fill conforming to the requirements of COS Section 9-03-14, (Type 17) Gravel Borrow, or material as approved for use as structural fill by the project geotechnical engineer.

2.3 COMMON FILL

A. Fill placed at locations, other than those requiring structural fill, where the purpose is to raise site grades, shall be “common fill” as defined:

1. Granular material, either naturally occurring or processed. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact readily. The maximum particle size shall not exceed 3 inches

2. Imported Common Fill shall meet the following gradation requirements

U.S. Standard Sieve Size	Percent Passing by Dry Weight
1/4 inch square	25
No. 200	10

3. Imported material consisting of granular soils essentially cleaned of organic and other deleterious material and of such particle size and gradation that specified compaction can be readily attained. The moisture content of common fill material at placement and compaction shall be within a range of one percent above to two percent below optimum moisture content.

4. Common fill shall be tested and approved by the Geotechnical Engineer prior to use.

2.4 GRAVEL SURFACE

A. Temporary gravel working surface shall be imported sand and gravel material conforming with the requirements of COS Section 9-03-9(2), Shoulder Ballast.

2.5 CRUSHED SURFACING

A. Crushed surfacing shall be manufactured from ledge rock or talus and shall conform with the requirements of COS Section 9-03-9(3), Crushed Surfacing. Crushed surfacing top course & keystone material shall conform to COS Section 9-03.16 for Mineral Aggregate Type 1, and crushed surfacing base course material shall conform to COS Section 9-03.16 for Mineral Aggregate Type 2.

2.6 GRAVEL BACKFILL FOR PIPE BEDDING

A. Imported sand and gravel material conforming with the requirements of COS Section 9-03-12(3), Gravel and Sand Backfill for Pipe Bedding.

2.7 GRAVEL BACKFILL FOR WALLS

A. Imported sand and gravel material conforming with the requirements of COS Section 9-03-12(2), Gravel Backfill for Walls.

2.8 GRAVEL FOR TRENCH BACKFILL

A. Gravel for trench backfill shall consist of free draining granular material, free from wood waste or other extraneous or objectionable materials. It shall meet the following gradation requirements:

U.S. Standard Sieve Size	Percent Passing by Dry Weight
4 inch square	100
1/4 inch square	25-70
No. 200	5.0 - Max

1. Imported material consisting of granular soils essentially cleaned of organic and other deleterious material and of such particle size and gradation that specified compaction can be readily attained. The moisture content of gravel trench backfill material at placement and compaction shall be within a range of one percent above to two percent below optimum moisture content.
2. On site soils may not be used as gravel trench backfill. The Contractor shall assume that all gravel trench backfill is to be imported material.
3. Imported gravel trench backfill material shall be tested and approved by the Geotechnical Engineer prior to use.

2.9 WASHED ROCK

A. Imported coarse aggregate conforming to COS Section 9-03.1(3)D, Mineral Aggregate Type 5.

2.10 CONTROL DENSITY FILL

A. Control density fill for utility trench backfill in the public right-of-way, and where noted on drawings, shall conform to City of Seattle Standard Specifications, Section 2-10.2(3)

2.11 TRACER TAPE

1. Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Conductive warning tape required over all sewer, drainage, water and irrigation pipe. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6" wide x 4 mils thick.

Tape Schedule		
Piping	*Color*	*Wording*
Domestic Water	Blue	Caution Domestic Water
Irrigation Water	Blue	Caution Irrigation Water
Storm Sewer	Green	Caution Storm Sewer
Sanitary Sewer	Green	Caution Sanitary Sewer
Natural Gas	Yellow	Caution Natural Gas

2.12 GEOTEXTILE FABRIC

A. Fabric for wrapping exterior drains and where needed for soil separation shall be Mirafi 140N, Supac 4NP or approved equal.

2.13 QUARRY SPALLS

A. Quarry spalls shall be imported material conforming to COS Section 9-13.7 4" to 8" quarry spall.

2.14 ROADWAY BALLAST

A. Roadway ballast shall be imported material conforming to COS Section 9-03.9(1) Mineral Aggregate Type 14.

PART 3 - EXECUTION

3.1 PERMITS

A. The Contractor shall be responsible for Right of Way Use Permits.

3.2 EROSION CONTROL

A. The implementation of the Erosion Control plans and the construction, maintenance, replacement and upgrading of these facilities is the responsibility of the Contractor until all construction is approved. All work shall be in accordance with the City of Seattle Construction Best Management Practices Manual. The Erosion and Sediment Control (ESC) facilities shown on the plan must be constructed in conjunction with all clearing and grading activities, and in such a manner as to insure that sediment laden water does not enter the drainage system or violate applicable water standards.

B. The ESC facilities shown are the minimum requirements for anticipated site conditions. During the construction period, the erosion control facilities shall be upgraded (e.g. additional sumps, construction of ditches and silt fences, etc.) shall be installed to control erosion and sediment laden runoff. Contractor shall pay for all costs associated with the construction, maintenance, upgrading and removal of the erosion control system throughout project duration.

C. Access Roads: Provide wheel cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public roads. If roads are fouled, they must be cleaned immediately in conformance with City of Seattle requirements, and all governing requirements and regulations.

D. Provide filter fabric between frame and grate of existing catch basins in and adjacent to work area. Provide filter fabric between frame and grate of new catch basins and area drains following installation, until site paving is completed.

3.3 PROTECTION OF EXISTING FACILITIES

A. Provide markers indicating limits of work and clear identification of items and areas requiring protection.

B. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.

C. Utilities:

1. Existing utilities and underground structures shown on the plan are based upon the best available public records and/or private records as supplied by the project Owner and/or data obtained verbally from Owners or officials associated with the particular utility. Neither the Owner nor the Engineer guarantee accuracy or completeness of this information and assume no responsibility for improper locations on the construction plans. Other underground facilities not shown on the drawings may be encountered during the course of the work. All invert elevations shown on the drawings shall be verified by the Contractor prior to construction.

2. If changed conditions are encountered, the Contractor shall notify the Owner's representative promptly of (1) pre-existing subsurface conditions differing from those indicated in the plans, or (2) pre-existing unknown subsurface conditions, of an unusual nature, differing materially from those originally encountered and generally recognized as inherent in work of the character provided for in the contract. The Contractor shall make no claims to the Owner for compensation for extra work resulting from changed conditions if the Contractor fails to promptly notify the Owner's representative and continues the work without approval in writing from the Owner.

3. The Contractor shall call the utilities underground location center for field location of all utilities and shall not begin excavation until all known underground facilities in the vicinity of the proposed work have been located and marked. If the utility is not a subscriber of the underground location center, then the Contractor shall give individual notice to that utility. Contractor shall pay all costs associated with locating existing utilities.

4. The Contractor shall, at his own expense, make excavations and borings ahead of the work, as necessary, to determine the exact location of utilities and underground structures.

5. It is understood that there will be interfering utilities, service laterals and other underground pipes, drains or structures encountered that are not shown or areas shown incorrectly on the plans or have not been previously discovered in the field. Contractor agrees this is a normal and usual occurrence in the construction of underground improvements.

6. Contractor agrees to provide for these conflicts and interference's and agrees to provide for a reasonable amount of time for design changes and/or utility relocation due to said interferences.

7. The Contractor shall take reasonable precautions and exercise sound engineering and construction practices in conducting the work. The Contractor shall protect existing public and private utilities from damage during construction. If existing public and private utilities are damaged, the Contractor shall immediately notify the Owner. The contractor shall restore the utility to its existing condition. The Contractor is responsible for the means and the methods of construction for designs shown on the plans.

8. Where the plans call for utilities to be relocated by others, the Contractor shall notify the utility company and coordinate his work so as to avoid conflicts. Depressions resulting from relocated utilities under future buildings, walls pavement, or other structures should be backfilled with structural fill.

9. All excavation, trenching, subgrade preparation, fill placement, and all soil work in general shall be conducted in compliance with the recommendations of the project soil engineer and the Geotechnical Engineer.

D. Pavement: The Contractor shall protect from damage all pavement or paved areas including curbs intended to remain. Contractor shall be responsible for replacement if damage occurs to pavement or curbs to remain.

E. Repair and/or replacement of damaged facilities will be accomplished at the Contractor's expense.

F. Dust Control: Contractor shall apply water as necessary to control dust during dry weather conditions. Do not use water to extent causing flooding, contaminated runoff or icing.

3.4 CLEARING AND GRUBBING

A. Remove any trash or debris from site, including below ground portions.

B. Remove all vegetable matter from within the limits indicated on the drawings.

1. Fill holes thus created with approved, compacted soil.

3.5 STRIPPING

A. Strip topsoil, roots, organic debris, and unsuitable material from areas to be developed.

1. Minimum stripping depth shall be 8-inches. Final stripping depth shall be approved by the Geotechnical Engineer.

2. Haul and dispose of materials off-site in a legal manner.

3. Shape surface of site to grades and contours as noted.

4. Remove debris, rocks over 6-inch in size, vegetation, and other organic matter from material to be re-used.

5. Control grading around building areas and building excavations at all times to prevent flow of water into excavated areas and ponding adjacent to building.

3.6 SUBGRADE

A. For paving and other site improvements, shape subgrades to lines, grades, and cross sections indicated. Any soft soils encountered shall be recompacted or excavated and replaced with compacted structural fill, whichever is necessary to reach the required compaction. Excavate rock encountered to a depth of 6" below finish subgrade elevations. Bring low areas up to required elevations with approved fill materials.

B. Grading shall conform to Section 2-06 of COS.

3.7 DEWATERING

A. Groundwater may be discharged to the existing storm drain or combined sewer system within the guidelines of COS.

B. The Contractor shall maintain on site sufficient equipment and materials to insure continuous and successful operation of the dewatering systems.

C. The Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, other Contractors' equipment, and the excavation, including damage to the excavation bottom due to heave and including removal of disturbed material that may result from Contractor negligence, inadequate or improper installation, maintenance and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

D. The Contractor shall remove from the site all dewatering system elements. The Contractor shall assume ownership and responsibility for the disposal of all dewatering pumps, pipes and other assorted system hardware.

3.8 SITE GRADING

A. General:

1. Required contours and elevations are indicated and noted on Drawings; should indicated figures conflict with actual conditions, notify Owner and obtain direction before proceeding with grading of area in conflict.

B. Grading:

1. To the extent applicable shape surface of site to grades and contours as noted.

2. Remove debris, rocks over 6-inch in size, vegetation, and other organic matter from material to be re-used.

3. Control grading around building areas at all times to prevent flow of water into excavated areas and ponding adjacent to buildings.

4. At paving and other site improvements, shape subgrades to line, grades, and cross sections indicated. After design grade is reached, Proof roll subgrade to identify soft areas in the presence of the Geotechnical Engineer. Any soft soils encountered shall be excavated and replaced with structural fill to reach the required compaction. Excavate rock encountered to a depth of 6" below finish subgrade elevations. Bring low areas up to required elevations with approved fill materials.

3.9 EXCAVATION AND BACKFILLING

A. General:

1. Earthwork quantities indicated on the plans are based on an engineering take-off estimate using the existing topographic survey grades and finished grade plan.

2. Contractor shall include in the base bid the cost of achieving the final grades shown on the Contract Documents beginning with the existing conditions as represented in the site survey of the final phase I stabilized site conditions provided by the Owner and Geotechnical report attached to, and included in, the Contract Documents. All excavation to suitable bearing soil, placement and backfill of common fill, export of excess material, import materials, placement, and compaction required to achieve the final grades, shall be included in the base bid.

B. Overexcavation:

1. Overexcavation of unanticipated unsuitable soils, as determined by the Owner's appointed Geotechnical Engineer, encountered below the anticipated sub grade elevation, shall be considered an unforeseen condition, and the Contractor will be compensated by means of a negotiated change order. Unanticipated unsuitable material shall be that material below the sub-grade elevations shown on the plans that does not meet bearing capacity requirements as defined in the field by the appointed Geotechnical Engineer.

2. The Contractor shall be responsible for measuring the quantity of unanticipated unsuitable material that is removed. The Contractor shall measure in-place bank yards by field measurement that shall be observed, verified, and documented by the Geotechnical Engineer prior to backfilling with imported structural fill. The Contractor shall note that measurement by truck tickets will not be accepted.

3. The Contractor will be compensated via a negotiated change order for excavation and off-site disposal of unanticipated unsuitable soils only and replacement imported structural fill, as verified and documented by the Geotechnical Engineer in the field. No compensation will be made to the Contractor for unverified and undocumented quantities.

C. Subgrade

1. Do not allow excavation subgrades and soil at foundations to be subjected to freezing temperatures or frost. Provide protective insulating materials as necessary. Should prepared, compacted subgrades be damaged by freezing, remove soil materials to the depth required by the Geotechnical Engineer and replace and recompact in conformance with specified requirements at no additional cost to the Owner.
2. The Contractor shall be responsible for verifying the bottom of excavation elevation with the construction documents. The bottom of excavation shown should be considered approximate only. Actual excavation elevations may vary based on field conditions and structural or other installations.
3. Provide excavation of whatever nature required for construction of the work; verify character, quality, and disposition of material to be excavated prior to commencing. Blasting is not permitted. Keep excavations free of water while construction is in progress.
4. All earthwork for utilities shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.
5. Protect all excavated stockpiles of site soils considered suitable for re-use as common fill as determined by the Geotechnical Engineer. Site soils are highly moisture sensitive and if exposed to wet weather will become unsuitable for re-use if not protected. Stockpiles which have been approved for common fill that become wet due to inadequate protection shall not be re-used unless the material can be dried out to meet optimum moisture content as approved by the Geotechnical Engineer.
6. Unusable material will be hauled from the site at expense of Contractor.

D. Catch basins, manholes and similar structures: Excavate to furnish a minimum of 12 inches between sides of excavation and outer surfaces of structure. Take care to excavate to exact depths required; fill overexcavation with compacted gravel for trench backfill.

E. Trench Excavation for Utilities, Mechanical, Electrical, Water, Irrigation, Storm Drains and Sanitary Sewers:

1. Trenching shall include all excavation of every description and of whatever materials encountered to the depth indicated on the Drawings or in the Project Manual and shall be in accordance with the following Sections of COS: 7-17.3(1)A1, excepting paragraphs 3 and 4; Section 7-17(1)A2; and Section 7-17(1)A4.

F. Bedding and Backfill for Storm Drains and Sanitary Sewers:

1. Bedding of storm drains and sanitary sewers shall be in accordance with Section 7-17.3(1)B of COS and the details in the plans.
2. Backfilling of storm drains and sanitary sewers shall be in accordance with the plans and Section 7-17.3(3) of COS, except paragraph 3 of 7-17.3(3)A shall not apply.
3. Backfilling of trenches in the vicinity of structures shall not take place until the cement in the masonry has become thoroughly hardened. Walking on the pipe shall not be allowed until at least one foot of earth has been placed upon it.

4. Compaction of backfill shall be in accordance with the plans and Section 7-17.3(3)B of COS with the following exceptions:

5. In-place density will be determined by ASTM D2922 - Test for Density of Soil in-place by the nuclear method.

3.10 COMPACTION

A. General

1. All areas that are to receive compacted fill shall be field reviewed by the Geotechnical Engineer prior to the placement of new fill.

2. Soil surfaces shall be compacted to a minimum relative compaction as listed in this Section. Relative compaction is defined as the ratio of the in-place soil dry density to the maximum dry density as determined by the ASTM D1557 test method.

3. Place fill in controlled layers the thickness of which is compatible with the type of compaction equipment used. The loose thickness of each fill layer shall not exceed maximum thickness as defined by the on-site soils engineer. Compact each layer to a minimum relative compaction as listed in this Section. Determine the field density of compacted soils by the ASTM D2922 and D3017 test method or equivalent.

4. Fill soils shall consist of excavated on-site soils free of organic and deleterious material or imported soils approved by the Geotechnical Engineer. All imported fill shall be granular and shall meet the gradation requirements stated herein. The Geotechnical Engineer shall evaluate and/or test proposed imported material for its conformance with specifications prior to delivery to the site. The Contractor shall notify the Geotechnical Engineer 72 hours prior to importing fill to the site. Rocks larger than six inches shall be segregated from fill material and removed from site.

5. The Geotechnical Engineer shall observe the placement of compacted fill and conduct in-place field density tests on the compacted fill to check for adequate moisture content and the required relative compaction. Where less than the required relative compaction is indicated, remove and replace the substandard soil or apply additional compactive effort and moisture-condition the soil as necessary until the relative compaction as specified in this Section is attained. Provide level testing pads for the conducting of field density test by the Geotechnical Engineer.

6. Compaction Requirements: Compact all fill and backfill to prevent subsequent settlement. Water settling or jetting is not permitted as a means of compaction. Furnish heavy rollers or compactors except as follows:

7. Use pneumatic hand tampers for trenches and areas not accessible to heavy equipment.

8. Required compaction: Compact fill and backfill to the following minimum relative compaction (percentage of maximum dry density determined in accordance with ASTM D1557):

Locations	Required Minimum Relative Compaction
Under slabs on grade	95%
Under walks and paving	95%
Bedding for utility lines	95%
Against walls	90%
Against footings and foundations	90%
Planting and landscape areas	90%
Other	90%

3.11 FINISH GRADING

A. General: Remove all concrete, rocks, rubble and debris larger than 2 inches from surface. Finish grades flush with adjacent surfaces unless indicated otherwise. Finish grades adjacent to sidewalks shall be 1 inch below elevation of sidewalk unless noted otherwise. Execute any fine grading as may be necessary or incidental to all subsequent work.

B. Grading Tolerance: Finish grades shall match contours and elevations shown within 1/10 foot.

C. Acceptance of Finish Grading: Finish grades will be inspected and subject to acceptance by the Owner. Correct work not approved at no additional cost or time.

D. Protection of Finished Surfaces: Allow no heavy objects to be moved over finish grade surfaces. At no cost to Owner, repair any ruts or holes in finished surfaces, and any obstruction to positive drainage. Repair areas showing settlement.

E. Minimum Grade: Finish surfaces shall be sloped to drain with a minimum cross slope of 1.0%. If field conditions do not allow for the minimum slope, the Contractor shall notify the Owner.

3.12 DISPOSAL OF EARTH MATERIALS

A. Remove all excavated material that is not acceptable for use as fill on site. Legally dispose of excess material off site, at no additional expense to owner.

3.13 FIELD QUALITY CONTROL

A. Special Inspections: Geotechnical Engineer will approve fill materials, observe placement of compacted fill, and conduct in-place field density tests on compacted fill, checking moisture content and relative compaction. Where less than required relative compaction is indicated, Contractor shall remove and replace substandard soil, or further compact and moisture-condition soil until specified relative compaction is attained. Furnish level testing pads for conducting field density test by Geotechnical Engineer.

B. Adjustments:

1. Repair ruts and holes in finished graded surfaces.
2. Correct slopes and obstructions to positive drainage.
3. Repair areas showing settlement.
4. Make corrections and adjustments to finish grading, as directed by Architect.

C. Protection:

1. Do not permit heavy objects to be moved over finish grades surfaces.
2. Protect from run-off and other conditions which may alter finish grades.
3. Private and Public Utilities: Protect from damage in accordance with 1-07.17 of COS.
4. Paved Areas Intended to Remain: Protect from damage.
5. Contractor is responsible for the protection of all prepared subgrades. Repair of damage subgrades shall be at Contractors expense.

END OF SECTION 310000

SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Furnish services and equipment as required for maintaining temporary erosion/sedimentation control and site clearing for subsequent construction operations.

B. Related Sections:

1. Section 31 00 00Earthwork
2. Drawings, general provisions of the Contractor and Division 01 specifications apply to this section.

C. Substitutions: Substitute products will be considered only under terms and conditions specified in Division 1.

D. Reference Standards: This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of the each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)

DR01-2017 Right-of-Way Opening and Restoration Rule (ROWORR)

Standard Plans Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans).

TCM Traffic Control Manual for In-Street Work, latest edition TCM.

DR10-2021 Construction Storm Water Control Technical Requirements Manual (July 2021)

Soils Report Project Geotechnical Report.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.1 BEST MANAGEMENT PRACTICES'S (B.M.P.'s)

A. Refer to the erosion control requirements (BMP's) on the drawings and in Section 31 00 00 - Earthwork. All City of Seattle erosion control requirements shall strictly be adhered to. The Contractor is required to prevent erosion from any portions of the site and/or adjacent property for the duration of the construction.

B. All BMP facilities shall conform to the City of Seattle Construction Best Management Practices Manual. A copy of this document shall be on-site during construction. All BMP's facilities shown on the plans reference the details in this manual unless otherwise noted.

C. Dust Control:

1. No visible airborne dust due to Contractor's activities will be allowed. Immediately sprinkle for dust control when dust is generated. Contractor will be held liable for subsequent damages caused by dust generated during his activities.

D. Water Control:

1. Control all surface and sub-surface water in order to prevent damage to the project site and adjacent properties. Provide all means necessary to immediately resolve surface water drainage problems generated on the construction site. Provide proper grading to prevent standing water.

2. The Contractor shall furnish, install, and operate all necessary machinery, appliances, and equipment to keep excavations free from water during construction. The Contractor shall dewater and dispose of the water so as to not cause damage to public/private property or to cause a nuisance/menace to the public. The Contractor shall at all times have sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages. The Contractor shall have available, at all times, competent workers for the operation of the pumping equipment.

3. The control of ground water shall be such that softening of the base of the excavation or formation of quick conditions or boils during excavation shall be prevented. Dewatering systems shall be designed and operated by the Contractor so as to prevent removal of natural soils and to eliminate turbidity (i.e. suspended solids) of the discharge water.

4. During excavation, construction of structures, installation of pipelines and sewers, and the placing/setting of concrete shall be kept free of water. The Contractor shall control surface run-off so as to prevent collection of water in the excavation. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent where it would damage adjacent structures or property.

5. Where dewatering systems are used, such as well, well points, ditching and sumping, the groundwater table shall be designed in accordance with the recommendations presented in the Geotechnical Report.

6. Before beginning dewatering, the Contractor shall submit to the Architect a statement of the method, installation, and details of the dewatering system in accordance with division 1 Submittal Procedures.

7. The release of ground water to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill, and prevent floatation/movement of structures, pipelines, and sewers.

E. Pollution Control: Comply with all applicable pollution control laws, regulations, and ordinances.

F. Location of Existing On-site Objects:

1. The drawings do not purport to show all objects existing on the site. Prior to commencing work, carefully inspect the entire site and determine all elements that are required to be removed or preserved. Locate all existing surface and sub-surface utility lines, active pipes, and electrical/telephone lines to determine whether or not they are a part of this project. Locate all existing utilities or those that are in progress under this contract or by other Contractors. Verify with Owner/Owner's Representative all objects to be removed or preserved.

G. Protection of Existing On-site Objects:

1. The Contractor shall perform the additional measures noted in the contract documents to protect the existing trees adjacent to utility installations. The Contractor shall hand dig or use air excavation (or other approved methods) for excavation within the tree protection zone. The Contractor shall notify the Owner appointed arborist 24 hours prior to work within the tree protection zone. All work within the tree protection zone shall be under the direction of the Owner appointed arborist.

2. Use all means necessary to protect existing elements of the site not designated to be removed. Protect adjacent property and the public from damage or injury.

3. Notify Owners of underground facilities at least two full business days prior to commencing any excavation. The Contractor shall provide a schedule of the excavation to all Owners of the underground facilities as required by Section 2(12) of Chapter 144 Washington State Laws of 1984.

4. All existing water, gas, irrigation, lighting, power, telephone, sewer, storm, or other surface/sub-surface structure shall be maintained by the Contractor and shall not be disturbed(except as approved by the Owner), disconnected, or damaged during work. The Contractor, in the performance of the work, shall be responsible for all expenses arising from damaged utilities/structures.

5. Maintain all roads, storm drains, sewer and water lines, except where closures are specifically required by the work and approved by the local governing authority.

H. No on-site blasting shall be permitted.

3.2 CLEARING & GRUBBING

A. Clearing: Clear areas of the site as required and designated for new construction. Remove trees and plantings in such a manner to protect those that are to remain. Cut and remove entire stumps of trees designated to be removed and remove other plants and roots to accommodate proposed surface grades.

3.3 DISPOSAL OF MATERIALS

A. Waste: Remove all waste from site. The Contractor shall arrangements for the disposal of waste materials and shall protect the Owner/Owner's Representative from any and all damages arising therefrom. No on-site waste burning will be permitted.

B. The refuse resulting from the clearing and grubbing operations shall be hauled to a waste facility secured by the Contractor. Coordinate material disposal location and any required hauling or disposal permits with authorities having jurisdiction

C. Disposal shall be in such a manner as to meet all requirements of City, State, County, and Municipal Regulations regarding health, safety, and public welfare.

D. In no case shall any cleared/grubbed material be left on the project site, shoved onto abutting properties, or buried in fills, embankments, or trenches on the project.

E. Remove all debris from the site. Leave the project area in a neat and orderly condition to meet the approval of the Owner/Owner's Representative.

F. All hauling and disposal of debris shall be at no additional cost to the owner.

END OF SECTION 311000

SECTION 312500 TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the work to minimize erosion and to construct facilities for treating stormwater runoff, dewatering pump discharge and seepage at all areas of the project site including Contractor work and staging areas. The Contractor is responsible for implementing Best Management Practices (BMP's) in accordance with the City of Seattle requirements. The information provided on the contract plans should be considered a minimum for the anticipated construction and conditions. The Contractor shall be responsible for adding additional BMP's as conditions change at no additional cost to the Owner. The Contractor shall coordinate installation and inspections of the BMP's with the City of Seattle DPD Site Inspector. Additional BMP's shall be stockpiled on site as requested by the DPD Site Inspector.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
   1. Section 31 10 00 Site Clearing
   2. Section 31 00 00 Earthwork

1.3 REFERENCES

A. Reference Standards: This section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.
   1. COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)
   2. DR 2016-01 Right-of-Way Opening and Restoration Rules. Seattle Transportation Director's Rule 2016-01, January 1, 2017
   3. DR10-2021 Construction Storm Water Control Technical Requirements Manual (July 2021)
   4. Standard Plans City of Seattle Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans).
   5. TCM Traffic Control Manual for In-Street Work, latest edition (TCM).
   6. CBMPM Best Management Practices, City of Seattle "Construction Best Management

Practices Manual", 1994.

7. Soils Report Project Geotechnical Report.

1.4 QUALITY CONTROL

A. Conform to regulatory requirements, including but not limited to the Clean Water Act of 1972, and Washington Administrative Code 173, and RCW 90.48. Conform to APWA Supplement Section 1-07.15 Temporary Water Pollution/Erosion Control.

B. Schedule, sequence, coordinate, and oversee all temporary and permanent erosion and sedimentation control measures in accordance with City of Seattle Standards.

1.5 SCHEDULE

A. Sediment control facilities shall be maintained in a satisfactory condition until such time that clearing and/or construction is completed including periods when construction activities are reduced or shut down.

1. The implementation, maintenance, replacement and additions to erosion/ sedimentation control systems shall be the responsibility of the Contractor. The Contractor is responsible for erosion and sediment control on the construction site.

PART 2 - PRODUCTS

2.1 QUARRY SPALLS

A. See Section 02300 "Earthwork".

2.2 FILTER FABRIC

1. Nonwoven Filter Fabric: Spun-bonded, nonwoven fabric composed of polypropylene filaments. Fabric shall be inert to biological degradation and shall be resistant to alkalis and acids found in soils. Use as drainage geotextile for separation of native materials from filtering material, Mirafi 140N or equivalent.

2. Woven Filter Fabric: Woven polypropylene, monofilament yarn used for silt fences. Fabric shall be inert to biological degradation and shall be resistant to alkalis and acids found in soils. The base plastic shall contain stabilizers and inhibitors to make the fabric resistant to ultraviolet radiation. Mirafi 700X or equivalent.

2.3 FILTER BAG INSERTS

A. Commercially manufactured filter bags specifically manufactured for silt filtering, and which will provide filtering performance required. Contractor to verify current standards with the City of Seattle Inspector.

2.4 PLASTIC SHEETING

A. Polyethylene (PE) Sheeting: In accordance with COS Standard Specifications Section 9-14.5(3).

2.5 STRAW

A. Air dried condition free of noxious weeds, weed seeds and materials detrimental to plant life. Be seasoned before baling or loading and shall be acceptable to the Engineer.

2.6 WATTLES

A. Per City of Seattle Standard 9-14.16, Straw or other organic fill in biodegradable material.

PART 3 - EXECUTION

3.1 GENERAL

A. The maintenance, replacement and upgrading of these facilities is the responsibility of the Contractor until all construction is approved.

B. The TESC facilities shown on the plans are the minimum requirements for anticipated site conditions. During the construction period, the erosion control facilities installed may require maintenance, relocation or upgrading (e.g. additional sumps, relocation of ditches and silt fences, etc.) as shown on the plans or as needed. Contractor shall pay for all costs associated with the construction, maintenance, upgrading and removal of the erosion control system throughout project duration.

C. Adequate temporary and permanent control of surface water runoff and subsurface seepage will be required in order to allow site access, excavation, and construction of underground utilities to proceed. Site preparation and initial construction activities should be planned to minimize disturbance to the existing ground surface particularly during extended wet weather periods. During wet site conditions, equipment traffic should not be allowed on exposed subgrade areas. The Contractor shall be responsible for protecting disturbed or prepared surfaces by some form of weather cover if left exposed for more than 2 days. Contractor shall also protect disturbed or prepared surfaces from surface ponding, stormwater runoff, and construction traffic. The Contractor will be solely responsible for any repairs required to these surfaces.

D. Access Streets and Roadways: Provide wheel cleaning stations to clean wheels and undercarriage of trucks before leaving site, as necessary to prevent dirt from being carried onto public streets. If streets are fouled, clean immediately in conformance with City of Seattle and all governing requirements and regulations.

E. During construction the runoff of stormwater flows shall be controlled and treated to minimize water quality impacts. The Contractor shall plan and execute the work in a manner which protects the project, and downstream waterways. Runoff from undisturbed areas shall be diverted from areas of construction activity by utilizing drainage ways as much as possible. Where this is not possible, and as practicable, diversion dikes and swales shall be constructed so runoff from undisturbed areas will not be contaminated by construction activity. Cleared and excavated materials shall not be deposited or stored in or alongside drainage ways where the materials can be eroded by storm runoff.

F. The Contractor shall remove temporary erosion control measures upon establishment of permanent erosion control and restoration of disturbed areas. Contractor shall remove all accumulated sediment from the drainage system immediately prior to final acceptance. All drainage structures, biofiltration swales, ditches, pipelines, gutters and other drainage conveyance systems shall be thoroughly cleaned at the completion of the phase II construction, prior to final acceptance.

G. The Contractor shall flush and thoroughly clean the existing and new storm water conveyance systems prior to substantial completion. Remove all accumulated sediment from catch basins, manholes, pipes, and outfalls.

3.2 EXAMINATION:

A. Verify locations of existing catch basins and related storm drainage features that may be impacted by construction activities.

3.3 PREPARATION

1. Locate existing utilities, avoid damage or disturbance. For aid in utility location call "Dial Dig 1-800-424-5555," 48 hours (two working days) prior to beginning construction. Provide and pay for additional marking as required.

3.4 SILT FENCES/ WATTLES

A. Silt fences and/or Wattles shall be installed per the drawings and parallel to existing contours.

3.5 PLACING PLASTIC COVERING

A. Plastic covering shall be installed on erodible stockpiles and embankment slopes as shown in the plans or as designated by the Owner.

B. Overlap joints a minimum of 28 inches. Overlap in direction of drainage and prevent water from draining onto material being protected. Secure in place to prevent movement and damage. Provide sandbags at 2.5 feet spacing and tie the sandbags together with rope on slopes greater than 3:1. Minimize driving stakes through plastic.

3.6 STRAW BALE CHECK DAMS:

A. Construct such that drainage flows through bales. Bevel bale edges or fill gaps to insure drainage passes through straw filter. Larger flows may flow over top on occasion. Key bales into ground to prevent drainage under bales. Raise elevations of ends of check dams to prevent drainage around ends. Provide splash pad on downstream side to prevent scouring from high flows or overtopping.

3.7 CATCH BASIN INLET PROTECTION

A. The Contractor shall install filter on all catch basins that receive construction runoff as indicated on the drawings and as directed by the City Inspector. Catch basin sediment filters shall be cleaned when 12-inches of sediment accumulation is evident.

B. When cleaning Catch basin sediment filters do not allow sediment to fall into catch basin. Remove catch basin filter in such a manner as to not allow any sediment to enter the catch basin. Dispose of sediment in a proper manner. Clean catch basin filter prior to re-installation. Replace catch basin filters if signs of deterioration are evident (tears, rips, puncture holes etc.).

C. Catch basin filters shall be maintained throughout the project.

3.8 STRAW MULCH

A. Straw mulch shall be applied 2 to 3 inches thick at the rate of 4,000 lb/acre or 2 to 3 bales per 1,000 square feet. Straw shall be crimped to avoid windblow.

3.9 ADJUSTMENTS AND REVISIONS

3.10 Adjust or move swales, berms, pipes, culverts, bales, and silt fences as necessary during construction to direct site runoff to temporary ponds, silt filters, and grass swales.

3.11 PROTECTION AND MAINTENANCE

A. Prevent silt-laden water from leaving site or from entering off-site storm sewer systems.

B. All slopes, cut, or fill areas where Work has stopped for more than 30 days shall be stabilized by polyethylene sheeting or other method to prevent erosion and sediment transport.

C. Keep all off-site parking areas and streets clean from construction activities. Paved surfaces shall be kept clean by the use of mechanical sweeping equipment, hand shovels and brooms or other accepted methods suitable of removing dirt, rock, silt and sand. No street washing will be allowed.

D. Supplementary measures:

1. Provide additional silt control and temporary erosion control measures as required to protect soils and prevent silt laden runoff from leaving project site at no additional cost to the Owner.

3.12 MAINTENANCE

A. Monitor and maintain silt control measures. Remove accumulations of sediment when more than 50 percent of silt storage capacity is filled. Maintain all temporary erosion control facilities until need for each facility has been superseded by other stabilization methods or until Architect authorizes removal.

B. Inspect and repair temporary erosion control facilities. Inspect entire system to ensure proper operation a minimum of once per week, during and after storms, and prior to weekends and holidays.

END OF SECTION 312500

SECTION 321413 – PEDESTAL SET UNIT CONCRETE PAVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes material and labor as required to furnish and install the following:
   1. Concrete pavers for use with Adjustable Deck Pedestals
   2. Adjustable Deck support pedestal system

1.2 RELATED SECTIONS

A. Section 075216 “SBS Modified Bituminous Membrane Roofing” roof assemble underneath pedestal pavers.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM E108-07a Class A Fire Rating
   2. ASTM C1028-07 Slip Resistance
   3. ASTM TAS108-95 Wind Uplift

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review methods and procedures related to pedestal pavers installation, including but not limited to, the following:

      a. Site logistics to move material to roof.
      b. Placement schedule.

1.5 SUBMITTALS

A. Shop drawings: Indicate perimeter conditions, relationship to adjoining materials and assemblies, joint and concrete paver layout, installation and setting details.

B. Pedestal samples with shims and any other required components.

C. Concrete Pavers:

1. Representative full-size samples of each concrete paver type, showing thickness, color, and finish. Select samples to indicate the extremes of color and texture expected in the finished installation.
2. Accepted samples become the standard of acceptance for the work in this Section.
3. Manufacturer's catalog literature and material safety data sheets for the safe handling of the specified materials and products.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Firm experienced in installing concrete paver systems similar in material, design and complexity to those required for this Project:
   1. Not less than five years of relevant experience.
   2. Not less than two comparable scale projects successfully completed and with a record of successful in-service performance for not less than 5 years.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when installation is in progress.

B. Special Considerations: The contractor assumes the responsibility for and must take into consideration the structural capability and adequacy of the structure to carry the dead and live load weight(s) involved, and that the density of any insulation is satisfactory to resist crushing and damaging the waterproofing membrane.

C. Source Limitations for concrete pavers: Obtain concrete pavers from a single supplier with resources to provide materials of consistent quality in appearance and physical properties.

D. Mock-Ups, Concrete Pavers:
   1. Install 8 ft x 8 ft area of pedestal set concrete pavers.
   2. Use this area to determine pedestal height and shimming requirements, joint sizes, lines, laying pattern, color and standard of work for the job.
   3. This area will be used as the standard by which the remainder of the work will be judged.
   4. Subject to acceptance by Owner, mock-up may be retained as part of finished work.
   5. If mock-up is not retained, remove and properly dispose of mock-up.

E. Concrete pavers may be rejected for any of the following reasons:
   1. Pieces not meeting design strength requirements.
   2. Pieces exceeding specified installation tolerances.
   3. Pieces damaged during construction operations.
   4. Pieces exposed to view which develop surface finish deficiencies including blemishes and color variations exceeding acceptable limits/samples.
   5. Un-repairable damage of any component or its' parts to Owner's requirements.

1.7 DELIVERY, STORAGE & HANDLING

A. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
   1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
   2. Deliver concrete paving slabs to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
   3. Unload paving slabs at job site in such a manner that no damage occurs to the product.

C. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials. Store concrete paving slab cleaners per manufacturer's instructions.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Requirements:
   1. Do not install pedestals and pavers during heavy rain or snowfall.

B. Heavy Roof Top and Flat Bottom Features require individual support in addition to the deck pedestal system.
   1. A minimum of one additional pedestal must be installed for every 500 lbs. (or portion thereof) of static loading. These additional support pedestals must be installed directly under the decking and evenly spaced immediately below the feature locations. One additional pedestal must be placed under each corner of any rectangular feature.

1.9 MAINTENANCE

A. Extra Materials: Provide 5% of total square footage of additional material for each color and texture for use by Owner for maintenance and repair, including pedestals.

B. Pavers shall be the same production run as installed materials.

C. Package for storage and identify with labels describing contents.

PART 2 - PRODUCTS

2.1 PEDESTAL SET ROOF PAVER

A. Manufacturer: Stepstone, LLC. Telephone: 800-572-9029

B. Request for substitution can be considered per approved equal.

C. Weight Bearing Capacity 1,250 lbs./ per tile

D. Model: Pedestal Set Roof Paver
   1. Dimensions: 24" x 24" x 2"

2. Material: 5000 psi hardrock precast concrete, type iii cement, reinforced with welded wire mesh
3. Color: To be selected by Landscape Architect from range of standard colors in 1800 color series.
4. Texture: Light Sandblast

2.2 PEDESTALS

A. Basis-of-Design: Bison Screwjack Pedestal System.
1. Manufacturer: Bison Innovative Products; 2395 W 4th Ave, Denver, CO 80223. Toll Free 888-412-4766. Phone 303-628-7950 Fax 303-825-5988. www.BisonIP.com.
2. Requests for substitutions will be considered in accordance with provisions of Section 012500.
3. Provide any and all required top and bottom caps, top and bottom shims, spacers, buffer pads, and any other components needed to provide and install a complete pedestal paving system to meet indicated finish conditions.

B. Scope
1. Furnish and install a complete adjustable deck support system with a maximum cavity height of up to 6-inches.
   a. Deck supports are not designed for supporting decks that carry vehicular traffic or equipment including but not limited to snow removal equipment, ATV's, forklifts, or any motorized vehicles.
   b. Consult the Architect regarding the following:
      1) When spacer tab condition or design requires spacing between decking tiles or concrete pavers other than the standard spacing required by the manufacturer.
      2) When the required pedestal height exceeds the safe limits as determined by the Manufacturer.
      3) When pedestal load capacity exceeds the maximum listed.
      4) When anticipating installation of any items with excess weight on top of the deck.
      5) When greater pedestal load capacity is required

C. Screwjack Deck Pedestal
1. Typical Height Range 0-16 inches
2. Weight Bearing Design Capacity 1000 lbs/pedestal FS:2
3. Integral 1/8 inch spacer tabs.
4. Made in the USA
5. Configurations
   a. Model B1: 1 1/4 inches to 2 inches
   b. Model B2: 2 inches to 3 inches
   c. Model B3: 3 inches to 4 3/4 inches
   d. Model B4: 4 3/4 inches to 7 3/4 inches
6. Shims
   a. Model: B11 Flexible Shim 1/16 inch

1) Use no more than 4 shims. If using only 1/4 segment, adhere it to the pedestal with construction adhesive.
2) Material: (1.5mm) Sanaprene.

b. Model: PS1 Rigid Poly Shims 1/8 inch
1) Use no more than 2 shims. If using only 1/4 segment, adhere it to the pedestal with construction adhesive.
2) Material: Mineral Filled High Density Copolymer Polypropylene. Contains 20% Post-industrial recycled material.

7. Floating Insulation Base | FIB
a. Model: FIB; Floating Insulation Base for use over roofing systems with 20 – 40 psi (137.895 – 275.79 kPa) bearing capacity.
1) Material: Mineral Filled High Density Copolymer Polypropylene. Contains 20% Post-industrial recycled material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Beginning work constitutes acceptance of conditions as satisfactory.

B. Examine surfaces to receive concrete pavers and conditions under which pavers will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of pavers.
2. Provide verification that a leak test has been executed and approved prior to installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect concrete pavers during erection as follows:
1. Cover tops of pavers during installation with non-staining, waterproof sheeting at end of each day's work.

B. Acceptance of Site Verification of Conditions:
1. Inspect, accept and certify in writing to the contractor that roof conditions meet specifications for the following items prior to installation of concrete paving slabs.
a. Verify that grades conform to specified requirements.
b. Verify that drainage mat has been placed according to drawings and specifications.
c. Verify location, type, and elevations of any edge restraints, adjacent pavements, anchors, embedment’s, penetrations, drains, drain holes, holes and inlets.

C. Sweep surface that pedestals will be placed on to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION

A. Install the work in accordance with "Quality Assurance" provisions, References, Specifications, Drawings, and Manufacturers' directions.

B. Set pavers to comply with requirements indicated on drawings and shop drawings.

C. Locate pedestals according to manufacturer’s recommendations and as indicated on the drawings.

D. Do not use concrete pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work

E. Place concrete pavers on pedestals so they are supported according to pedestal manufacturer’s recommendations.

F. Align pedestals in all directions and shim elevations of pavers as work progresses and according to the manufacturer’s recommendations.

G. In areas to receive planters, provide core drilled holes aligning with irrigation lines and planter drainage holes. In addition to pedestals at each paver corner, provide pedestals at the center of each paver in contact with the planter and verify that each pedestal is snug to the bottom of the paver. Remove spacer tabs from the pedestals at the center of pavers.

H. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

I. Pavers over Waterproofing: Exercise care in placing pedestals, pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.

J. Trimming and Cutting
   1. Concrete Paver Tiles: Trim, cut and remove uncovered portion of pedestals to fit tightly with pavers against parapets, walls, and protrusions in the roof. Cut Concrete pavers with a masonry saw to fit in these areas. Cut concrete pavers without damage to exposed faces and edges. Cut units should be no smaller than 1/3 a whole concrete paver.

K. Arrange concrete paver to provide consistent joint work throughout at widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.

L. Maintain consistent joint widths and joints aligned in all directions as indicated on the drawings.

M. Do not install cracked, chipped or broken concrete pavers.

N. Remove cut pieces and other debris from the surface and on the roof deck. Sweep concrete paver surfaces clean.

3.4 INSTALLATION TOLERANCES

A. Pavers shall not be installed in segments with any dimension shorter than 6-inches. False joint pavers shall be used as needed to accommodate pattern as indicated in drawings.

B. Variation from Level: For horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/16 inch in 10 feet, 1/8 inch in 20 feet, or 1/4 inch in 40’ or more.

C. Variation of Linear Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/8-inch in 20-feet or ¼-inch in 40-feet or more.

D. Variation in Cross-Sectional Dimensions: For thickness of units from dimensions indicated, do not exceed plus or minus 1/8 inch.

E. Variation in Plane between adjacent concrete pavers (Lippage): Do not exceed 1/16-inch difference between planes of adjacent concrete pavers.

F. Check final surface elevations for conformance to drawings.

3.5 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged pavers or pavers that do not match approved samples and mockups. Damaged pavers may be repaired only if Architect approves methods and results.

B. Replace in a manner that results in pavers matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. Clean concrete pavers in accordance with the manufacturer’s written recommendations.

3.6 PROTECTION

A. After work in this section is complete, protect work from damage due to subsequent and adjacent construction activity on the site.

END OF SECTION 321413

SECTION 321600 CONCRETE CURBS AND SIDEWALKS

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Provide concrete curb and gutters, vertical curb, and extruded curb as shown on the project drawings.
2. Provide concrete sidewalks, walkways, stairs, including curb ramps and slabs as shown on the project drawings and as required to provide complete and uniform pedestrian access.

B. Related Sections

1. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:
   Section 31 00 00 – Earthwork

1.2 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

1. COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS).
2. DR01-2017 Right-of-Way Opening and Restoration Rule (ROWORR)
3. Standard Plans Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans).
4. TCM Traffic Control Manual for In-Street Work, latest edition TCM).
5. Geotechnical Report: Project Geotechnical Report.

PART 2 - PRODUCTS

2.1 CEMENT CONCRETE VERTICAL CURB, CURB AND GUTTER, AND EXTRUDED CURB

A. Materials for cement concrete curbs, and curb and gutter shall conform to COS Section 8-04.

2.2 CEMENT CONCRETE SIDEWALKS, SIDEWALK WITH MONOLITHIC CURB AND CURB RAMPS

A. Materials for cement concrete sidewalks and curb ramps shall conform to COS Section 8-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not install until unsatisfactory conditions are corrected. Beginning work constitutes Contractor's acceptance of conditions as satisfactory.

3.2 PREPARATION

A. Field Measurements: Verify existing dimensions and shapes. Allow for transitions to existing surfaces and pavement where applicable.

B. Subgrade:

1. Preparation of subgrade shall conform to COS section 2-09.

2. Verify compaction of subgrade per Section 31 00 00, for on-grade work.

C. Coordinate scoring patterns, finish, coloring, and layout with the Architect and/or Landscape Architect prior to construction.

3.3 INSTALLATION

A. Curbs: Cement concrete curbs shall be installed in accordance with plan drawings, and COS Section 8-04. Expansion joints shall be provided at 15-foot maximum spacing. The work shall be performed in a manner that results in a curb constructed to specified line and grade, uniform in appearance and structurally sound. Curbs found with unsightly bulges, ridges or other defects shall be removed and replaced at the Contractor's expense if the Architect considers them to be irreparable. When checked with a 10-foot straightedge, grade shall not deviate more than 1/8 inch, and alignment shall not vary more than 1/4 inch.

B. Sidewalks:

1. Cement concrete sidewalks and walkways shall be installed in accordance with COS Section 8-14. Expansion joints shall be provided at 15-foot maximum spacing.

Sidewalks shall be divided into square panels per the Landscape Plan by scoring 1/4 inch deep.

C. Cement concrete steps shall be installed in accordance with Contract Documents.

3.4 FIELD QUALITY CONTROL

A. Cement concrete proportioning shall meet the requirement of COS Section 5-05 and 5-06.

3.5 CLEANING

A. Leave premises clean and free of residue of work of this Section.

END OF SECTION 321600

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Horizontal-slide gates.
3. Privacy slats.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete post footings.
2. Section 281500 "Access Control Hardware Devices" for gate controls.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of gate operator.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
   a. Fence and gate posts, rails, and fittings.
   b. Chain-link fabric, reinforcements, and attachments.
   c. Accessories: .
   d. Gates and hardware.
   e. Gate operators, including operating instructions and motor characteristics.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Samples: For each type of factory-applied finish.

D. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer .

B. Product Certificates: For each type of chain-link fence, and gate.

C. Product Test Reports: For framework strength according to ASTM F 1043, for tests performed by .

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Shop Drawings: Show details of fabrication and installation, including dimensions, arrangement and details of fabric, posts, railings, and gates; and details showing relationship with, and attachment to related work.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify layout and finish grade information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions and final grades by field measurements.

1.9 WARRANTY

A. Special Warranty: to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to comply with performance requirements.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Faulty operation of gate operators and controls.
2. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire for Fabric: Wire diameter of 0.148 inch
   a. Mesh Size: 2 inch.
   b. Polymer-Coated Fabric: ASTM F 668, Class 2b over zinc-coated steel wire.
      1) Color: Black, according to ASTM F 934.
   c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
3. Selvage: Knuckled at both selvages.

2.3 FENCE FRAMEWORK

A. Posts and Rails: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:

1. Fence Height: 96 inches.
2. Brace Rails: ASTM F 1043.
3. Polymer coating over metallic coating.
   a. Color: Black, according to ASTM F 934.

2.4 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:

1. Top Rail Sleeves: Pressed-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting rails to posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.

1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
   a. Hot-Dip Galvanized Steel: 0.148-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.
   a. Polymer coating over metallic coating.
   b. Color: Black ASTM F934

2.5 PRIVACY SLATS

A. Tubular Polyethylene Slats: Minimum 0.023-inch-thick tubular polyethylene, manufactured for chain-link fences from virgin polyethylene with UV inhibitor, sized to fit mesh specified for direction indicated, with .

B. Color: To be selected by Architect from standard colors.

2.6 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

B. Layout to be field verified by owner or Landscape Architect.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
   a. Exposed Concrete: Extend 1 inch above grade; shape and smooth to shed water.
   b. Concealed Concrete: Place top of concrete 2 inches below finished grade of mulch and 1” above finished grade of soil to allow covering with surface material.

c. Posts Set into Sleeves in Concrete: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.

d. Posts Set into Holes in Concrete: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.

3. Mechanically Driven Posts: Drive into soil to depth of 30 inches. Protect post top to prevent distortion.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

G. Intermediate and Bottom Rails: Secure to posts with fittings.

H. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 1-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

J. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

K. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.4 ADJUSTING

A. Lubricate hardware and other moving parts.

END OF SECTION 323113

SECTION 328000 - PLANTING IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and related items necessary to complete the work shown on the Drawings and/or Specifications. The items of work to be performed include but are not limited to:
   1. Provide irrigation sleeving. Layout of irrigation sleeves to coordinate with irrigation system and with work of other trades.
   2. Provide dripline, drip emitters, air/vacuum relief valves, flush valves, sprinkler heads, root watering systems, quick couplers, fittings, valves, and valve boxes.
   3. Provide Irrigation Controller, expansion modules, rain sensor, and valve control wire.
   4. Provide gate valves, Backflow Prevention, and master valve.
   5. Warranty, maintenance and protection.
   6. All other related items required to complete the work in the best accepted trade practices.

B. Coordinate system with all existing irrigation systems and points of connection within the vicinity of the Limit of Work / Site Disturbance, and which may be affected by construction in order to insure undisturbed coverage during and after construction.

1.2 RELATED SECTIONS:
   1. Section 321313 - Site Concrete
   2. Section 310000 - Site Clearing
   3. Section 329200 - Seeding
   4. Section 329300 - Planting
   5. Section 328300 - Soil Preparation

1.3 SUBMITTALS PROCEDURE

A. Prior to purchasing any materials, submit four (4) copies of the manufacturer’s catalog data sheets for all proposed material and equipment for review and approval by Landscape Architect. Verify with Landscape Architect any submittals requiring Owner review.

B. Contract Closeout:
   1. Project Record Documents: The Irrigation Contractor shall record all changes made during construction which deviate from the equipment or locations shown on the drawings, as well as actual locations (horizontal and vertical) of mainline, sleeves, and valves etc. Provide dimensioned Record drawings at completion of project.
   2. Instructional Session: Irrigation Contractor to schedule and hold one (1) instructional session for Owner’s Grounds and maintenance employees prior to completion of work. Record drawings and O&M manuals to be available for the instructional session.
   3. Operation and Maintenance Data: Contractor shall provide three (3) sets of all manufacturer’s maintenance data sheets, replacement parts list, equipment brochures, and system operations information bound in 3-ring binders. Composite data sheets

shall have the specific product used on the project clearly identified in colored ink marking.

4. Zone Control Map: Provide (1) color coded laminated zone control map of the approved record drawings. Showing locations of Mainline, zone valves, laterals, zone descriptions, and corresponding zone control numbers. The drawing shall be mounted within the irrigation controller cabinet at the time of final inspection.
5. Warranty: Irrigation Contractor is to warranty the work of this section for a period of one (1) year from date of final acceptance against all defects of materials and workmanship. Obtain a certificate indicating the date of final acceptance of the landscaping. Irrigation equipment damaged by vandalism or resulting from Owner occupancy of the site will not be required to be replaced under warranty, unless improper installation is a contributing factor in the damage (i.e. heads at improper elevation, irrigation piping at improper depths).

1.4 QUALITY ASSURANCE

A. Irrigation Contractor/Installer Qualifications: Must be a company specializing in work of this section with a minimum of 5 years of documented experience in irrigation installation of similar nature. Provide a list of at least three past projects of similar size and complexity completed by the installer in the past five years. Provide references for each project with name, title, telephone number and address. Submit to Landscape Architect for review and approval before Irrigation Installer is contracted for work.

B. Regulatory Requirements: The Contractor shall perform the work in accordance with all local, municipal, and state laws, rules, and regulations governing or relating to any of the work in this section. All electrical work to be done by a licensed electrical Contractor.

C. The Irrigation Contractor shall be included in the General Contractors Quality Control Plan. All work performed under this section shall be thoroughly inspected and tested prior to requesting Owner review. The Irrigation Contractor will be expected to note all deficiencies and make needed corrections prior to Owner review.

1.5 PROTECTION OF WORK, PROPERTY, UTILITIES AND PERSONS

A. Provide protection of all property, persons, work in progress, structures, existing landscape and irrigation work to remain, utilities, walls, walks, curbs, paved surfaces, drainage materials, water proofing membrane, and all survey markers and monuments from damages incurred arising from this Contract. Irrigation work to remain is to be kept in a fully functional condition. The Irrigation Contractor shall pay for any such damage at no additional cost to the Owner.

B. Verify locations of all underground utilities prior to commencement of work. Existing known utilities have been shown on Architectural/Engineering or Survey Drawings. The Irrigation Contractor shall be responsible for the protection of said utilities. Promptly notify the General Contractor of any conflict between proposed work and obstruction(s).

1.6 VERIFICATION OF SITE CONDITIONS

A. Before proceeding with any work, the Irrigation Contractor shall verify all dimensions pertaining to the location of irrigation equipment. Should any errors or conflicts in the Drawings and/or Specifications be found, the Irrigation Contractor shall immediately notify the Owner's Representative.

B. The drawings are intended as a diagrammatic irrigation design. Actual layout may need to be adjusted per actual field conditions.

1.7 CLEANUP

A. All paved surfaces and planted areas shall be kept clean of soil and debris on a daily basis.

B. The Irrigation Contractor shall be responsible for cleaning all paved surfaces affected by irrigation work prior to final acceptance.

1.8 SYSTEM MAINTENANCE

A. Concurrent with the one (1) year warranty period for planting, and irrigation. The Irrigation Contractor is to monitor and maintain the new irrigation system in an operational, water efficient condition. Ensure balanced precipitation rates, no excessively wet or dry areas, properly functioning equipment including controller, backflow prevention, valves, and heads.

B. Maintenance Schedule: Contractor is to provide a schedule of maintenance, for Owner's approval, which will include the following:
   1. Spring startup of the system.
   2. Monitoring and adjusting irrigation controller time duration and scheduling.
   3. Nozzle adjustment. Repair and replacement of irrigation components to match as original designed.
   4. Checking and adjusting elevation of valve boxes and irrigation heads.
   5. Checking and correcting for any settling of trench backfill.

C. Owner Inspection:
   1. Owner will inspect periodically during the maintenance period. Deficiencies will be noted and reported to the Contractor who will correct all deficiencies to the satisfaction of the Owner within 24 hours after notification.
   2. Eleven months after the date of final acceptance the Owner and Owner's Representative will make a final warranty walk through review of the irrigation system. All deficiencies will be noted and corrections required. If the deficiencies are major in scope it may result in an extension of the warranty period for the affected item after corrections are made.

1.9 PERMITS, CODES AND ORDINANCES

A. Obtain and pay for all necessary permits and fees as required by applicable codes and ordinances for this work.

B. Comply with all applicable codes, regulations and ordinances.

1.10 SUBSTITUTIONS

A. Substitutions to equipment specified will only be permitted as per the requirements as outlined in Section 012500.

1.11 INSPECTIONS

A. The Irrigation Contractor shall give the Owner's Representative 48 hours notice prior to inspection of trench depth, flushing, head layout, pressure tests and performance tests.

1.12 CHANGE ORDERS

A. The Irrigation Contractor shall provide no work requiring extra compensation without the approval by the Owner.

1.13 COORDINATION

A. During the entire construction period, schedule and coordinate all work to avoid interference with the work of other contractors. Schedule work hours, staging areas, access routes, parking, utility connections, and similar items, under the direction of the Owner and the General Contractor.

PART 2 - PRODUCTS

2.1 GATE VALVE

A. Gate valves to be A. Y. McDonald valves 72035T or approved equal. Same size as pipe.

2.2 BACKFLOW PREVENTION

A. Zurn Wilkins Wilkens 975 XL-S, Reduced Pressure Principle Assembly. Provide with a minimum of (2) unions and brass wye-strainer. Sized as noted on drawings.

2.3 GALVANIZED PIPE

A. Pipe shall be Schedule 40, domestic manufacture, and conform to ASTM A120-65. Fittings shall be malleable galvanized, painted and wrapped.

2.4 PLASTIC PIPE

A. PVC Schedule 40 for all lateral piping (downstream from valves) and PVC Schedule 40 for mainline piping (pressure line).

B. Pipe to be marked with manufacturer's name, class of pipe, NSF seal and date and shift of manufacturing run. Pipe to bear no evidence of interior or exterior extrusion marks.

C. Pipe walls to be uniform, smooth and glossy. Pipe may be pre-belled or with individual solvent-weld couplings.

D. Fittings: Schedule 40 molded, full size.

E. Sleeving: PVC Schedule 40 or better. Twice size of interior pipe, minimum 6” diameter.

2.5 AUTOMATIC CONTROL VALVES

A. Automatic valves shall be of the sizes indicated on the Drawings. Valves shall be Hunter ICV-101G-FS-AS-ADJ, Automatic control valve or Hunter ICV-101G-FS as noted on the drawings. Valves shall include a flow adjustment/shut-off handle and shall be plastic, adjustable Accu Sync pressure regulator, 24V solenoid type globe valve.

B. Drip Control Zones: Hunter ICZ-101-LF-25, 1” drip control zone for Dripline zones. To include (1) remote control valve and (1) pressure regulating filter for each drip control zone. Provide (1) Hunter PLD-AVR Valve kit, Air/Vacuum Relief valve and (1) Hunter PLD-BV, Manual flush valve for each isolated dripline zone.

2.6 BALL VALVES

A. KBI low torque slip-by-slip, or approved equal. Same size as pipe.

2.7 SPRINKLER HEADS

A. Pop-up sprinkler heads shall be Hunter PROS-02, 2” pop-up as indicated on the drawings. Nozzle with Hunter MP rotator nozzles as indicated on the drawings.

2.8 SWING JOINTS

A. ½’ Inch inlet sprinklers: Hunter SJ-512 swing assemblies.

B. Quick Coupler: Hunter HSJ-1-3S-218, 3-way swing joint.

2.9 ROOT WATERING SYSTEM

A. Hunter RZWS-18-50-CV, Root watering system with a 0.50 GPM bubbler and check valve.

2.10 DRIP COMPONENTS

A. Hunter HDL-06-12-CV, 0.60 G.P.H. emitters at 12” o.c.

B. Hunter PLD-AVR, Air/Vacuum Relief valves.

C. Hunter PLD-BV, Manual flush valves.

D. Bronze ¼” drain valve.

E. Hunter PLD LOC series, Twist Lock Fittings as needed.

F. Galvanized dripline tie down stakes. Rain Bird TDS-050 Bend or equal.

2.11 IRRIGATION CONTROLLER

A. Hunter IC-600-PL, modular Irrigation Controller with Hunter ICM-600 modules as noted on drawings.

B. Provide a Hunter SOLAR-SYNC-SEN, wired ET/Rain/Freeze sensor.

2.12 CONTROL WIRE

A. Valve wire shall be #14 UF direct burial wire. White shall be common wire, red the valve impulse wire for lane zones, green the valve impulse wire for dripline shrub zones, yellow or purple for sprinkler shrub zones, black the master valve.

B. Provide two spare wire to each mainline terminus. All spare wires to be orange.

C. Wire spices: 3M-DBY direct bury splice kit or approved equal.

2.13 TRACE WIRE

A. Bare #14 UF single strand copper blue direct burial wire.

2.14 QUICK COUPLING VALVE

A. Hunter HQ-44-LRC, 1" quick coupling valve. Provide two keys with hose swivel ells.

B. Quick Couplers shall be placed on 3-way swing joints.

2.15 VALVES BOXES

A. All valve boxes to be N.D.S. Pro Series Valve boxes or approved equal.

B. Valve boxes shall have no more than one valve per box.

C. All automatic valves shall be placed in a Standard valve box with dimensions of 11 inches x 17 inches.

D. All valve boxes shall be set with top at finish grade.

E. Extensions shall be used as needed.

2.16 PVC CEMENT AND PRIMER

A. Follow Manufacturer’s instructions for cementing PVC pipe.

B. For PVC pipe cement use WELD-ON plastic pipe cement, P75 Wet/Dry for PVC gray, heavy bodied, medium set.

C. Primer: Weld-on primer, P-75 Wet/Dry, purple primer.

2.17 DRAIN ROCK

A. Unfractured rock, 100 percent passing 5/8 inch sieve and 0 percent passing ¾ inch sieve.

PART 3 - EXECUTION

3.1 VERIFICATION

A. Verify in writing to the Owner's Representative that adequate gallonage and pressure is available at meter to properly operate the irrigation system prior to installation. Provide Owner's Representative with pressure readings at meter location prior to installation of irrigation system.

B. Advise Owner's Representative of any discrepancies between drawings and actual ground measurements prior to beginning actual installations.

C. Check correlation between irrigation and any trees, hydrants, signs, street lights, etc. and notify Owner's Representative of any potential conflicts.

D. Coordinate all work with existing irrigation systems and points of connection within the vicinity of the Limit of Work / Site Disturbance, and which may be affected by construction in order to insure undisturbed coverage.

3.2 TRENCHING

A. Safety: Do not begin excavation until arrangements have been made to protect the general public from holes, trenches, parked equipment, etc. Before any excavation is left unattended for any length of time it shall be made safe by means of barricades, fences, flagging, warning signs and any other measures necessary to ensure public safety.

B. Provide straight trenches minimum of 6" wide and without abrupt grade changes. Trench bottoms shall be flat and free of any rock or debris larger than 1". Trenches shall be of sufficient depth to allow for 18" of cover over sprinkler mainlines. 12" of cover over sprinkler lateral lines for permanent irrigation valves.

3.3 SLEEVING

A. Install sleeves under all paved surfaces as required to facilitate installation of the irrigation work shown on the Drawings.

B. Sleeves shall be a minimum 4" diameter. Wire sleeves to be a minimum of 4" diameter.

C. Extend sleeves a minimum of 12" beyond the edge of curbs, walks, walls and/or other paved surfaces. Cap and identify sleeve ends.

D. Compact backfill to 95% per ASTM D-1557.

3.4 SPRINKLER HEADS

A. Install all heads as detailed on the drawings, adjusting location as necessary to achieve maximum coverage as intended. Heads adjacent to walks, walls, and curbs shall be set two (2”) inches from edge of concrete and flush with finish elevation of concrete.

B. Adjustment: All nozzles on sprinklers shall be tightened after installation. All sprinklers having an adjustment screw, adjusting stem, or adjusting friction collars shall be adjusted as required for proper arc, radius, and/or G.P.M. discharge. Adjust pressure regulating automatic valves as needed to provide reduced radius on nozzles to eliminate overspray.

C. Set perpendicular to slope and 1” above finish elevation of topsoil.

3.5 DRIPLINE

A. Install dripline in all planting beds 3-4” below finish grade of topsoil. Coordinate spacing of dripline with proposed planting to not conflict.

B. Install galvanized stakes every 5’ o.c. for dripline installed in on grade planting beds.

C. Install a manual flush valve at a low spot within each isolated dripline area.

D. Install an air vacuum/relief valve at each high point within each isolated dripline area.

3.6 ROOT WATERING SYSTEM

A. Install Root Watering System on opposite side of tree root ball and set flush with finish grade.

3.7 REMOTE CONTROL VALVES

A. Install valves in approximate locations shown on Drawings maintaining a minimum 12" spacing from paved surfaces. Group valves where possible in planting beds and in an orderly fashion. Provide 12” spacing between valve boxes.

B. Install a PVC schedule 80 union on each end of valve.

C. Install a ball valve on mainline service for each valve.

D. Install drain rock gravel sump and valve box as indicated on the details shown on the Drawings. Minimum depth of 12”. Notify Owner’s Representative if positive drainage does not exist.

3.8 QUICK COUPLING VALVE

A. Install quick coupling valve with swing joints, drain rock sump and valve box per the locations and details shown on the Drawings. Minimum depth of 12”.

3.9 CONTROL WIRING

A. Install the control wire in continuous runs. Tape wire to the bottom of mainline at 5' intervals with plastic zip ties.

B. Provide a 24" loop of excess control wire at each valve.

C. Provide a 24” inch expansion and contraction loop at every 100 feet of length in the trench. Placed in 6” valve box.

D. Provide a bare trace wire the entire length of the mainline.

3.10 CONTROLLER

A. The General Contractor shall provide the new Irrigation Contractor with 110V power to and into the irrigation controller. All other electrical work necessary to make the equipment operate properly shall be provided and installed by the Irrigation Contractor.

B. Install new controller at the location shown on the drawings. Confirm location with Landscape Architect before installation. Install per the manufacturer's specifications.

C. Install wired ET, Rain/Freeze Sensor on roof edge at a location approved by Landscape Architect. Provide conduit and wire from Controller to sensor. Verify communication with controller before permeant installation. Install per manufactures recommendations.

D. Sequence the valves per the number system on the Drawings. Affix a non-fading copy of sequence diagram to the inside of the controller cabinet door.

3.11 PIPE AND FITTINGS

A. Transport and store pipe on a flat and even surface.

B. Seal all threaded joints with Teflon tape. No PVC pipe (except swing joint assemblies) shall be threaded or connected to a threaded fitting without an adapter.

C. Keep pipe free from dirt or debris at all times. Cover ends of pipe when not in progress of installation.

D. There shall be no more than 2 lines per trench. When laying 2 lines in a single trench they are to be set side by side and never stacked. Bends in pipe shall not exceed 18 degrees in 20 feet.

E. Connect pipe using two-step solvent weld process. Do not move or handle pipe for a minimum of 15 minutes while solvent welds are curing. No water shall be permitted in pipe until a period of at least 10 hours has elapsed for solvent weld setting and curing. The joints shall be allowed to cure at least 24 hours before pressure is applied to the system. Weld PVC in temperatures above 40 degrees F and under cover in rainy or wet conditions.

F. When possible, install no fittings closer than 6 inches apart.

G. Swing joints shall not be installed until pressure test is completed.

3.12 FLUSHING

A. Flush all irrigation lines after irrigation piping and risers are in place and connected, all necessary division work has been completed and prior to installation of irrigation heads. All control valves shall be opened and a full head of water used to flush out the system completely. Flush until water flows clear and no debris is caught in the fine mesh strainer placed over each of several outlets.

B. All irrigation heads to be installed immediately after flushing.

3.13 PRESSURE TEST

A. Owner's Representative must be present for all pressure testing.

B. The Contractor is to use test equipment in good condition and test equipment will have no leaks at couplings which might compromise test procedure.

C. All joints and connections shall be left exposed until after completion and acceptance of pressure test.

D. After flushing is complete, zone valves and heads installed, pressure test entire mainline to 100 PSI. System will pass when it maintains test pressure for a 30 minute test period. System to be tested by filling piping with water and pressuring system.

E. Joints and connections shall be visually checked by the Irrigation Contractor and Owner's Representative. Any leaks, however minor to be corrected and the test will begin anew. The process will be complete when the system holds with no noticeable drop in pressure for 30 minutes.

3.14 BACKFILLING

A. Backfill over fittings only after system has been pressure tested and inspected by the Owner's Representative and Landscape Architect.

B. Backfill with only material which is free of rock and pipe damaging debris.

C. Provide detector tape or bare copper wire on top of PVC mainline for future detection.

D. Upon completion of pressure test backfill all trenches and compact to 85% per ASTM D1557 (95% for sleeve trenches).

E. Protect work at all times from damage by foot and vehicular traffic. Keep rock, soil and all other debris from piping, valves and other equipment.

3.15 PERFORMANCE TESTS

A. Upon completion of system installation, Irrigation Contractor shall operate system in the

presence of the Owner's Representative. Owner's Representative may request that up to five percent (5%) of the total nozzles be substituted, as appropriate to site conditions, at no additional cost to the Contract.

3.16 FINAL ACCEPTANCE

A. Prior to final acceptance of work, Irrigation Contractor shall have completed all punch list items, submittals, and shall submit signed and approved sprinkler/plumbing/health/electrical permits as applicable to the work.

END OF SECTION 32 84 00

SECTION 329115 – SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subgrade preparation
   2. Planting soil
   3. Lightweight Soil
   4. Soil amending
   5. Preparation of planting areas
   6. Finish grading

B. Related Sections:
   1. Section 310000 – “Earthwork” for structural soil base, excavation, filling, and rough grading
   2. Section 329300 – “Planting” for plant and mulch installation
   3. Section 329700 – “Layered Vegetated Roof Systems” for extensive green roof

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Planting Soil: A base soil that has been amended to produce a planting soil mixture best for plant growth.

D. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before aggregate bases or planting soil is placed.

E. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.

F. Total Placement Depth: Combined soil depth, from top of subgrade to bottom of mulch. Does not include subgrade scarification/tilling/amendments or mulch.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s product data for the following, including sources:
   1. Planting Soil with components listed by percentage of volume.
   2. Organic Community Garden Planter Soil with components listed by percentage of volume.
   3. Compost and Seal of Testing Assurance (STA) certificate before application
   4. Organic Fertilizer.
   5. Mycorrhizal Fungi.
   6. Amendments: For any amendments required.
   7. Quantity Documentation: If requested, submit proof of quantities of compost or amendments applied so that application rates can be verified.

B. Product Certificates. Submit for each product, from manufacturer, within 90 days of delivery to site:
   1. Compost Certification: Provide copy of the producer's STA as issued by the U.S. Composting Council.
   2. Compost feedstock sources. Submit list of sources of feedstock and percentages in the final product.

C. Material Test Reports:
   1. Compost Technical Data Sheet including test results.
   2. Complete Soil Analysis for all soil types, including mineral components analysis, at least 45 days prior to installation:
      a. Planting Soil
      b. Include lab interpretation report for each.

D. Samples: 2-quarts per sample.
   1. Planting Soil Samples: Submit sample of each type of planting soil, with analyses.
   2. Compost: Submit with laboratory analysis and certification.

E. Prepared Soil Settlement Test:
   1. Install 20 square feet of prepared planting soil at specified depth and apply irrigation to induce settlement to determine percent of additional soil required to achieve specified grade conditions of soil after settling.
   2. Supplement specified depth with additional planting soil to achieve specified grade conditions.
   3. Submit Prepared Soil Settlement Test report stating test date, time and conclusion.

F. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

H. Warranty: Submit special warranty.

I. Contract Closeout Submittals:
   1. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: A qualified landscape Installer whose work has resulted in successful establishment of plants.
      a. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 -- Quality Requirements.
      b. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
   2. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

a. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.

B. Testing Laboratory Services:
1. Provide to Lab:

Provide the following information to soil testing laboratory for all samples tested:

a. Project location.
b. Description of type of plants to be used.
c. Material Samples:

1) From the source, take a minimum of ten representative 1-cup samples from equally spaced locations at 12-inch depth for each ingredient.
2) Thoroughly mix all samples in a separate clean bucket for each soil type.
3) Place 2 cups of the mix into a sealable plastic bag for testing. Verify quantity of sample required by soil testing laboratory.
4) Label bag with site information, area of sample, contractor name and phone number.
5) Verify with selected laboratory that additional requirements do not apply.

2. Analyses Required: Conduct the following analyses within 90 days of delivery to the site.
a. Compost:
1) Timing: Prior to mixing into soils, dated no more than 90-days prior to installation.
2) Analysis:
a) Agricultural Soil Suitability series:
i. pH, salinity, types and concentrations of soluble salts in saturation extract, SAR (sodium adsorption ratio).
ii. Essential nutrients on a total basis: boron, calcium, chloride, copper, iron, magnesium, manganese, molybdenum, nitrogen, nickel, phosphorus, potassium, sulfur, zinc, and for some plants sodium (using ammonium bicarbonate DTPA testing method).
iii. Non-essential minerals on a total basis: aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, mercury, selenium, silver, sodium, strontium, tin, titanium, and vanadium.
b) Test for any additional items listed in Part 2.
b. Planting Soil:
1) Test soil prior to amending:
a) Timing: No more than 60-days prior to mixing.
b) Analysis: Organic Matter content and sieve analysis for each mineral component of the mix; state gradation of sand, silt, and clay content per USDA Soil Classification system, including percent passing the #200 screen size.
2) Soil analyses:
a) Timing: No more than 60-days prior to site placement.
b) Analyses:
i. Agricultural Soil Suitability series as listed under Compost above
ii. Organic Matter content on a dry weight basis
iii. Sieve analysis. Provide percent gravel, sand, silt, and clay content per USDA Soil Classification system. Provide gradation of sand (material between 0.05 and 2 millimeters) per USDA Soil Classification system, including percent passing the #200 screen size.
iv. Carbon to Nitrogen ratio

v. Other analysis as required to show compliance with requirements.

c) Report: Interpretation of nutrient analysis and written report from soil testing lab, including:

i. Suitability of tested soil for growing intended plants

ii. Recommendations for soil amendments to be incorporated to produce soil conducive to healthy growth of intended plants

iii. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action

iv. Other analysis as required to show compliance with requirements

C. Preinstallation Conference: Conduct conference at Project site, with Landscape Architect and Landscape Installer present. Discuss the following items:

1. Laboratory Analyses
2. Products
3. Subgrade Preparation
4. Soil placement
5. Installation
6. Schedule and Staging

D. Notification for Review: Notify Architect 5-days in advance of the following review points:

1. Subgrade Preparation Review
2. Planting Soil Placement Review
3. Soil Preparation and Finish Grading Review

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

1. Bulk Materials:

a. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

b. Do not store soil or compost materials in piles higher than six feet.

c. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

d. Do not move or handle materials when they are wet or frozen.

e. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations and dimensions of planting areas and adjacent construction by field measurements before proceeding with planting work. Notify Architect if discrepancies exist between plans and actual conditions.

B. Weather Restrictions: Do not perform work of this section when soils or subgrades are excessively wet, in the opinion of the Landscape Architect.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace work of this Section that fails in materials or workmanship, within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Excessive settling of soils
      b. Presence of horsetail, morning glory, reed canary grass or other nuisance plants or noxious weeds in planting soils
   2. Warranty Period from Date of Planting Completion: 12 months
   3. Include the following remedial actions as a minimum at end of warranty period:
      a. Correct grades that have settled
      b. Provide nuisance and noxious weed eradication from planting areas. Do not use inorganic herbicide unless approved. Remove soils containing horsetail and replace.

1.8 MAINTENANCE

A. Maintenance: Maintain as required to eradicate imported weeds and correct settlement. Begin maintenance immediately after plants are installed and continue for 30 days after Planting Completion.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

A. Intent of soil materials is to provide planting soil with healthy soil chemistry that comes from the use of high quality components instead of through the use of added amendments.

B. Planting Soil consists of the following soil that has been tested and amended as required and thoroughly mixed before installation:
   1. Planting Soil:
      a. Sandy Loam, (per USDA Soil Texture), with maximum 15-percent passing #200 screen size.
      b. Organic Matter of the Mix: 8 to 15-percent, using TMECC 05.07 A, Loss-on-Ignition. Adjust volume of compost to achieve specified soil organic matter in the mix.
      c. pH: 6.5 to 7.5
      d. ECe: 0.5 to 3 (millimho/cm)
      e. SAR: 0.5 to 3.5
      f. Boron: Max. 1.0 mg/l (parts per million)

C. Conduct Soil Analyses, as described in Part 1.

D. Apply additional amendments in the quantities recommended by soil testing lab for each planting type, and thoroughly blend into base soils off-site to create planting soil.

E. Remove from planting soil all roots, plants, weeds, sod, stones larger than 1-inch in any dimension, clods, pockets of coarse sand, construction debris and other extraneous materials harmful to plant growth.

2.2 COMPOST

A. Compost: Result of the biological degradation and transformation of Type I or III organic feedstocks under controlled conditions designed to promote aerobic decomposition and manufactured by a participant in the United States Composting Council's (USCC) STA program.
   1. Stable with regard to oxygen consumption and carbon dioxide generation.
   2. Mature with regard to its suitability for soil amendment or erosion control BMP.
   3. Moisture content resulting in no visible free water or dust produced in handling.

B. Production and quality in conformance with California Department of Environmental Quality. Meets the following criteria:

Criteria	Testing Method
pH range of 5.5 to 8.0	TMECC 04.11-A “1:5 Slurry pH”
Moisture content 35 to 55 percent by weight	
100% passing through 1-inch sieve 90-100% passing through 5/8-inch sieve 40-90% passing through ¼-inch sieve	TMECC 02.02-B “Sample Sieving for Aggregate Size Classification”
Carbon:Nitrogen Ratio: Maximum 25:1	TMECC 04.01 “Total Carbon TMECC 04.02-D “ Total Kjeldhal Nitrogen”
Total organic matter content of 45% to 65% dry weight basis	TMECC 05.07-A “Loss-On-Ignition Organic Matter Method”
Maturity >80%	TMECC 05.05-A “Germination and Vigor”
Soluble salt content of maximum 6 mmhos/cm	TMECC 04.10-A “1:% Slurry Method, Mass Basis”
Manufactured inert contaminants less than 1.0 percent dry weight or volume basis	TMECC 03.08-A “percent dry weight basis”
Minimum 65% by volume “Type 1 Feedstock” (recycled plant waste) A maximum of 35% by volume of other approved organic waste, “Type III Feedstock,” may be substituted for Type I. This includes post-consumer food waste, but not biosolids.	

Stability: 7 or below	TMECC 05.08-B "Carbon Dioxide Evolution Rate"

C. Free of substances toxic to plantings.

D. Tested within 90 days prior to application.

2.3 LIGHTWEIGHT SOILS

1. INTENSIVE GROWING MEDIUM – rooflite® intensive 600
   a. Description:
   A planting medium for extensive vegetative (green) roof systems with a separate drain layer, designed to retain stormwater and to promote long lasting vigorous plant growth, and which meets the requirements described in ASTM E2777-14 Standard Guide for Vegetative (Green) Roof Systems and detailed below. rooflite extensive 600 is the 60 to 70 lb/ft³ fully saturated weight class of the rooflite extensive product line*. rooflite® extensive 600 is a precisely balanced blend of carefully selected lightweight mineral aggregates and premium organic components, like USCC STA approved compost complying with the following technical and performance requirements:

   b. Physical and Chemical Properties:

1) Particle Size Distribution (ASTM D422-63)

a)	Proportion of particles < 0.05 mm		≤ 15 %
b)	Proportion of particles < 0.25 mm	# 60 mesh	5 - 30 %
c)	Proportion of particles < 1.00 mm	# 18 mesh	10 - 50 %
d)	Proportion of particles < 2.00 mm	# 10 mesh	30 - 70 %
e)	Proportion of particles < 3.20 mm	1/8-inch mesh	40 - 80 %
f)	Proportion of particles < 6.30 mm	1/4-inch mesh	65 - 95 %
g)	Proportion of particles < 9.50 mm	3/8-inch mesh	80 -100 %
h)	Proportion of particles <12.50 mm	1/2-inch mesh	100 %

2) Bulk Density Measurements (ASTM E2399)*

a)	Bulk Density dry weight basis	25 - 45 lb/ft³
b)	Bulk Density at max. water-holding capacity	60 - 70 lb/ft³

3) Water/Air Measurements (ASTM E2399)

a)	Total Pore Volume	≥ 50 %
b)	Maximum water-holding capacity	40 – 60 %
c)	Air-filled porosity at max. water-holding capacity	≥ 7 %
d)	Water permeability (saturated hydraulic conductivity)	0.024 - 2.83 in/min

4) pH (in CaCl2) 6.0 - 8.5

5) Soluble salts (water, 1:10, m:v) ≤ 3.5 g (KCl)/L

6) Organic Matter Content LOI at 500°C (SM 2540 G) 25 – 65 g/L

7) Nutrient Retention Capacity/Cation Exchange Capacity (CEC) > 6 meq/100 g

c. Supplier: Skyland USA, LLC; www.rooflitesoil.com; 1.877.268.0017

2.4 MYCORRHIZAL FUNGI INOCULUM

A. Endo Mycorrhizal Fungi:

1. Endo/Ecto Mycorrhizal Fungi: Dry, granular mycorrhizal inoculum containing:
   a. 4 species of endomycorrhizae, 20,000 propagules per lb.
   b. 7 species of ectomycorrhizae, 110 million propagules per lb.
   c. 2 species Trichoderma
   d. Biostimulant package
2. Approved product: MycoApply Granular Endo, by Mycorrhizal Applications, Inc.
   a. Available from: Rocky Mountain Bio Products, http://www.rockymtnbioproducts.com/contact_us.htm
   b. Approved equals: MycoGrow Gel as manufactured by Fungi Perfecti, Olympia, WA, (800) 780-9126; Mycorrhizal Landscape Inoculant as manufactured by BioOrganics, Santa Monica, CA, 1-888332-7676; or Biovam as manufactured by Brock Probiotics and available through T&J Enterprises, Spokane, WA (509) 327-7670.

2.5 AMENDMENTS AND HERBICIDES

A. Soil Amendments: Use Organic soil amendments.

B. Fertilizer:

1. Organic based slow release commercial fertilizer complying with California fertilizer laws. Deliver fertilizer in original unopened containers that bear manufacturers certificate of compliance covering analysis which shall be furnished to Owner.

2. Fertilizer percentages of weight of ingredients and application rates shall be as recommended by soils testing results.

2.6 DRAINAGE

A. Planter Drain Rock: Drain rock shall conform with requirements for Gravel Backfill for Drains (Type 26 Aggregate) as specified in WSDOT Standard Specifications.

B. Filter Fabric: Non-woven, needle-punched, geotextile filter sheet manufactured for separation applications and made of non-rotting polypropylene fibers to prevent particles from washing through the system.

1. Performance:

Property	Test Method	Performance
Weight	ASTM D-5261	4 oz/sy
Tensile Strength	ASTM D-4632	105 lbs
Elongation @ Break	ASTM D-4632	50%
Thickness	ASTM D-5199	70 mils
Mullen Burst*	ASTM D-3786*	230 psi
Puncture Strength*	ASTM D-4833*	65 lbs
CBR Puncture	ASTM D-6241	305 lbs

Trapezoidal Tear	ASTM D-4533	45 lbs
Apparent Opening Size	ASTM D-4751	70 US Sieve
Permittivity	ASTM D-4491	2.00 Sec-1
Permeability	ASTM D-4491	0.55 cm/sec
Water Flow Rate	ASTM D-4491	160 g/min/sf
UV Resistance @ 500 Hours	ASTM D-4355	70%

Basis of design: U. S. Fabrics #US 105NW

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive planting soil for compliance with requirements and conditions affecting installation and performance.

1. Verify that subgrades are at proper elevation and will accommodate all required materials to required depths. Do not proceed with soil preparation until deficiencies are corrected.

2. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting areas.

a. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination and replace with new planting soil.

3. Unsatisfactory subgrade percolation:

a. If percolation rates determined during pre-installation testing are equal to or less than one inch per hour, remedial steps may need to be taken. The Contractor and Landscape Architect shall discuss remediation techniques, to include auguring drain holes in the subgrade and backfilling with sand.

1) Depth and spacing of augured drain holes shall be determined based on geotechnical reports, observed conditions and discussions between the Landside Architect and Contractor.

b. Retest percolation rates after drainage holes are installed.

c. If unsatisfactory drainage conditions persist, consult with Landscape Architect on installation of underdrainage system to correct issue.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION

A. Soil Protection:

1. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

2. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Erosion control: Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
   a. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
4. Protect planting from compaction after subgrades have been loosened and soils have been installed, amended and prepared

3.3 SUBGRADE PREPARATION

A. Remove all construction debris and extraneous matter from planting areas.

B. Eradicate unwanted vegetation.

C. On-Grade Areas:

1. Loosen subgrade of planting areas to a minimum depth 8 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish and other extraneous matter and legally dispose of them off Owner's property.

D. Notify Landscape Architect for Subgrade Preparation Review.

3.4 INSTALLATION OF PLANTING SOIL

A. Place the first lift of planting soil. Lifts shall not exceed eight inches in depth. Mix.

B. Level the planting soil.

C. Walk-through or roll with hand roller the placed planting soil to remove air pockets and settle the soil. Do not compact greater than 80 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Wheeled vehicles or equipment is not permitted on newly-placed planting soil.

D. Check placed soil for compaction with a penetrometer or densitometer or similar.

E. Place subsequent lifts of planting soil. Compact through each lift prior to placement of subsequent lift. Notify Architect for Planting Soil Placement Review.

1. Install planting soil so that there is approximately 3” depth below the finished grade elevation. Place enough soil to meet finished grades within specified tolerances and allow for settlement.

F. Install 3” depth compost over the planting soil and rake into the top planting soil surface at least 3 inches.

G. Notify Landscape Architect for Planting Soil Placement Review.

H. Spread Endomycorrhizal Fungi at all planting and seeded areas at manufacturer’s recommended rates immediately prior to planting.

3.5 INSTALLATION OF LIGHTWEIGHT SOIL

A. Ensure underlying roof components and anchoring systems have been installed and accepted by Owner prior to the installation of planter growing medium.

B. Ensure that underlying roof components have been installed and accepted by Owner prior to the installation of the planter growing medium. Ensure roof drain test has been conducted and approved by Owner.

C. Protect roof drains during the installation of the planter growing medium layers to avoid contamination or clogging of drainpipes.

D. Install drainage and insulation components.

E. Install filter fabric

F. Place Planter Growing Medium directly on the separation fabric/drainage mat and level the surface evenly.

G. Place soil in lifts no greater than 6 inches and repeat procedure until soil has been compacted within 1 inch of final grade. The remaining soil shall be loosely placed at 1 inch greater than final grade and hand compacted.

H. Compact with a hand held, non-mechanical tool to achieve a uniform growing medium compaction.

1. Compress the growing medium to a degree where full exposure of body weight on one foot does not further reduce depth.

2. Mechanical compactors including plate compactors are not acceptable because they can over compact the media and can damage the underlayment.

3. Proper compaction is crucial to avoid loss of volume and to maintain a healthy root environment.

I. Soil Settlement: Water the planter soil to ensure proper compaction and to remove air pockets. Provide additional material as required to achieve the grade indicated within the planter.

J. After installation of Planter Growing Medium, protect surface from wind erosion by installing temporary erosion control mats until plant material is installed.

3.6 REMOVE FROM PLANTING AREAS

A. All Planting Areas: Remove roots, plants, weeds, sod, stones larger than 1-inch in any dimension, clods, pockets of coarse sand, construction debris and other extraneous materials harmful to plant growth.

3.7 FINISH GRADING

A. Grade areas, lightly roll and rake, resulting in a smooth, uniform surface plane with loose, uniformly fine texture. Provide positive drainage at all planting areas, except at bioretention planters and where shown. Crown all planting areas at center or slope grades away from buildings unless otherwise shown. Ensure that grades are as shown after light rolling and natural settlement.

B. Planting Areas:
   1. Rake, remove ridges, and fill depressions to meet finish grades and profiles shown.
   2. Finish grade planted areas at contact points with paving or curb as shown.

C. Eradicate unwanted vegetation and restore planting areas if eroded or otherwise disturbed after finish grading.

D. Notify Architect for Soil Preparation and Finish Grading Review.

3.8 MAINTENANCE

A. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

B. Do not apply any herbicide or pesticide in the presence of children. Prevent children from accessing the garden during manufacturer’s prescribed waiting period following application.

3.9 CLEANUP AND PROTECTION

A. During soil preparation, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect planting soils from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damage or disturbance.

3.10 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329115

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following items:

1. Plants.
2. Amendments, Fertilizers and Anti-desiccant.
3. Tree Stabilization.
4. Mulch.
5. Root barrier.

B. Related Sections:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 329115 “Soil Preparation” for subgrade preparation, planting soils, and soil amendments.

1.2 DEFINITIONS

A. Backfill: The earth or topsoil used to replace or the act of replacing earth or topsoil in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

E. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

F. Finish Grade: Elevation of finished surface of planting soil.

G. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and

molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

H. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

I. Planting Area: Areas to be planted.

J. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

K. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

1.3 SUBMITTALS

A. Qualification Information: For qualified landscape Installer that meets the requirements herein and 1.4.A. Submit a list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Schedule and Work Plan: Submit detailed schedule and work plan one week prior to landscape preconstruction meeting. Indicate:

1. Start and finish dates of planting activities, including layout, soil preparation, and delivery of plant material from nursery sources, excavation and installation. If planting work is being installed in phases, submit plan with definable areas outlined and keyed and provide schedule for planting work within each area.

2. Proposed watering schedule and rates to rates to establish planting areas until acceptance.

3. Proposed weed management plan for planting areas through Final Acceptance.

4. Once accepted, if there are delays, revise and resubmit the Schedule for acceptance, and include documentation of reasons for delays and the revised dates.

C. Plants:

1. Schedule of Plant Sources, submit within 30 days of bidding:

a. Include botanical names, quantities, sizes, where plants were grown, their genetic stock (describe provenance).

b. For each plant indicate source nursery. Provide name of nursery, location of nursery address, contact name, address, phone, email.

c. Submit immediate notice of any supply difficulties and substantiate if any material specified is not obtainable including copies of supplier’s correspondence.

d. Plant substitutions: Plant substitutions will not be permitted unless the Contractor furnishes the Architect with written evidence from no less than three nurseries that the plants specified are not obtainable. Plant substitution requests shall be submitted no later than 90 days prior to landscape preinstallation meeting.

2. Representative Photos:
    a. Format: Color digital photographs of each required species and cultivar on plant schedule. Take photographs from an angle depicting true size and condition of the typical plant to be furnished.
    b. Range and number of photos: Each size clearly showing the full range of variations between the sizes. Include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished in each size.
        1) Trees: include images of tree row with scale figure, single tree with scale figure.
        2) Shrubs and ground covers: include image of plant groupings in nursery and sample single plant.
    c. Scale: Include a measuring device in each photograph.
    d. Background: Ensure form and condition of plant is clear from background.
    e. Label: Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery, date photograph was taken
3. Delivery, Storage and Handling Plan: Submit two weeks prior to landscape pre-construction meeting the proposed Delivery, Storage and Handling Plan. Indicate:
    1) Method of transportation to the Project Site.
    2) Proposed location for on-site plant holding.
    3) Water Source.
    4) Protection measures during seasonal variations in conditions.

D. Product Data: Submit manufacturer's printed product data for the following products:
1. Amendments
2. Organic Fertilizer
3. Anti-desiccant
4. Mycorrhizal Fungi Inoculum
5. Mulches: Organic mulch
6. Tree Stabilization Materials
7. Root barrier

E. Samples for Verification: Submit product data and samples together for each of the following:
1. Mulch: Submit one-gallon sample of mulch, typical of the lot of material to be furnished, in labeled, sealed plastic bags, including source:
    a. Organic Mulch.

F. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

G. Tree Pit Drainage Test Report:

1. Submit a report on the drainage of standing water in all tree pits. Fill each tree pit with 4 inches of water. Monitor tree pit four hours later and record water level. Tree Pit Drainage Test shall be overseen by Owner's Representative. Indicate in report all pits that do not fully drain in 4 hours. For tree pits not fully draining within the indicated time, Contractor to repair subgrade to provide adequate drainage per Section 329115 Soil Preparation. Owner's Representative to advise if further modifications will be required.

H. Maintenance Instructions: Recommended procedures to be implemented by Owner for maintenance of plants during a calendar year. Submit before Planting Completion.

I. Warranty: At Planting Completion, submit certification documentation of special warranty

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 - Quality Requirements.
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State licensed, commercial

B. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

C. Notification for Review: Notify Architect minimum five (5) days in advance of each the following review points:

1. Plant Materials:
   a. Tree Review: At nursery or holding area, prior to delivery to site.
   b. Other Plant Material Review: At nursery, holding area or project site.
   c. Landscape Architect may review plant materials either at nursery, holding area or site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to review trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected plant materials immediately from Project site.
2. Tree Layout Review: Prior to installation of trees.

3. Layout Review: Prior to installation of plant materials.
4. Sample Planting Review: After an initial planting of 50 square feet.
5. Punch List Review.
6. Planting Completion Review.
7. Warranty Review: Two weeks prior to end of Warranty Period.

D. Preinstallation Conference: Conduct conference at Project site. Discuss:

1. Schedule and Phasing.
2. Required Reviews.
3. Submittals.
4. Coordination with Irrigation Work.
5. Storage on Site.
6. Tree Protection

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 016000 – Product Requirements.

B. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Plant Delivery: Notify Architect at least 5 days in advance of delivery of plant materials and submit an itemized list of the plants in each delivery.

1. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
   a. Handle planting stock by root ball.

b. Set balled stock on ground and cover ball with soil, compost, or other acceptable material.

c. Set plants so that no branches are in contact with the ground.

d. Do not remove container-grown stock from containers before time of planting.

e. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

2. Plant materials damaged in any way shall be removed for the site and replaced

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of planting areas and adjacent construction by field measurements before proceeding with planting work. Notify Architect if discrepancies exist between plans and actual conditions.

B. Planting Restrictions: Do not plant during the following conditions unless approved.

1. Cold weather: When ambient temperature is below 35 degrees F

2. Hot weather: When temperature exceeds 90 degrees F

3. Wet weather: When soil becomes saturated

4. Windy weather: When wind velocity exceeds 30 mph

C. Warranty Inspection: During warranty period visit the site and inspect the work of this section quarterly.

1. Report in writing to Architect. Notify of any observed unsatisfactory growing conditions or maintenance practices requiring attention and propose solutions.

2. In the absence of such communications, perform all warranty work regardless of cause of failure.

D. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.

b. Structural failures including plantings falling or blowing over.

c. Faulty performance of tree stabilization, edgings and tree grates.

d. Deterioration of materials beyond normal weathering.

2. Warranty Period from Date of Substantial Completion:

a. All Plant Materials: 12 months.

3. Include the following remedial actions as a minimum at end of warranty period:
    a. Replace plants that are more than 25 percent dead, in unhealthy condition, not exhibiting satisfactory growth, that appear to be a different species or variety than specified or do not match adjacent plants by same name.
    b. Reset plant materials that have settled or become un-set.
4. Provide new warranty for replaced plant material for period equal to original warranty period, beginning from date of replacement.

1.7 MAINTENANCE

A. Maintenance for Plant Materials: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue for 30 days after Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANTING SOIL

A. See Section 329115 “Soil Preparation”.

2.2 PLANT MATERIAL

A. General: Furnish nursery-grown plants as indicated in Plant Schedule on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, weeds, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
    1. Trees will be rejected that have damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; trunks that are not uniformly tapering; or with stem girdling roots.
    2. Deciduous tree branching height, unless otherwise shown:
        a. 1.5” caliper: 4-6’ height
        b. 2” caliper: 5-7’ height
        c. 3” caliper: 6-8’ height
    3. Coniferous tree branching height: Furnish coniferous trees full, even branching; lowest branches within 12” of ground level.
    4. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Ensure that root flare is visible before planting.

D. Furnish balled and burlapped stock with biodegradable burlap, current season's crop.

E. Furnish containerized plants with healthy, well-established roots that reach to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container.

F. Ensure that plants are acclimated to outdoor conditions before delivery.

G. Labeling: Label for Plant Material Review as least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus, species and cultivar. Where two or more similar species or cultivars are provided, label each plant.

2.3 AMENDMENTS, FERTILIZERS, AND ANTI-DESICCANT

A. Soil Amendments and Fertilizers:

1. Use only organic soil amendments and fertilizers packaged in new, waterproof, non-overlaid 80-pound bags clearly labeled as to weight.

2. Fertilizer to be commercial grade, containing not less than 10 percent Nitrogen, 6 percent phosphorous and 4 percent potash by weight of ingredients.

B. Mycorrhizal Fungi Inoculum:

1. Endo/Ecto Mycorrhizal Fungi: Dry, granular mycorrhizal inoculum containing:

a. 4 species of endomycorrhizae, 20,000 propagules per lb.

b. 7 species of ectomycorrhizae, 110 million propagules per lb.

c. 2 species Trichoderma

d. Biostimulant package

2. Approved product: MycoApply Granular Endo, by Mycorrhizal Applications, Inc.

a. Available from: Rocky Mountain Bio Products, http://www.rockymtnbioproducts.com/contact_us.htm

b. Approved equals: MycoGrow Gel as manufactured by Fungi Perfecti, Olympia, WA, (800) 780-9126; Mycorrhizal Landscape Inoculant as manufactured by BioOrganics, Santa Monica, CA, 1-888332-7676; or Biovam as manufactured by Brock Probiotics and available through T&J Enterprises, Spokane, WA (509) 327-7670.

C. Anti-desiccant:

1. Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

2. Wiltpruf as manufactured by Wiltpruf Products, Inc., PO Box 4280, Greenwich, CT 06830, (203) 531-4740; Moisturin as manufactured by GSI Horticultural, 141 NW Greenwood, St. 200, Bend, OR 97701, (541) 383-0222 (www.gsihorticultural.com); or Vapor Guard as manufactured by Miller Chemical & Fertilizer Corp., PO Box 333, Hanover, PA 17331, (717) 632-8921 www.millerchemical.com), or approved equal.

2.4 TREE STABILIZATION MATERIALS

A. Tree Stakes and Tree Ties for trees

1. Upright Stakes: (2) Treated 2” diameter lodgepole pine dowel tree stakes (8’-0” length)
2. Flexible Ties: “Chainlock” or equal tree tie material (1” size)

2.5 MULCH

A. Provide organic wood mulch free from deleterious materials and suitable as a top dressing of planting areas and consisting of the following:

1. Size Range: 1-1/2-inch minus
2. Color: Natural
3. Basis-of-Design: Medium dark Fir/Hemlock bark mulch, or approved equal

2.6 ROOT BARRIER

A. Black, injection molded or extruded modular panels 18 inches high (deep), 80 mils thick and composed of 30% recycled materials.

B. Compliant with City of Seattle Standards Specifications item 9-14.17.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid or construction waste, trash, debris, stones larger than one inch in diameter or length, has been deposited in soil within a planting area.
2. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil in accordance with Section 328300 – Soil Preparation.
3. Verify that final grades have been established, and that foreseeable plant growth will not interfere with previously completed work, especially underground utilities.
4. Verify that all protection board and membranes are in place.
5. Verify that roof waterproofing membrane has been tested to ensure that there are no leaks, and continually protected after this testing.

6. If areas of membrane have been left exposed, waterproofing must be retested prior to installation of overburden.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PLANT MATERIAL REVIEW

A. Notify Architect for Plant Material Review prior to planting any plant materials.

3.3 TREE STAKING AND LAYOUT REVIEW

A. Notify Landscape Architect for Tree Layout and Layout Reviews.

B. Staking and Flagging Layout:

1. Tree Staking: Stake individual tree locations as indicated in drawings.

2. Outlines of Planting and Edging Areas: Flag or paint edges of planting areas.

3. Individual shrub and ground cover layout: place pots in locations laid out for review by Landscape Architect. After approval, commence with planting.

C. Adjust locations when requested.

3.4 EXCAVATION FOR PLANT MATERIALS

A. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings. Notify Architect for Layout Review.

B. Planting Pits: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit glazed or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for all trees.

2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

5. Maintain supervision of excavations during working hours.

6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

C. Subsoil removed from excavations may not be used as planting soil.

D. Obstructions: Notify Architect if unexpected water, rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

E. At approved, at-grade staked tree locations, drive Anchors and set anchor engagement with soil per manufacturers' recommendations. Connect ratcheting tie-downs to steel wire loops connected to Anchors.

3.5 PLANT MATERIAL INSTALLATION

A. Notify Landscape Architect for Sample Planting Review, after an initial planting of 50 square feet.

B. Perform Soil Settlement Test and Tree Pit Drainage Tests after soil preparation and prior to planting. Submit Settlement Test and Tree Pit Drainage Test Reports to Architect prior to tree planting.

C. Before planting trees:
1. Verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil from the root ball in a level manner to where the top-most root emerges from the trunk. After soil removal to expose the root flare, re-measure root ball to ensure that root ball still meets size requirements.

2. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

D. Apply anti-desiccant to trees and shrubs as needed using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again two weeks after planting.

E. Set plant materials plumb and in center of planting pit with tree root flares raised 3-inches above and shrub crowns raised 1½-inches above adjacent finish grades as shown.

1. Use planting soil for backfill of type designated for each particular planting area.

2. Ecto/Endo Mycorrhizal Fungi: Broadcast dry product uniformly over prepared surface of planting holes at manufacturer's recommended rates.

3. Balled and burlapped stock:

a. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.

b. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill.

c. Place loop of webbing loosely around trunk sized to allow no contact with trunk but half rootball diameter. Loop tie-down straps through webbing at three points per

detail and tighten tree anchorage system until rootball is secure but not damaged and webbing loop is not in contact with trunk.

d. Continue backfilling process. Water again after placing and tamping final layer of soil.

4. Container-grown stock:

a. Carefully remove root ball from container without damaging root ball or plant.

b. Score rootballs ½ inch depth in 3 places.

c. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill.

d. Continue backfilling process. Water again after placing and tamping final layer of soil.

e. Unless otherwise shown, plants are triangular spaced and in even rows.

F. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

G. Cleaning: Remove all plant containers from the site immediately after planting and thoroughly clean all areas at the close of each day's planting.

H. Labels: Remove all nursery plant labels upon Substantial Completion.

3.6 PRUNING

A. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

3.7 TREE ANCHORAGE

A. Install tree anchorage per manufacturer's written direction.

3.8 PLANTING AREA MULCHING

A. Install mulch at all planting areas and other areas indicated within 24 hours of planting.

1. Trees and Tree-like Shrubs in Tree Pits: Apply mulch of 3-inch average thickness, 36-inch diameter, around trunks or stems. Do not place mulch within 3 inches of trunks or stems.

2. Mulch in Planting Areas:

a. Apply mulch over entire surface of planting area and other areas shown.

1) Organic Mulch: 3-inch depth.

b. Finish grade of Mulch: 1/2-inch below adjacent finish grades as shown. Do not place mulch within 3-inches of tree trunks or 1½-inch from shrub stems.

3.9 FILTER FABRIC

A. Apply filter fabric as indicated in drawings.

3.10 ROOT BARRIER

A. Install as shown in drawings and per manufacturer's specification.

1. Position top of root barrier flush with the finished grade unless the root barrier is covered by a tree grate, covered by mulch, or out of pedestrian circulation routes, then the top barrier must be installed 1/2 inch to 9/16 inch above finished grade.
2. Panels must be joined with locking strips or integral male/female sliding locks. Locking mechanism must have a close tolerance to restrict slippage between panels.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.
5. Barriers must be installed with root deflectors facing inward.

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. 3 to 6 months after installation of plant materials, test soil and apply fertilizer at planting areas as recommended by soil testing laboratory. Adjust timing as required.

C. Replace mulAch materials damaged or lost in areas of settling or other processes.

D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.12 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion , remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.13 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.14 PLANTING COMPLETION AND WARRANTY REVIEW

A. Coordinate reviews for Substantial Completion and Warranty Review.

B. Upon Architect’s approval of Substantial Completion, the Warranty Period shall begin.

END OF SECTION 329300

SECTION 329451 –SUSPENDED PAVEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Suspended pavement system for planting and paving, including assemblies and related accessories:
   1. Other materials including, but not limited to, geotextile, geogrid, aggregate, subbase material, backfill, root barrier, Water and Air System, and planting soil.

1.2 DEFINITIONS

A. Aggregate Base Course: Aggregate material between the paving and the top of the soil cell deck below, designed to distribute loads across the top of the deck.
B. Aggregate Subbase: Aggregate material between the bottom of the soil cell base and the compacted subgrade below, designed to distribute loads from the soil cell bases to the subgrade.
C. Backfill: The earth used to replace or the act of replacing earth in an excavation beside the soil cell system to the excavation extents.
D. Finish Grade: Elevation of finished surface of planting soil or paving.
E. Soil Cell: One assembled unit made up of one base, six post assemblies, and 1 soil cell deck.
F. Soil Cell System: Two or more soil cells used in combination with each other and with required accessories.
G. Walk-Through Compaction: A process for light compaction of soils by walking through the soil following placement. Walk through compaction shall result in 75 to 85 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not exceed root limiting compaction for the given soil type.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Prior to installation of the suspended pavement system and associated Work, meet with the Contractor, soil cell system installer and their field supervisor, manufacturer's technical representative, the Architect, the Owner at the Owner's discretion, and other entities concerned with the soil cell system performance.
   1. Provide at least 72 hours advance notice to participants prior to convening preinstallation conference.
   2. Introduce and provide a roster of individuals in attendance with contact information.
   3. The preinstallation conference agenda will include, but is not limited to the review of:
      a. Required submittals both completed and yet to be completed.
      b. The sequence of installation and the construction schedule.
      c. Coordination with other trades.
      d. Details, materials and methods of installation.
      Review requirements for substrate conditions, special details, if any, installation

procedures.

1) Installation layout, procedures, means and methods.

Mock-up requirements.

1.4 ACTION SUBMITTALS

Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:
Submit results of compaction testing.
1. Include analysis of bulk materials including soils and aggregates, by a recognized laboratory.

B. Manufacturer's Report: Submit manufacturer's letter of review and approval of the Project, including Drawings and Specifications, Addenda, Clarifications and Modifications, and for compliance with product installation requirements.

C. Qualification Data: For manufacturer and Installer.

D. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
A manufacturer with not less than 100 soil cell systems in-place, each system in use for not less than 7 years, confirming durability and longevity of the system.
1. A manufacturer with documented written approval of their product for use as a stormwater treatment device by a minimum of 3 governmental jurisdictions.
2. A manufacturer with an established and demonstrated utility service and repair process, including written procedure and photographs demonstrating work.
3. A manufacturer with a published operating and maintenance manual.

B. Installer Qualifications:
A qualified installer with not less than 5 years of successful experience installing soil cell systems or related products and materials, and whose work has resulted in successful installation of underground piping, chambers and vault structures, planting soils, and planter drainage systems of a similar scope and scale in dense urban areas.
1. Employs a full-time supervisor with not less than 5 years of successful experience and present at the Project Site when Work is in progress. Utilize the same field supervisor throughout the Project, unless a substitution is submitted and approved in writing by the Architect.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
Size and Extent: Minimum of 100 sq. ft. (10 sq. m.) in area and including the complete soil cell system installation with subbase, aggregate subbase, drainage installation, soil cell decks, posts, and bases, base course aggregate, geotextile, geogrid, backfill, planting soil, and necessary accessories.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Suspended Pavement System: Protect suspended pavement system components from damage during delivery, storage and handling.
Store components on smooth surfaces, free from dirt, mud and debris. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week.
1. Perform handling with equipment appropriate to the size (height) of soil cells and site conditions; equipment may include, hand, handcart, forklifts, extension lifts, or small cranes, with care given to minimize damage to soil cell bases, posts, decks and adjacent assembled soil cells.

B. Packaged Materials: Deliver packaged materials in original, unopened containers indicating weight, certified analysis, name and address of manufacturer, and indication of conformance with State and Federal laws, if applicable. Protect materials from deterioration during delivery and while on the Project site.
Do not deliver or place backfill, soils, or soil amendments in frozen, wet, or muddy conditions.
1. Provide protection including tarps, plastic and/or matting between bulk materials and finished surfaces sufficient to protect the finish material.
2. Bring planting soil to the site using equipment and methods that do not overly mix and further damage soil peds within the soil mix.

C. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the Project limits as needed.

1.8 FIELD CONDITIONS

A. Existing Conditions: Do not proceed with Work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

1.9 WARRANTY

A. Special Warranty:Manufacturer's standard form in which manufacturer agrees to repair or replace materials with defects in materials and workmanship within specified warranty period.
Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SUSPENDED PAVEMENT SYSTEM

A. Modular, structural soil cell system designed for growing healthy trees and providing stormwater management.
   1. Basis-of-Design System: Subject to compliance with requirements, provide the following:
      Stratavault 30 by CityGreen Urban Landscape Solutions.
B. Each soil cell shall be structurally-independent from all adjacent soil cells for incorporating utilities and other site features as well as for future repairs.
   1. Soil cells shall be capable of supporting loads up to and including AASHTO H-20 (United States) or CSA-S6 87.5 kN (Canada) when used in conjunction with approved pavement profiles.
   2. Soil cells shall be open on all vertical faces and horizontal planes and shall have no interior walls or diaphragms.
   3. Soil cells shall be capable of providing a large, contiguous, continuous volume of planting soil that does not inhibit or prevent the following:
      Placement of planting soil.
      a. Walk through compaction.
      b. Compaction testing of planting soil, once in place.
      c. Movement and growth of roots.
      d. Movement of water within the provided soil volume, including lateral capillary movement.
      e. Installation and maintenance of utilities placed within, adjacent to, or below the soil cell.
C. Soil cells shall be able capable of being filled with a variety of soil types and soils that include peds 2 inches or larger in diameter as is appropriate for the application, location of the installation, and tree species.

2.2 MATERIALS

A. Suspended Pavement System Components:
   1. Stratavault Foot Plate
   2. Stratavault Module
   3. Stratavault Bridge
   4. Stratavault Connector
   5. Statavault Grate
B. Materials and Fabrication:
   Bases and Posts: 100% recycled Polupropylene (PP).
C. Root Barrier: As specified in Section 329300 "Plants."
D. Water and Air System: Used as a standalone system or in conjunction with the soil cell, the water and air system enables water and air to be directly added to tree roots and the surrounding soil system.
   Product: CityGreen Aeration Pipes
E. Geogrid: Net-shaped woven polyester fabric with PVC coating, uniaxial or biaxial geogrid,

inert to biological degradation, resistant to naturally occurring chemicals, alkalis, and acids; used to provide a stabilizing force within soil structure as the fill interlocks with the grid.

1. Product: Filter Grid 3030 by CityGreen

F. Geotextile: composed of high tenacity polypropylene yarns which are woven into a network such that the yarns retain their relative position and is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

2.3 RELATED MATERIALS

A. Wood Blocking: Nominal dimensioned untreated lumber used for spacing assembled soil cells.

B. Aggregate Subbase (Below Soil Cell Base):
Aggregate meeting one of the following specifications:
Complying ASTM D1241, Type I, Gradation B; Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve. Sieve size and percent passing as follows:
1) 1-1/2 inches (37.5 mm); 100 percent passing.
2) 1 inch (25 mm);75 to 95 percent passing.
3) 3/8 inch (9.5 mm); 40 to 75 percent passing.
4) No 4 (4.75 mm); 30 to 60 percent passing.
5) No 10 (2 mm); 20 to 45 percent passing.
6) No 40 (425 µm); 15 to 30 percent passing.
7) No 200 (75 µm); 5 to 15 percent passing.
Local Department of Transportation (DOT) virgin aggregate that most closely meets the gradation of ASTM D1241.

C. Aggregate Base Course (Above Soil Cell Base): Same as aggregate subbase specified above unless indicated otherwise.

D. Backfill Material (Adjacent to Soil Cells): Clean, compactable, coarse grained fill soil free of organic material, trash and other debris, and free of toxic material injurious to plant growth

E. Planting Soil: As specified in Section 329113 "Soil Preparation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the conditions under which the suspended soil system is to be installed.
Carefully check and verify dimensions, quantities, and grade elevations.
1. Carefully examine the Drawings to become familiar with the existing underground conditions before digging. Verify the location of aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system.
2. Notify the Contractor and the Architect in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation.
3. Obtain written approval of changes to the Work prior to proceeding. Proceed with installation only after changes have been made and unsatisfactory conditions have been

corrected.

3.2 PREPARATION

A. Take proper precautions as necessary to avoid damage to existing improvements and plantings.
B. Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete soil cell system.
C. Coordinate installation with other trades that may impact the completion of the Work.

3.3 TEMPORARY PROTECTION

A. Protect open excavations and soil cell system from access and damage both when Work is in progress and following completion, with highly visible construction tape, fencing, or other means until related construction is complete.
B. Do not drive vehicles or operate equipment over the soil cell system until the final surface material has been installed.

3.4 EXCAVATION

A. General: Excavate to the depths and shapes indicated on the Drawings. Provide smooth and level excavation base free of lumps and debris.
B. Confirm that the depth of the excavation is accurate and includes the full section of materials required to place the subbase aggregate, soil cell, and pavement profile as indicated on the Drawings.
C. Over-excavate beyond the perimeter of the soil cell to allow for:
The extension of aggregate subbase beyond the soil cell layout as shown on the Drawings.
1. Adequate space for proper compaction of backfill around the soil cell system.
D. If unsuitable subgrade soils are encountered, consult the Owner's geotechnical consultants for directions on how to proceed.
E. If conflicts arise during excavation, notify the Architect in writing and make recommendations for action. Proceed with Work only when action is approved in writing.

3.5 SUBGRADE COMPACTION

A. Compact subgrade to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method, or as approved by the Owner’s geotechnical representative.
B. Do not exceed 10 percent slope for subgrade profile in any one direction. If the 10 percent slope is exceeded, contact manufacturer's representative for directions on how to proceed.

3.6 INSTALLATION OF GEOTEXTILE OVER SUBGRADE

A. Install geotextile over compacted subgrade. Lay geotextile flat with no folds or creases.
1. Install the geotextile with a minimum joint overlap of 18 inches (450 mm).

3.7 INSTALLATION OF AGGREGATE SUBBASE BELOW SOIL CELL BASES

A. Install aggregate subbase to the depths indicated on the Drawings.
B. Extend subbase aggregate a minimum of 6 inches (150 mm) beyond the base of the soil cell layout.
C. Compact aggregate subbase to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method.
D. Do not exceed 10 percent slope on the surface of the subbase. Where proposed grades are greater than 10 percent, step the soil cells to maintain proper relation to the finished grade.

3.8 INSTALLATION OF SUSPENDED PAVEMENT SYSTEM BASE AND POSTS

A. Install the suspended soil system in strict accordance with manufacturer's instructions and as specified herein; where requirements conflict or are contradictory, follow the more stringent requirements.
B. Layout and Elevation Control:
Provide layout and elevation control during installation of the soil cell system to ensure that layout and elevations are in accordance with the Drawings.
C. Establish the location of the tree openings in accordance with the Drawings. Once the trees are located, mark the inside dimensions of the tree openings on the prepared subbase.
D. Locate and mark other Project features located within the soil cell layout (e.g. light pole bases, utility pipes). Apply marking to identify the extent of the soil cell layout around these features. Follow the layout as shown on the Drawings to ensure proper spacing of the soil cell bases. Refer to the Drawings for offsets between these features and the soil cells.
E. Check each soil cell component for damage prior to placement. Reject cracked or chipped units.
F. Place the soil cell bases on the compacted aggregate subbase. Start at the tree opening and place soil cell bases around the tree openings as shown on the Drawings.
G. Working from tree opening to tree opening, place soil cell bases to fill in the area between tree openings.
Maintain spacing no less than 1 inch (25 mm) and no more than 6 inches (150 mm) apart.
H. Follow the soil cell layout plan as shown on the Drawings.
I. Install soil cell bases around, over, or under existing or proposed utility lines, as indicated on the Drawings.
J. Level each soil cell base as needed to provide full contact with subbase. Adjust subbase material, including larger pieces of aggregate, so each base sits solidly on the surface of the subbase. Soil cell bases that rock or bend over any stone or other obstruction protruding above the surface of the subbase material are not allowed. Soil cell bases which bend into dips in the subbase material are not allowed. The maximum tolerance for deviations in the plane of the subbase material under the bottom of the horizontal beams of each soil cell base is 1/4 inch in 4 feet (6 mm in 1200 mm).
K. Anchor soil cell base with 2 anchoring spikes per base.
For applications where soil cells are installed over waterproofed structures, use wood blocking or similar spacing system consistent with requirements of the waterproofing system to maintain required spacing.
L. Install soil cell posts in configuration indicated and in accordance with manufacturer's instructions.
Attach posts to soil cell base.

3.9 INSTALLATION OF STRONGBACKS, GEOGRID, BACKFILL AND PLANTING SOIL

A. For suspended pavement systems that have a perforated drain line located inside or adjacent to the system, consult Drawings for layout and details for requirements.
B. Install strongbacks on top of the soil cell posts by snapping into place over installed posts prior to installing planting soil and backfill.
   Strongbacks are required only during the placement and compaction of the planting soil and backfill.
   1. Move strongbacks as the Work progresses across the installation.
   2. Remove strongbacks prior to the installation of the soil cell decks.
C. Install geogrid around the perimeter of the soil cell system where the compacted backfill and planting soil interface.
   Do not place geogrid between the edge of the soil cells and adjacent planting areas.
   1. Cut the geogrid to allow for a 6-inch (150-mm) overlap at the soil cell base and a 12-inch (300-mm) overlap at the soil cell deck.
   2. Provide a minimum 12-inch (300-mm) overlap between adjacent sheets of geogrid.
   3. Secure geogrid with cable ties below the top of the posts, along the post ridges.
D. Place the first lift of backfill material loosely around the perimeter of the soil cell system, between the geogrid and the sides of the excavation. Place backfill to approximately the midpoint of the soil cell post. Do not compact.
E. Place the first lift of planting soil in the soil cell system to approximately the midpoint of the soil cell post.
   Level the planting soil throughout the system.
   1. Walk-through the placed planting soil to remove air pockets and settle the soil.
      Lightly compact soils by walking through the soil following placement.
      a. Walk through compaction shall result in 75-85 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not exceed root limiting compaction for the given soil type.
F. Compact the first lift of backfill material, previously spread, to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method or in accordance with Project Specifications for hardscape areas, whichever is greater.
G. Add and compact additional backfill material so that the final finished elevation is at approximately the same level of the placed planting soil within the soil cells.
   Maintain the geogrid between the soil cell system and the backfill material at all times.
H. Place the second lift of backfill material loosely around the perimeter of the soil cell system, between the geogrid and the sides of the excavation so that the material is 2 to 3 inches below the top of the posts. Do not compact.
I. Place the second lift of planting soil inside of the soil cell to the bottom of the strongbacks. Walk through compact.

3.10 INSTALLATION OF IRRIGATION AND WATER HARVESTING SYSTEM

A. Install irrigation and water harvesting system in accordance with the Drawings and Specifications. Remove only the minimum number of strongbacks needed to accommodate the Work and reinstall them immediately upon completion to maintain alignment of posts.

3.11 INSTALLATION OF SOIL CELLS

A. Obtain final approval by the Architect of planting soil installation prior to installation of the soil cell decks.

B. Remove strongbacks, level out the planting soil, and immediately install decks over the posts below. Place deck over the top of the posts. Push decks down until the deck clips lock into the posts, snapping the deck into place.
C. Fold the 12 inches (300 mm) of geogrid onto the top of the decks.

3.12 FINAL BACKFILL PLACEMENT AND COMPACTION

A. Place and compact final lift of backfill material to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, such that the backfill is flush with the top of the installed deck. Do not allow compacting equipment to come in contact with the decks.

3.13 INSTALLATION OF GEOTEXTILE AND AGGREGATE BASE COURSE OVER THE DECK

A. Ensure geotextile meets the specifications in section 2.04 paragraph C.
B. Place geotextile over the top of the deck and extend to the edge of the excavation. Overlap joints a minimum of 18 inches (450 mm). Leave enough slack in the geotextile for the aggregate base course to push the geotextile down in the gaps in between the decks.
C. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics. Work the aggregate from one side of the layout to the other so that the fabric and aggregate conform to the soil cell deck contours.
D. Maintain equipment used to place aggregate base course completely outside the limits of the soil cell excavation area to prevent damage to the installed system.
E. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the soil cell manufacturer.
F. Compact aggregate base course(s) to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Utilize a vibration or plate compactor with a maximum weight of 800 lbs (362.87 kg).
G. Do not drive vehicles or operate equipment over the completed aggregate base course.

3.14 INSTALLATION OF CONCRETE CURBS AT TREE OPENINGS, AGGREGATE SUBBASE AND PAVEMENT ABOVE THE SOIL CELL SYSTEM

A. Place concrete curbs along planting areas and tree openings as shown on the Drawings to retain the aggregate base course from migrating into the planting soil.
B. When staking concrete forms (e.g. curbs around the tree openings), prevent stakes from penetrating the soil cell decks.
C. Turn down edge of concrete paving to the soil cell deck along the edges of tree openings or planting areas to retain the aggregate base course material.
D. When paving type is a unit paver or other flexible material, provide a concrete curb under the paving at the edge of the soil cell deck to retain the aggregate base course material at the tree opening.
E. Place paving material over soil cell system in accordance with the Drawings.
The soil cell system does not fully meet loading strength until the final paving is installed. Do not operate construction equipment on top of the soil cell system until paving installation has been completed.

F. Use care when placing paving or other backfill on top of soil cell system to prevent damage to the soil cell system or its components.

3.15 INSTALLATION OF ROOT BARRIERS

A. Install root barrier in accordance with manufacturer's installation instructions.

3.16 INSTALLATION OF PLANTING SOIL WITHIN THE TREE PLANTING AREA

A. Remove rubble, debris, dust and silt from the top of the planting soil within the tree opening that may have accumulated after the initial installation of the planting soil within the soil cells.
B. Install additional planting soil within the tree openings, to the depths indicated on the Drawings.
Use the same soil used within the soil cells for planting soil within the tree openings.
C. Compact planting soil under the tree root ball as needed to prevent settlement of the root ball.
D. Place trees in accordance with the Drawings.

3.17 PROTECTION

A. Keep construction traffic away from the limits of the soil cells until the final pavement profile is in place. The soil cell system does not fully meet loading strength until the final paving is installed.
Do not operate equipment directly on top of the soil cell system until paving installation has been completed.
1. Provide fencing and other barriers to prevent vehicles from entering into the soil cell area.
B. When the soil cell installation is completed and the permanent pavement is in place, limit traffic and construction related activities to only loads less than the design loads.

3.18 CLEAN UP

A. Perform clean up during installation and upon completion of the Work. Maintain the site free of soil, sediment, trash and debris. Remove excess soil materials, debris, and equipment from the site following completion of the Work of this Section.
B. Repair damage to adjacent materials and surfaces resulting from installation of this Work using mechanics skilled in remedial work of the construction type and trades affected.

END OF SECTION 329451

SECTION 329700 – VEGETATED ROOF ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Layered Extensive vegetated roof assemblies.
2. Vegetated Roof Plants.

B. Related Requirements:
1. Section 075400 “Single-ply membrane roofing" for roofing membrane, roof thermal insulation, and roofing system warranty.
2. Section 328400 "Planting Irrigation" for irrigation system.
3. Section 329300 "Plants" for trees, shrubs, and groundcovers.

1.2 DEFINITIONS

A. Captured Water: Water that is retained in the drainage layer of a vegetated roof assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.

B. Finish Elevation: Elevation of finished growing-media surface of planting area.

C. Planting Area: Areas to be planted.

D. Plant; Plants; Plant Material: Vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

E. Growing Medium: Manufactured, lightweight soil mixture that promotes good growing conditions for specific varieties of plants.

F. FLL Greenroof Guidelines: German Guidelines for Planning, Execution, and Upkeep of Green Roof Sites, Current Release. Worldwide acknowledged state-of-the-art technology as scientific foundation for successful and thriving green roofs.

G. FM Approval: Class Number 4477, Approval Standard for Vegetated Roof System.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Arrange, in accordance with Section 013100.

2. Attendance: Contractor, Installer, Owner Architect, vegetated roofing system and membrane roofing system manufacturer representatives, roofing installer, and those requested to attend.
3. Meeting Date: Minimum 2 weeks prior to beginning work of this Section, and to prior work of related Sections affecting work of this Section.
4. Agenda:

    a. Discuss drainage mats, root barriers, filter fabrics, slip-sheets, protection course, and other requirements of the roofing manufacturer.
    b. Verify water source and connections for irrigation system.
    c. Discuss post-installation care including establishment period and maintenance regimen.

1.4 ACTION SUBMITTALS

A. Product Data: For each vegetated roof assembly.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include material descriptions for each growing medium.
3. Include material descriptions for each plant type and characteristics.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and manufacturing locations for each system.

C. Shop Drawings: For each vegetated roof assembly.

1. Include plans, sections, and edger locations.
2. Indicate dimensions, weights, and loads.
3. Detail field assembly of components, depth of growing media, metal edger connections, and attachments to other work.
4. Indicate walkway pavers, geofoam fill, coordination with lighting and accessories.

D. Samples for Verification: For each of the following components of vegetated roof assembly:
1. Growing Media: 1-quart volume of each growing medium, in sealed plastic bags labeled with content and source. Each Sample shall be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
2. Drainage Mat: 12 by 12 inches.
3. Root Barrier: 12 by 12 inches.
4. Access Boxes: One in each size and color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer**.**

1. Written submittal by manufacturer indicating that installer is certified as qualified to perform the work of this section.

B. Product Certificates: For each type of manufactured product.

1. Manufacturer's technical data sheets for standard products.
2. Analysis of other materials by a recognized laboratory, according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Product Test Reports: For complete analysis of each growing medium, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency. Confirm that growing medium meets FFL Green Roof Guidelines.

D. Field quality-control reports.

E. Sample Warranty: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For vegetated roof assembly and plants, including a recommended maintenance plan with procedures for inspection and care during a calendar year. Submit before start of required warranty and maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified vegetated roof assembly Installer, approved, authorized, or licensed by vegetated roofing system provider, whose work has resulted in successful establishment of vegetated roofs.

1. Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when vegetated roof assembly work is in progress.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests.

C. Perform the following tests:

1. Electronic Leak-Detection Testing:

a. Testing agency shall test each deck area for leaks using an electronic leak-detection method that locates discontinuities in the roofing membrane.
b. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
c. Testing agency shall create a conductive electronic field over the area of roofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the roofing.

d. Testing agency shall provide survey report indicating locations of discontinuities if any.

2. Proceed with installation of vegetated roof assembly only after unsatisfactory conditions have been corrected.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and Federal laws if applicable. Store away from sources of ignition and extremely high temperatures. Avoid exposure to heat, sparks, and open flames.

B. Bulk Materials:

1. Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Store growing medium in a dry area, free of contaminants which may adversely affect the engineered blend, including weed seeds.
4. Accompany each delivery of bulk materials with product certificates.

C. Plant Materials:

1. Maintain health of plants as recommended by nursery guidelines prior to installation. Store vegetated planters and materials over plywood panels or protective sheeting on the roof.
2. Rolled sedum mats and stacked sedum tiles may be stored in a cool location, below 75 deg F (20 deg C), for a maximum of twenty-four hours. Do not leave plants in hot storage areas.
3. Provide water source for irrigating plants per manufacturer's recommendations until permanent irrigation system is in place.

D. Handle and store materials, and place equipment in a manner to avoid overloading roof structure or damaging roofing membrane.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when optimum results may be obtained. Install plant materials when temperatures are between 40 deg F (5 deg C) and 95 deg F (35 deg C), except as otherwise instructed by manufacturer. Do not install if extended freezing temperatures are expected or if ambient soil temperature is expected to remain below 50 deg

F (10 deg C). Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty for Vegetated Roof Assembly: Installer agrees to repair or replace components of vegetated roof assembly that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, ponding or prolonged wetness of growing medium caused as a result of failure of the assembly to properly drain.
   2. Warranty period: One year from date of Substantial Completion.

B. Special Warranty for Rooftop Plant Growth: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

   1. Foliage Cover: Planted materials shall growth to achieve and maintain at least 90 percent foliage cover over planting area commencing 24 months after planting, through the duration of this warranty.

   2. Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, neglect by Owner, or incidents that are beyond Contractor’s control.

   3. Warranty Period: From date of Substantial Completion as follows:

      a. Ground Covers and Perennials: One year.

   4. Include the following remedial actions as a minimum:

      a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
      b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
      c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

   5. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain vegetated roof assembly components, growing medium, plants, and accessories from single source from single manufacturer.

2.2 VEGETATED ROOF ASSEMBLIES

A. Layered Vegetated Roof Assembly: Layered assembly consisting of manufacturer's standard vegetated roof assembly components for installation over roofing system.

1. Basis-of-Design Product: Columbia Green Technologies; Layered Vegetated Roof System.

2. Growing Medium Depth: 6 inches (100 mm)
3. Assembly Weight: Maximum 43 lb/sq. ft., including vegetated roof system, growing medium and plants saturated with captured water, but not including weight of roofing system.

2.3 LAYERED VEGETATED ROOF ASSEMBLY COMPONENTS

A. Moisture-Retention Mat: Assembly manufacturer's standard water-retaining high-loft nonwoven geo-synthetic fabric manufactured from high tensile polyester fibers.

1. Retention Mat Depth, Nominal: 1 inch.

B. Drainage Layer: Assembly manufacturer's standard drainage layer formed from geotextile-faced, entangled plastic-filament layer. Drainage layer is faced with a spunbonded nondirectional weave synthetic filtration layer.

1. Drainage Layer Depth, Nominal: 0.375 inch.

C. Root Barrier: Roof assembly manufacturer's standard.

2.4 MANUFACTURED GROWING MEDIA

A. Growing Medium: Vegetated roof assembly manufacturer's lightweight, manufactured soil mixture designed for designated Planting Area.

1. Basis of Design Product: Columbia Green Technologies; Extensive Growing Medium.
2. General Condition at Time of Planting: Free of aggregates 1/2 inch or larger in any dimension; free of roots, plants, clods, pockets of sand, paint, building debris, oils, solvents, roofing materials, and other extraneous materials harmful to plant growth; free of weeds, disease-causing plant pathogens, and other undesirable organisms.
3. Maximum Media Density: ASTM E 2399, 80 lb/cu. ft. for growing-medium mixture.
4. Maximum Media Water Retention: ASTM E 2399, 35 to 65 percent by volume for growing-medium mixture at maximum media density per FLL Green Roof Guidelines.

2.5 PLANTS

A. Plants must be sourced or approved by Columbia Green Technologies for warranty coverage to apply. Choose from one of Columbia Green's standard mixes or create a custom mix to suit specific project needs. Contact Columbia green Representative for more information regarding

custom mixes for sedum tiles, cuttings, and pregrown trays. (503) 327-8723 or info@columbia-green.com.

B. Conform to Project landscape design requirements, recommendations of local horticulturalists, and requirements of authorities having jurisdiction, including Fire Marshal, for specific recommendations and regulations.

C. Planting Method:

1. Sedum Mats: 48 inch by 75 inch pre-vegetated sedum mat with minimum 85 percent plant coverage on an approximately 1/2 inch to 3/4 inch thick soil base of coconut fiber.

2.6 ACCESSORIES

A. Protection Board: As recommended by roofing-membrane manufacturer.

B. Root Barrier: Vegetated Roof Assembly Manufacturer’s standard

C. Access Boxes: Vegetated roof assembly manufacturer's aluminum drain boxes with removable, rigid covers for accessing drains, valves, and switches beneath the finish elevation of growing medium; secure each cover with four noncorrosive screws.

1. Size: 12 inches square by depth of vegetated roof assembly at each location.

D. Soil Retainer: Vegetated roof assembly manufacturer's extruded-aluminum edging.

1. Basis-of-Design Product: Columbia Green Technologies; Metal Perimeter Edging

2. Layered System Edger: Lightweight "L"-shaped edger with slotted wall crafted from durable aluminum.

a. Edger Height: 6.5 inch. X 5.5” Base
b. Color: Mill finish.

3. Method of Attachment, Layered System: Layered edger is held in place by the weight of the system. Connect adjacent sections with manufacturer's standard sliding connector at both the wall and the base.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine each area to receive vegetated roof assembly for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Verify that roof insulation over roofing membrane is in place, secure, and flush along all seams.
2. Verify that perimeter and other flashings are in place and secure along entire lengths where they will be covered by vegetated roof assembly.
3. Verify protection course over membrane roofing is in place and conforming to roofing manufacturer instructions, as inspected and accepted by roofing manufacturer's technical representative.
4. Verify leak testing and roof drainage test have been completed and approved by the owner’s representative.

B. Inspect growing medium.

1. Verify that no foreign or deleterious material or liquid, such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in growing medium within a planting area.
2. If growing medium is contaminated by foreign or deleterious material or liquid, remove growing medium and contamination and replace with new growing medium.

3.2 INSTALLATION, GENERAL

A. Protection Course: Cover roofing system with protection board if required by roofing manufacturer with butted and fully taped joints before roofing system is subject to vegetated roof assembly installation work.

B. Sweep with broom and then use air compressor to blow remaining dust and debris from substrate.

C. Install vegetated roof assembly according to manufacturer's written instructions.

3.3 LAYERED SYSTEM EDGER INSTALLATION

A. Install edger according to manufacturer's written instructions and details.

B. Install layered system edger at vegetated roof perimeter.

C. Abut lengths of edging neatly. Connect adjacent sections with manufacturer's sliding connector into channel at end of each section and both the wall and the base.

D. Curved or Corner Sections: Remove twist-and-snap tabs and form to desired angle or curve.

3.4 LAYERED SYSTEM PLACEMENT

A. Install layered system according to manufacturer's written instructions and details.

B. Drainage Layer: Unroll and place drainage layer parallel to slope. Abut sections of drainage layer. Overlap provided seams of attached filter fabric.

C. Water retention Mat: Unroll and place retention mat over filter fabric and drainage layer perpendicular to slope. Abut sections of mat, do not overlap materials.

D. Place growing medium or temporary ballast immediately after layered system installation to prevent movement due to weather and construction activities.

E. Small Plant Stabilization: Install erosion-control fabric over planting area to secure small plants according to manufacturer's written instructions.

F. Access Boxes: Install access box at each drain, valve, and switch and at locations shown on Drawings. Install top of boxes level with the finish elevation of growing medium.

3.5 GROWING MEDIUM PLACEMENT

A. Transport growing medium to roof using stabilized hoisting equipment, blower truck, or cranes.

B. Remove all debris on layered system prior to installing growing medium.

C. Distribute growing medium evenly throughout the system, removing ay temporary ballast measures.

3.6 PLANTING ON ROOF

A. Perform planting according to vegetated roof assembly manufacturer's written instructions.

B. Do not place growing medium or plants during frozen, wet, or muddy conditions.

C. Suspend spreading, grading, and planting operations during periods of excessive moisture until the moisture content in growing medium reaches acceptable levels to attain the required results.

D. Uniformly moisten an excessively dry growing medium that is too dusty or unworkable.

E. Pre-planted Vegetative Mat or Tile: Install in full contact with growing medium. Abut with adjacent mat or tile with no gaps or overlaps.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage roofing-membrane manufacturer's authorized service representative to provide full-time inspection of vegetated roof assembly installation and prepare inspection reports.

B. Correct deficiencies in work that do not comply with requirements.

C. Prepare test and inspection reports.

3.8 ADJUSTING

A. Make adjustments and alignments of metal edger as necessary to give a uniform and finished appearance.

B. Replace plant material that appears to be stressed or damaged.

3.9 CLEANING

A. Leave installations clean, premises free from debris and residue resulting from work of this Section.

B. Remove stains from adjacent surfaces with manufacturer's recommended cleaning agents.

3.10 PROTECTION

A. Protect vegetated roof assemblies from damage, including growing-medium contamination, due to operations of other contractors and trades. Repair or replace damaged vegetated roof assemblies.

3.11 MAINTENANCE SERVICE

A. Maintenance Service: Provide maintenance by skilled employees of vegetated roof assembly Installer approved by roofing-membrane manufacturer. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than the specified maintenance period.

1. Assembly and Plant Maintenance: During maintenance period, maintain plantings by pruning, cultivating, watering, weeding, fertilizing if necessary, mulching, restoring planting saucers, adjusting and repairing devices, resetting plants to proper elevations or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

    a. Replace growing medium that becomes displaced or eroded because of settling or other processes.
    b. Apply treatments as required to keep plant materials, planted areas, and growing medium free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
    c. Use only products and methods acceptable to roofing-membrane manufacturer.

d. Following maintenance period, instruct Owner and furnish written maintenance instructions as necessary for planting materials to develop and maintain healthy root structure.

2. Maintenance Period: 12 months from date of Substantial Completion.

END OF SECTION 329700

SECTION 331000 WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Furnishing and installing waterlines, gate valves, fittings, thrust blocking and new services.
2. Connections to existing water services.
3. Temporary connections.

B. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:

Section 310000 Earthwork

1.2 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)

DR 2016-01 Right-of-Way Opening and Restoration Rules. Seattle Transportation Director's Rule 2016-01, January 1, 2017.

Standard Plans City of Seattle Standard Plans for Municipal Public Works Construction, 2020 Edition (Standard Plans).

TCM Traffic Control Manual for In-Street Work, latest edition TCM).

Geotechnical Report: Project Geotechnical Report.

UPC The Uniform Plumbing Code (current edition, as adopted by City of Seattle).

IAMPO The International Association of Plumbing and Mechanical Officials Standards.

AWWA American Water Works Association Standards.

1.3 DIMENSIONS AND LAYOUTS

A. The Contractor will be responsible for furnishing, setting and marking all line location stakes. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work and shall be on site at all times when work requiring control is being performed, together with all necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at no additional cost to the Owner, for the purpose of verifying layout and certifying the accuracy of work on the site.

B. The Contractor is responsible for review of all City and Owner's records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all active utilities at Contractor's own expense.

C. The Contractor is to notify the Owner’s Representative immediately if underground utilities not shown on the Site Survey are encountered.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. 4 inch or larger pipe: Ductile iron pipe Class 52 per COS Section 9-30.1(1).

B. Fittings: Ductile iron fittings shall be per COS Section 9-30.2(1). All other fittings shall be per applicable portions of COS Sections 9-30.2, 9-30.6(3) and 9-30.6(5).

C. Pipe 3 inches and smaller in diameter; Copper tubing Type K, ASTMB88, annealed, unless indicated otherwise on plans. The tubing shall be coupled using flare-type compression fittings, conforming to the requirements of AWWA C800, minimum 150 psi working pressure.

D. All pipe shall be marked with the National Sanitation Foundation (NSF) seal and in accordance with ASTM and AWWA marking requirements which include but is not limited to the manufacturer's name and class of pipe. Pipe shall bear no evidence of interior or exterior extrusion marks. Pipe walls shall be uniform, smooth and glossy.

2.2 Conductive warning tape

A. Conductive warning tape shall be placed over all sewer, drainage, water and irrigation pipe. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6" wide x 4 mils thick. Tape Schedule:

Piping	Color	Wording
Domestic Water	Blue	Caution Domestic Water
Irrigation Water	Blue	Caution Irrigation Water

2.3 BEDDING AND BACKFILL MATERIAL

A. Bedding and backfill material shall be in accordance with Section 31 00 00.

2.4 VALVES

A. Gate valves shall conform to COS Sections 9-30.3. (All valves shall be of the same diameter as the pipe as shown on the plans unless otherwise specified.)

B. Flanges shall be faced and drilled, ASA Class 235, for use with full-face gaskets.

C. Valve boxes shall be in accordance with Section 9-30.3(5) of COS. Unless otherwise noted on the plans, valve boxes shall be installed on all buried valves. Provide cast iron extensions as necessary to fit site requirements.

2.5 THRUST BLOCKING

A. Portland Cement Concrete for thrust blocking shall be Class 5 (1-1/2) per COS Standard Plans and Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATIONS

A. Contractor shall note that Seattle Public Utilities shall install the new meters from the tap on the main up to and including the new meters. The Contractor shall coordinate installation with Seattle Public Utilities such that the project is not delayed.

B. Verify existing locations from the records of City of Seattle.

C. General:

1. All trenching shall conform to the Washington Administrative Code (WAC) 296-155 requirements for Excavation, Trenching and Shoring.

2. Trench excavation, foundation bedding, and backfill for water mains shall be in accordance with Section 310000.

D. Install pipe, fittings and appurtenances in accordance with the following Sections of COS: 7-11.1 through 7-11.3(6), and in accordance with manufacturer's instructions. Pipe deflection at joints shall be one half the manufacturer’s allowable amount.

E. Install valves in accordance with COS Section 7-12.

F. Install fire hydrants in accordance with COS Section 7-14.

G. Install thrust blocking in accordance with COS Section 7-11.3(13).

3.3 CONNECTIONS TO EXISTING SERVICES

A. Seattle Public Utilities shall make all connections to existing public water mains.

3.4 TESTING AND DISINFECTION

A. Contractor shall pressure test pipe in accordance with Section 7-11.3(11) of COS and AWWA C600.

B. Flushing and disinfection of water mains shall be in accordance with COS Section 7-11.3(12). Contractor shall provide and pay all costs for disinfection testing.

C. Contractor shall coordinate with the Seattle Fire Department for required thrust restraint inspections and witnessing of flushing, flow and pressure tests. Call 206-386-1443 to schedule SFD inspection. Minimum five days notice required prior to each test.

D. After disinfection, all contaminated water is to be disposed of into the sanitary sewer or neutralized prior to discharge into the storm drainage system. Flushing of the water mains shall be accomplished in such a manner as not to cause flooding or downstream property damage.

E. Any construction defects identified during testing shall be located and corrected at the Contractor's expense.

END OF SECTION 331000

SECTION 333000 SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Furnishing and installing sanitary sewer pipe, fittings, cleanouts, manholes and side sewers of the type and sizes designated in the plans and specifications.
2. Coordinate with City of Seattle and provide connections to existing public and private system.
3. Temporary connections.

B. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:

Section 33 10 00 – Site Clearing

Section 31 00 00 – Earthwork

Section 33 40 00 – Storm Drainage System

1.2 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

1. COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)
2. DR 2016-01 Right-of-Way Opening and Restoration Rules. Seattle Transportation Director's Rule 2016-01, January 1, 2017
3. City of Seattle Standard Plans Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans).
4. Requirements for Design & Construction of Side Sewers (Drainage & Wastewater Discharges) SDCI DR 4-2011, SDOT DR 2011-004
5. TCM Traffic Control Manual for In-Street Work, latest edition TCM).

6. DR10-2021 Construction Storm Water Control Technical Requirements Manual (July 2021)
7. Geotechnical Report: Project Geotechnical Report.

1.3 DIMENSIONS AND LAYOUTS

A. The Contractor will be responsible for furnishing, setting and marking all line location. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work and shall be on site at all times when work requiring control is being performed, together with all necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at no additional cost to the Owner, for the purpose of verifying layout and certifying the accuracy of work

B. The Contractor is responsible for review of all COS records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all active utilities at the Contractor's own expense.

C. The Contractor is to notify the Architect immediately of underground utilities encountered, which are not shown on the drawings or Owner's survey or record drawings.

D. All side sewers shall be installed by a Side Sewer Contractor registered with the City of Seattle.

E. Contractor shall obtain and pay for side sewer and street use permit(s) as required by the city.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC pipe shall conform to Section 9-05.12 of COS and shall be ASTM D3034, SDR 35, or better with rubber gasket joints.

B. Pipe with less than 18 inches of cover under paved areas shall be PVC Schedule 40. ASTM D 3034 SDR 35 or ASTM F 789.

C. Fittings for PVC pipe shall be injected molded tees or factory solvent cemented saddle tees and shall have sufficient strength to withstand handling and load stresses normally encountered.

2.2 CONDUCTIVE WARNING TAPE

A. Conductive warning tape required over all sewer, drainage, water, and irrigation pipe. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6" wide x 4 mils thick. Tape Schedule:

Piping	Color	Wording
Sanitary Sewer	Green	Caution Sanitary Sewer

2.3 FITTINGS, COUPLINGS AND JOINTS

A. Fittings shall be the same material as the pipe.

B. Tees on existing pipe and new connections to manholes shall be connected by core drilling and flexible connections.

C. Pipe to pipe connections shall be made with a flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by Romac, Caulder, or Fernco.

2.4 CLEAN-OUTS

A. Cleanouts shall conform to COS Std plans and Contract Documents. Size to match connecting pipe.

2.5 BEDDING AND BACKFILL MATERIAL

A. Backfill material shall be in accordance with Section 310000 and the details in the Plans.

B. Bedding material shall be in accordance with Section 310000 and the details in the Plans.

PART 3 - EXECUTION

3.1 COORDINATION WITH OTHER WORK

A. Verify location from the records of COS.

B. Re-use of existing side sewers

1. Record side sewers are noted in the contract documents- confirm locations and depths at the property line during site demolition.

2. Verify condition, depth and size of existing side sewers. Report this information to design team. If sewer locations, depth and size are useful to project, video inspect per sections M and P of the current Seattle Side Sewer Code (DR 4-2011)

3. Confirm ability to successfully line existing sewers with a pipe lining specialist.

4. If possible, line designated sewers and re-inspect lined sewers. Provide video documentation to owner and engineer for city documentation per sections M and P of the Side Sewer Code (DR 4-2011).

C. Before installation, Contractor shall make proper provisions for site sanitary sewer lines and avoid interference with installation of other work and/or other Contractors. Any changes caused by Contractor's neglect to coordinate work shall be made by Contractor at Contractor's expense.

D. Sanitary drawings and specifications shall be compared with drawings and specifications of other trades and any discrepancies between them reported to the Architect prior to installation of work.

3.2 TRENCHING AND PIPE LAYING

A. Excavation and preparation of the trench shall be in accordance with Section 310000. All trenching shall conform to the Washington Administrative Code (WAC) 296-155 and WISHA requirements for Excavation, Trenching and Shoring.

B. Excavation shall be made to alignment, elevation, grade and slope as indicated on the drawings.

C. Pipe Laying shall be in conformance with Section 31 00 00 and COS Section 7-17.3(2).

3.3 BEDDING AND BACKFILLING

A. Bedding and backfill shall be per Section 310000 and the details in the Plans.

3.4 PIPE CROSSINGS

A. Where pipe crossings are less than 6-inches clear, foam blocking shall be placed for separation and protection per manufacturer’s recommendations.

3.5 CLEANING AND TESTING

A. Cleaning and testing shall be in conformance with Contract Documents and Section 7-17.3(4) of COS.

3.6 AS-BUILTS

A. Document installed sanitary sewer conditions, locations and depths per city requirements.

B. Prepare and deliver to the inspector record drawings of installed sanitary system per City of Seattle requirements.

C. See: https://www.seattle.gov/dpd/publications/CAM/cam504.pdf

END OF SECTION 33 30 00

SECTION 334000 STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes but is not limited to the following:

1. Furnishing and installing storm sewer piping and fittings of the type and sizes designated in the plans and specifications.
2. Temporary connections.

B. Related sections

1. Coordinate related work specified in other parts of the Project Manual, including but not limited to the following:

Section 31 10 00 – Site Clearing
Section 31 00 00 – Earthwork
Section 33 30 00 – Sanitary Sewer System

1.2 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. The Contractor shall have one copy of the each of the following documents at the job site. The bidder in submitting a bid acknowledges that he is familiar with the documents named in References and that they are incorporated into this document by reference. The Standard Plans and Specifications apply only to performance and materials and how they are to be incorporated into the work. The legal/contractual relationship sections and the measurements and payment sections do not apply to this document.

1. COS City of Seattle 2023 Standard Specifications for Road, Bridge and Municipal Construction (COS)
2. DR 2016-01 Right-of-Way Opening and Restoration Rules. Seattle Transportation Director's Rule 2016-01, January 1, 2017
3. City of Seattle Standard Plans Standard Plans for Municipal Public Works Construction, 2023 Edition (Standard Plans).
4. TCM Traffic Control Manual for In-Street Work, latest edition TCM).
5. DR10-2021 Construction Storm Water Control Technical Requirements Manual (July 2021)
6. Geotechnical Report: Project Geotechnical Report.

1.3 DIMENSIONS AND LAYOUTS

A. The Contractor will be responsible for furnishing, setting and marking all line location stakes. A qualified layout engineer, surveyor, or technical specialist must be assigned to the Contractor's crew for this work and shall be on site at all times when work requiring control is being performed, together with all necessary equipment, supplies and instruments related thereto. This equipment and personnel must be available, at no additional cost to the Owner, for the purpose of verifying layout and certifying the accuracy of work on the site.

B. The Contractor is responsible for review of all COS records relative to the existing underground utilities. The Contractor is responsible for avoiding damage to these facilities and shall restore all active utilities at the Contractor's own expense.

C. The Contractor is to notify the Owner’s Representative immediately of underground utilities encountered, which are not shown on the drawings or Owner's survey or record drawings.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE

A. Concrete pipe 12" in diameter or larger shall be ASTM C-76, Class IV with rubber gasket joints.

B. Connections to manholes, catch basins and inlets shall be by mortar joint. Portland cement joints on pipe are prohibited.

2.2 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC pipe shall conform to Section 9-05.12 of COS and shall be ASTM D3034, SDR 35, or better with rubber gasket joints.

B. Pipe with less than 18-inches of cover shall be PVC Schedule 40, ASTM D 3034 SDR 35 or ASTM F 789.

C. Perforated pipe exterior to the building shall be a minimum of ASTM D-2729 PVC slotted as needed. Glue joints, smooth bore.

D. Connections to catch basins or manholes shall be by a GPK manhole adapter.

E. Fittings for PVC pipe shall be injected molded tees or factory solvent cemented saddle tees and shall have sufficient strength to withstand handling and load stresses normally encountered.

2.3 CONDUCTIVE WARNING TAPE

A. Conductive warning tape required over all sewer, drainage, water and irrigation pipe. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 6" wide x 4 mils thick. Tape Schedule:

Piping	Color	Wording
Storm Sewer	Green	Caution Storm Sewer

2.4 FITTINGS, COUPLINGS AND JOINTS

A. Fittings shall be the same material as the pipe.

B. Tees on existing pipe and new connections to manholes shall be connected by core drilling and flexible connections.

C. Pipe to pipe connections shall be made with a flexible gasketed coupling, adapter or coupling-adapter to make a watertight joint. Couplings shall be those manufactured by Romac, Caulder, or Fernco.

2.5 BEDDING AND BACKFILL MATERIAL

A. Backfill material shall be in accordance with Section 31 00 00 and the details in the Plans.

B. Bedding material shall be in accordance with Section 31 00 00 and the details in the Plans.

C. Perforated ASTM D-2729 PVC pipe shall be bedded with 1-1/2-inch washed rock with filter fabric cloth.

2.6 STORM DRAINAGE CLEANOUTS

A. Storm drainage cleanout shall be per Contract Documents.

2.7 TRENCH DRAINS

A. Aco, Zurn or other approved drain body to fit selected drain grate, see Metal Fabrication

2.8 MANHOLES, CATCH BASINS AND INLETS

A. Manholes, catch basins, and inlets shall be in conformance with Section 7-05 of COS.

B. Manhole lid shall be sealed when connected to combined sewer systems, without a P-trap.

1. Sealed lids shall include a gasketed seal between the lid and rim.
2. No open lifting holes in the lid
3. Sealed lifting pocket or hand hole for lifting the lid.

PART 3 - EXECUTION

3.1 COORDINATION WITH OTHER WORK

A. Verify location of existing utilities from the records of City of Seattle and on-site exploration.

B. Re-use of existing side sewers

1. Record side sewers are noted in the contract documents- confirm locations and depths at the property line during site demolition.
2. Verify condition, depth and size of existing side sewers. Report this information to the design team. If sewer locations, depth and size are useful to project, video inspect per sections M and P of the current Seattle Side Sewer Code (DR 4-2011)
3. Confirm ability to successfully line existing sewers with a pipe lining specialist.
4. If possible, line designated sewers and re-inspect lined sewers. Provide video documentation to owner and engineer for city documentation per sections M and P of the Side Sewer Code (DR 4-2011).

C. Before installation Contractor shall make proper provisions for site storm lines to avoid interference with installation of other work and/or other Contractors. Any changes caused by Contractor's neglect to coordinate work shall be made by Contractor at Contractor's expense.

D. Site storm drain drawings and specifications shall be compared with drawings and specifications of other trades and any discrepancies between the documents reported to the Architect prior to installation of work.

3.2 TRENCHING AND PIPE LAYING

A. Excavation and preparation of the trench shall be in accordance with Section 310000. All trenching shall conform to the Washington Administrative Code (WAC) 296-155 and WISHA requirements for Excavation, Trenching and Shoring.

B. Excavation shall be made to alignment, elevation, grade and slope as indicated on the drawings.

C. Pipe laying shall be in conformance with Section 31 00 00 and COS Section 7-17.3(2).

3.3 BEDDING AND BACKFILLING

A. Bedding and backfill shall be per Section 31 00 00 and the details in the Plans.

3.4 PIPE CROSSINGS

A. Where pipe crossings are less than 6-inches clear, foam blocking shall be placed for separation and protection per manufacturer's recommendations.

3.5 ADJUSTMENT OF MANHOLES CATCH BASINS AND SIMILAR STRUCTURES.

A. Adjustments shall be in conformance with Section 7-20.3 of COS.

3.6 CLEANING AND TESTING

A. Cleaning and testing shall be in conformance with Section 7-17.3(4) of COS.

3.7 AS-BUILTS

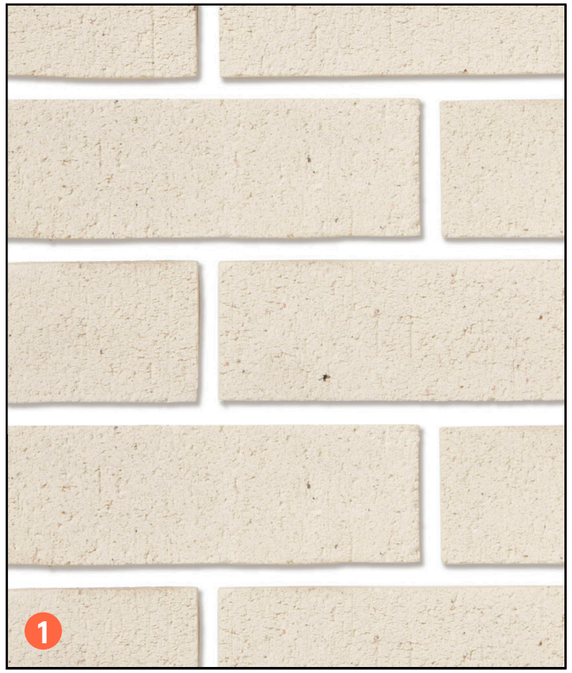
A. Document installed sanitary sewer conditions, locations and depths per city requirements.

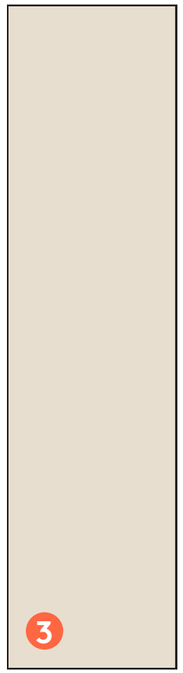
B. Prepare and deliver to the inspector record drawings of installed sanitary system per City of Seattle requirements.

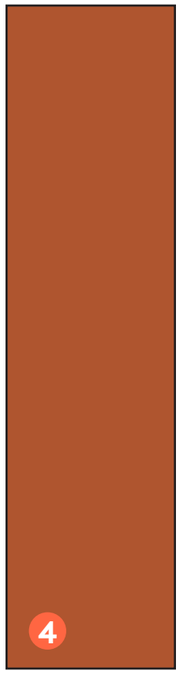
C. See: https://www.seattle.gov/dpd/publications/CAM/cam504.pdf

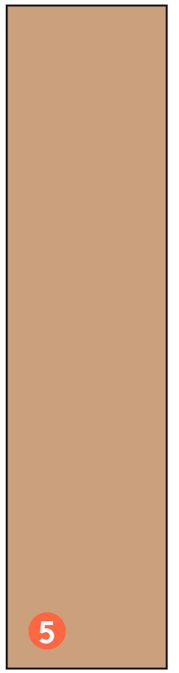
END OF SECTION 33 40 00

BUILDING MATERIALS



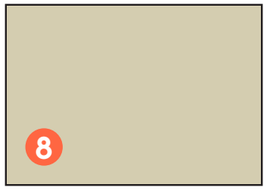




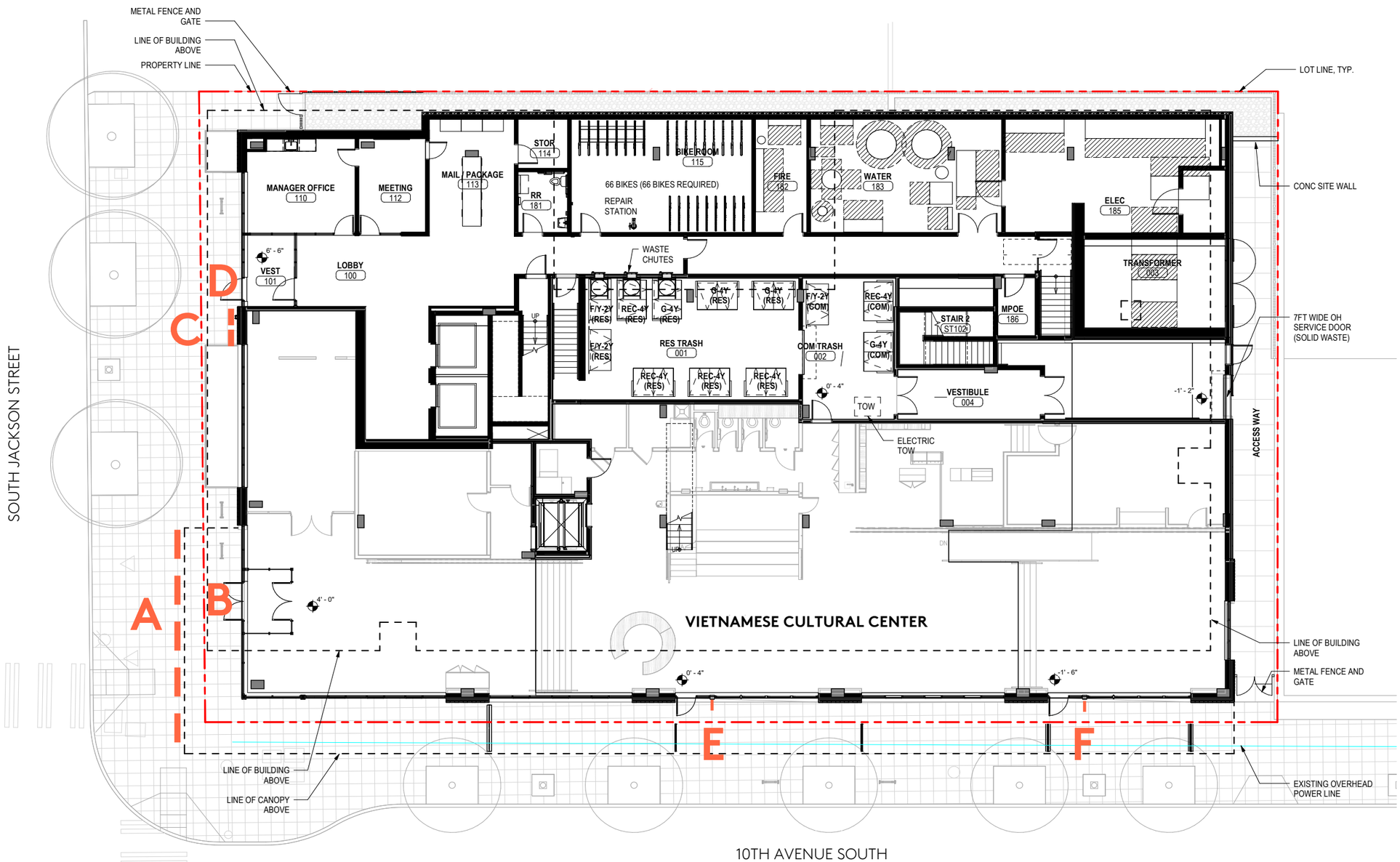


LEGEND

1. THIN BRICK, “MUTUAL MATERIAS” DESERT BLEND
   STACKED BOND, SMOOTH TEXTURE
2. BRICK, “MUTUAL MATERIALS” AUTUMN BLEND
   RUNNING BOND, MISSION TEXTURE
3. FIBER CEMENT PANEL, PAINTED, P1
4. FIBER CEMENT PANEL, PAINTED, P2
5. METAL WINDOW SHROUD, PAINTED, P3
6. WOOD SOFFIT, STAINED
7. ALUM STOREFRONT MULLION COLOR, DARK BRONZE
8. VINYL WINDOW, ADOBE
9. CONCRETE



CONCEPTUAL SIGNAGE PLAN - STREET LEVEL



A VIETNAMESE CULTURAL CENTER ENTRY: MOUNTED HORIZONTALLY ON TOP OF CANOPY WITH CENTER NAME

B CENTER ADDRESS: ON GLASS ABOVE CENTER ENTRY DOOR

C RESIDENTIAL ENTRY: MOUNTED VERTICALLY ON BRICK SURFACE WITH BUILDING NAME

D BUILDING ADDRESS: ON GLASS ABOVE RESIDENTIAL ENTRY DOOR

E PERPENDICULARLY-MOUNTED BLADE SIGN WITH CENTER NAME

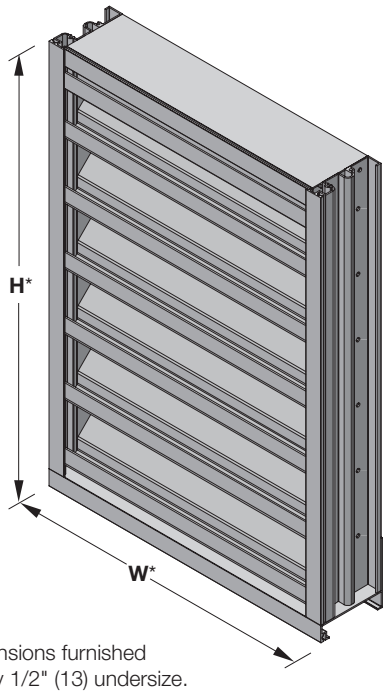
F PERPENDICULARLY-MOUNTED BLADE SIGN WITH CENTER NAME

N 0 8' 16'

C&S Air Products

ED-445

Extruded Aluminum Louver
4" deep • 45° Drainable Blade



ED-445
(standard)
*Louver dimensions furnished approximately 1/2" (13) undersize.

The ED-445 drainable blade louver is designed to prevent water penetration in non-wind-driven rain applications by collecting water in frame and blade gutters and channeling it into downspouts and away from airflow paths. The ED-445 is available in a wide array of anodized and painted finishes including custom color matching.

Ratings

Free Area: [48" × 48" (1219 × 1219) unit]: 8.1 ft² (0.75 m²)
50.4%

Performance @ Beginning Point of Water Penetration

Free Area Velocity: 1,026 fpm (5.21 m/s)

Air Volume Delivered: 8,311cfm (3.92 m³/s)

Pressure Loss: 0.16 in.wg. (40 Pa)

Velocity @ 0.15 in.wg. Pressure Loss: 982 fpm (4.99 m/s)

Std. Design Load: 25 psf

Standard Construction

Material: Mill finish 6063-T5 extruded aluminum

Frame: 4" deep × 0.081" thick (102 × 2) channel

Blades: 45° × 0.081" (2) thick drainable style

Screen: 1/2" × 0.063" (12.7 × 1.6) expanded and flattened aluminum

Mullion: Visible

Minimum Size: 4.5" × 7" (114 × 178)

Maximum Size:

Single section: 60" × 120" (1524 × 3048)
120" × 60" (3048 × 1524)

Multiple section: Unlimited

Options

- **Factory finish:**
  - High Performance Fluoropolymer
  - Baked Enamel ▪ Prime Coat
  - Clear Anodize ▪ Integral Color Anodize
- **Frame options:**
  - 1-1/2" (38) flange frame
  - Stucco flange ▪ Glazing frame
- **Installation hardware**
  - Clip angles ▪ Continuous angles
- **Hidden vertical mullion**
- **Alternate bird or insect screens**
- **Insulated or non-insulated blank-off panels**
- **Filter racks**
- **Hinged frame**
- **Subframe**
- **Head and/or sill flashing**
- **Burglar bars**
- **Frame closure**
- **Net OD (actual size)**

5 year warranty

NOTE: Dimensions in parentheses ( ) are millimeters.
Information is subject to change without notice or obligation.

PERFORMANCE

ED-445
Extruded Aluminum Louver
4" deep • 45° Drainable Blade

Free Area (ft^2)

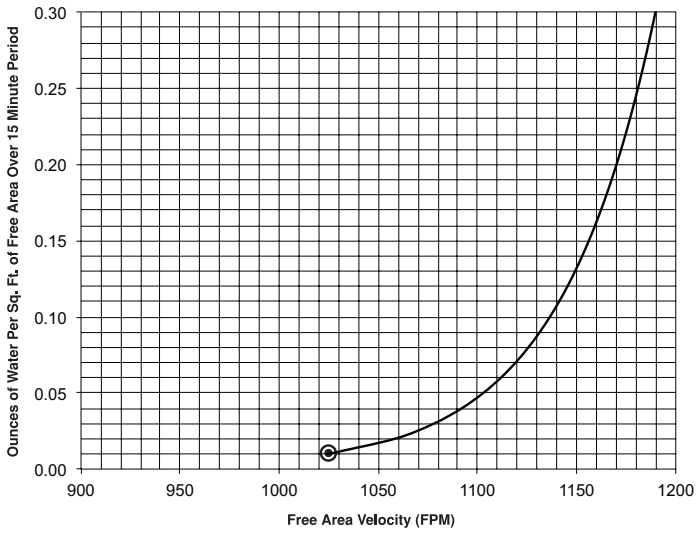
Width (Inches)

Height (Inches)	4.5	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
7	**0.0**	**0.1**	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0
12	0.1	**0.3**	0.5	0.7	0.9	1.1	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.7	2.9	3.1	3.3	3.5	3.7
18	0.1	0.5	**0.8**	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.4	3.7	4.0	4.3	4.6	4.9	5.2	5.6	5.9	6.2
24	0.2	0.8	1.2	**1.7**	2.2	2.6	3.1	3.6	4.0	4.5	4.9	5.4	5.9	6.3	6.8	7.3	7.7	8.2	8.6	9.1
30	0.3	1.0	1.7	2.3	**2.9**	3.5	4.2	4.8	5.4	6.0	6.6	7.3	7.9	8.5	9.1	9.7	10.4	11.0	11.6	12.2
36	0.3	1.2	2.0	2.7	3.5	**4.2**	4.9	5.7	6.4	7.2	7.9	8.6	9.4	10.1	10.8	11.6	12.3	13.1	13.8	14.5
42	0.4	1.6	2.5	3.4	4.3	5.2	**6.2**	7.1	8.0	8.9	9.9	10.8	11.7	12.6	13.5	14.5	15.4	16.3	17.2	18.2
48	0.5	1.8	2.8	3.9	4.9	6.0	7.0	**8.1**	9.1	10.2	11.2	12.3	13.3	14.4	15.4	16.5	17.5	18.6	19.6	20.7
54	0.5	2.0	3.2	4.4	5.6	6.8	8.0	9.2	**10.4**	11.6	12.8	14.0	15.2	16.4	17.6	18.8	20.0	21.2	22.4	23.6
60	0.6	2.3	3.6	5.0	6.4	7.7	9.1	10.4	11.8	**13.1**	14.5	15.9	17.2	18.6	19.9	21.3	22.6	24.0	25.4	26.7
66	0.6	2.5	4.0	5.4	6.9	8.4	9.9	11.3	12.8	14.3										
72	0.7	2.8	4.5	6.1	7.8	9.4	11.1	12.7	14.4	16.1										
78	0.8	3.0	4.8	6.6	8.4	10.2	11.9	13.7	15.5	17.3										
84	0.8	3.3	5.2	7.1	9.1	11.0	12.9	14.9	16.8	18.7										
90	0.9	3.5	5.6	7.7	9.8	11.9	14.0	16.1	18.2	20.3										
96	1.0	3.7	5.9	8.1	10.4	12.6	14.8	17.0	19.2	21.4										
102	1.0	4.0	6.4	8.8	11.2	13.6	16.0	18.4	20.8	23.2										
108	1.1	4.3	6.8	9.3	11.8	14.3	16.9	19.4	21.9	24.4										
114	1.2	4.5	7.2	9.8	12.5	15.2	17.9	20.5	23.2	25.9										
120	1.2	4.8	7.6	10.4	13.3	16.1	18.9	21.7	24.6	27.4										

Water Penetration

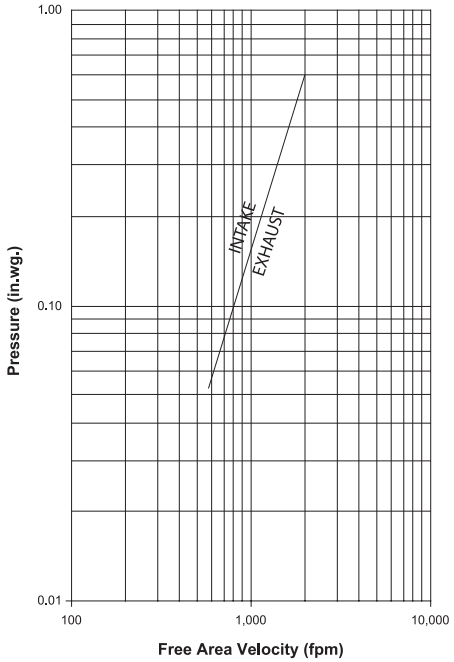
AMCA defines the beginning point of water penetration as the free area velocity at the intersection of a simple linear regression of test data and the line of 0.01 ounces of water per square foot of free area measured through a 48" x 48" louver during a 15 minute period. The AMCA water penetration test provides a method for comparing louver models and designs as to their efficiency in resisting the penetration of rainfall under specific lab conditions. We recommend that intake louvers are selected with a reasonable margin of safety below the beginning point of water penetration in order to avoid unwanted penetration during severe storm conditions.

Beginning Point of Water Penetration = 1,026 fpm



Pressure Loss

(Data corrected to standard air density.)

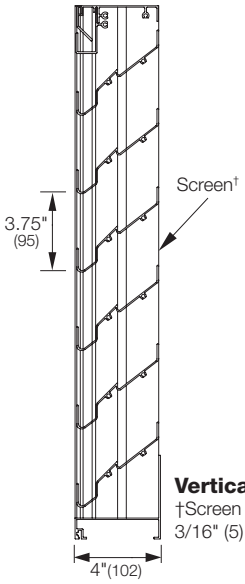


Louver Test Size = 48" x 48" (1219 x 1219)
Pressure loss tested in accordance with Figure 5.5 of AMCA Standard 500-L.

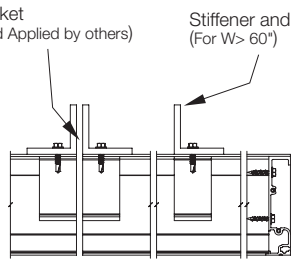
ED-445

Extruded Aluminum Louver
4" deep • 45° Drainable Blade

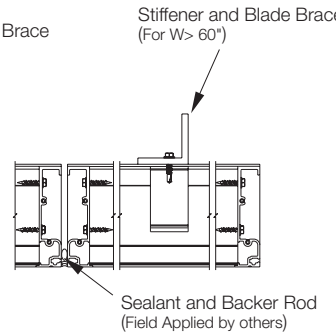
Attributes



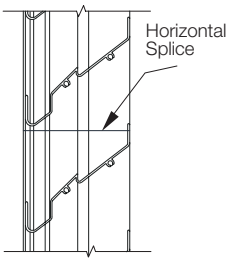
Vertical Section
†Screen adds approximately
3/16" (5) to louver depth



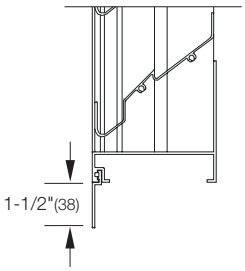
Hidden Vertical Mullion
(optional)



Visible Vertical Mullion
(standard)

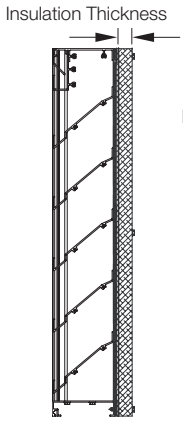


Horizontal Mullion
(standard)

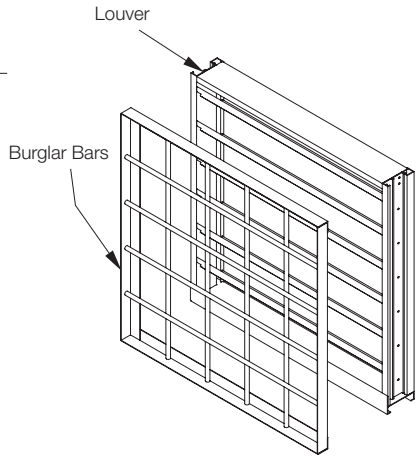


Flange Frame
(optional)

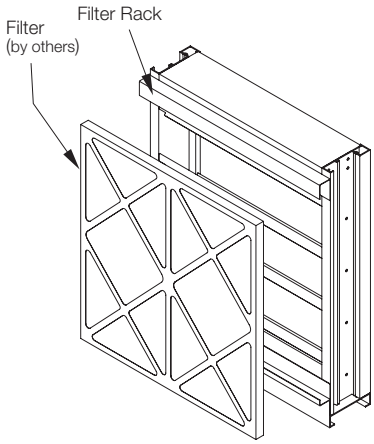
Supplemental Options



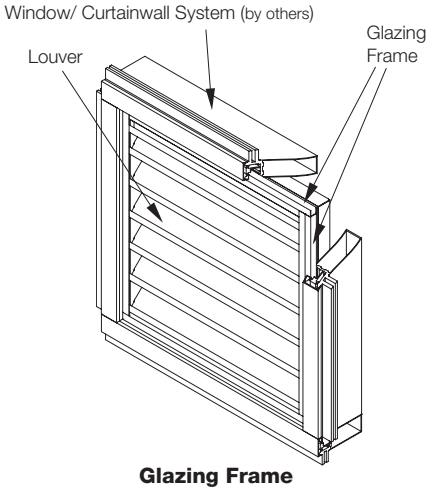
Blank-Off Options
Non-Insulated and Gasketed
1" Insulated (4.25 R-value)
2" Insulated (8.75 R-value)



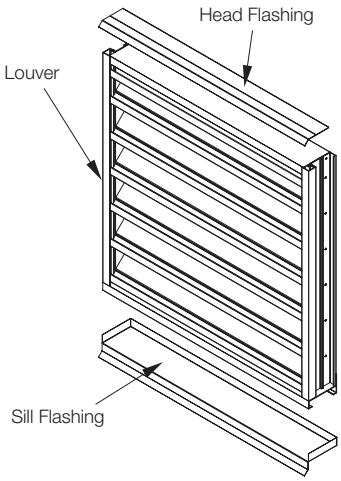
Burglar Bars
Shipped Loose or Mounted



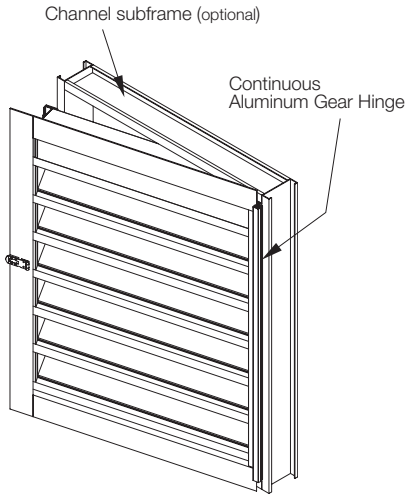
Filter Rack



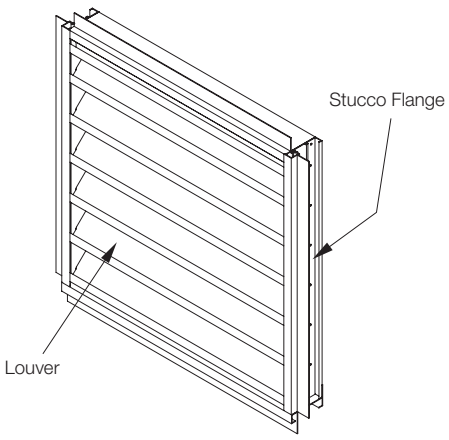
Glazing Frame



Flashing Options
Head and Sill Available



Hinge and Subframe
Right or Left Side Option Available



Stucco Flange

SUELO Adjustable Optics Vandal Resistant

inter·lux

CORRELATED COLOR TEMPERATURE INDICATED IN RED BY SPARKLAB - 10/31/2025

4400 lb

General: Suelo is a family of round LED in-grades that includes a broad selection of specialty optics in multiple sizes and outputs, making it possible to find the perfect luminaire to illuminate outdoor architectural elements such as facades, columns as well as landscape and pathway lighting within the same product range.
The standard Suelo R provides maximum output and a selection of accessories to control the emission based on application needs. The Suelo PRO version has a more recessed optical chamber instead, to guarantee the best glare control without the need of any louver.
Lastly, Suelo is also available with a Dual Optic (Double, allowing to aim light at two different areas from one fixture) and in a Telescopic version, with an adjustable aluminum tube that elevates the fixture off the ground, to prevent growing vegetation from blocking the light.

4.4" SFSTVR (8W / 9W)

6.7" SFSTVR (13W)

9.1" SFSTVR (33.6W)

12.4" SFSTVR (48.2W)

Fixture Body: Open-pore Anodized and Powder Coated Die-Cast Aluminum.
Trim: Semi-Flush (Stainless Steel) Trim with Extra-clear Tempered glass.
Mounting/Casing: Black, ABS casings for Concrete installations. Vandal Resistant, secured with Hex or Torx screws (check installation instructions for details).
Drive-over: Up to 5,511 lbs.
Dimensions/Weight: 4.4" (1.61 lbs) – 6.7" (2.21 lbs) – 9.1" (6.61 lbs) – 12.1"/12.4" (17.6 lbs)

CC version: (4.4", 6.7") Remote 120-277V Constant Current driver 0-10V dimmable down to 0.1%. Less susceptible to voltage drop (up to 200' wiring distance); Fixtures need to be wired in series.
CV version: (4.4") Remote 120-277V Constant Voltage 24VDC. Driver options in 0-10V (typical dim level 10%, dry location) or Non-dim (wet location). Possibility to use higher wattage drivers and feed multiple fixtures with fewer wiring runs; fixtures need to be wired in parallel.
ID version: (9.1", 12.4", 12.1") Integral driver 120-277V dimmable 0-10V down to 1%.
Wattages: 8W / 9W (4.4") – 13W (6.7") – 33.6W (9.1") – 48.2W (12.1" & 12.4")
Cable: Fixture comes with 3.28' of power cable and built-in Aquastop® (anti-wicking) system

IP rating: IP67 for temporary submersion up to 3.3' of depth for up to a maximum of 1 hr.
IK rating: IK 10
ETL Certification: ETL, wet location

Optics: Adjustable. Available in Ultra Spot – Spot – Narrow Flood – Flood – Medium Wide Flood – Wide Flood.
Color temperatures: 2700K – 3000K – 4000K.
CRI: 80+

Lumen Maintenance: L70 projections tested at Tj 65° C and Ta 25°.
Warranty: 5-year Limited Warranty on fixtures. 1-year Limited Warranty on Remote Drivers.

Delivered Lumens*	4.4"	6.7"	9.1"	12.1" & 12.4"
USP	–	–	–	3209
SP	–	914	3123	4340
NFL	625	–	–	–
FL	559	1021	3069	4332
MWFL	–	1183	–	–
WFL	573	–	2979	4161

*Values shown for 3000K

Ordering Information

SUR	SFSTVR								
Product	**Trim**	**Type**	**Diameter**	**Wattage/Operation**	**Color Temp**	**Optic**	**+**	**Housing**	**Driver**
SUR = Suelo R	SFSTVR = Semi-Flush St. Steel Vandal Resistant SFBTVR = Semi-Flush Brass Trim Vandal Resistant[1]	A = Adjustable AHC = Adjustable Honeycomb[3] ADL = Adjustable DarkLight[3]	44 = 4.4"	8 CC = 8W / Constant Current (630 mA) 9 CV = 9W / Constant Voltage (24 VDC)	27 = 2700K 30 = 3000K 40 = 4000K	USP = Ultra Spot[4] SP = Spot[5] NFL = Narrow Flood[6] FL = Flood MWFL = Medium Wide Flood[7] WFL = Wide Flood[8,9]		E98121 (4.4") E84933 (6.7") E83096 (12.1" & 12.4") E93099 (12.1" & 12.4") E83097 (12.4") E83098 (12.1")	**CC:** ECO30W-XXX SOLO50W-XXX SOLO100W-XXX **CV:** OT96-D010 OT96-JBX
			67 = 6.7"	13 CC = 13W / Constant Current (350 mA)					
			91 = 9.1"	34 ID = 33.6W / Integral 120/277VAC 0-10V dim					
	FTVR = Flush Trim Vandal Resistant (St. Steel)[2]		124 = 12.4"	48 ID = 48.2W / Integral 120/277VAC 0-10V dim					
			121 = 12.1"	48 ID = 48.2W / Integral 120/277VAC 0-10V dim					

[1] SFBTVR 6.7" ONLY
[2] FTVR 12.1" & 12.4" ONLY
[3] AHC & ADL 12.1" & 12.4" ONLY
[4] USP 12.1" & 12.4" ONLY
[5] SP N/A for 4.4"
[6] NFL 4.4" ONLY
[7] MWFL 6.7" ONLY
[8] WFL N/A for 6.7"
[9] WFL N/A for ADL 12.1" & 12.4"
[10] See page 2

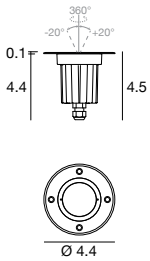
linea light i-LED

410 381 1497 inter-lux.com answers@inter-lux.com
Inter-lux reserves the right to make technical changes without notice.

SUELO Adjustable Optics Vandal Resistant

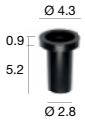
inter·lux

4.4" 8W / 9W



Housing

E98121
Recessed Housing



DRIVER OPTIONS (pick one)

C.C. Power supply options (remote only)

ECO30W-630
0-10V EldoLED
ECOdrive 30W
for 1-3 fixtures

SOLO50W-630
0-10V EldoLED
SOLOdrive 50W
for 1-4 fixtures

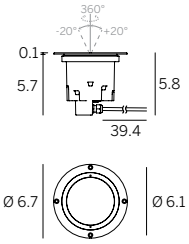
SOLO100W-630
0-10V EldoLED
SOLOdrive 100W
for 1-8 fixtures

C.V. Power supply options (remote only)

OT96-D010
Osram, 10% 0-10V dim, 96W, 24VDC, 120-277VAC, supplied in a Dry location enclosure

OT96-JBX
Osram, Non-dim 24VDC, 120-277VAC, Wet location

6.7" 13W



Housing

E84933
Recessed Housing

DRIVER OPTIONS (pick one)

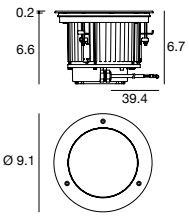
C.C. Power supply options (remote only)

ECO30W-350
0-10V EldoLED
ECOdrive 30W
for 1 fixture

SOLO50W-350
0-10V EldoLED
SOLOdrive 50W
for 1-2 fixtures

SOLO100W-350
0-10V EldoLED
SOLOdrive 100W
for 1-4 fixtures

9.1" 33.6W



Housing

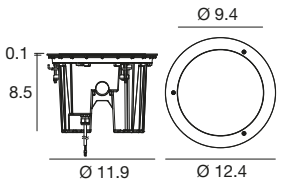
E99794
Recessed Housing

Integral 120/277VAC 0-10V dim Driver

SUELO Adjustable Optics Vandal Resistant

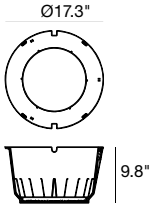
inter·lux

12.4" 48.2W

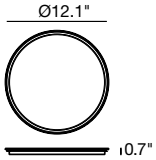


Housing

E83096
Recessed Housing

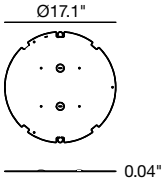


E83098
Concrete pour cover
(required)

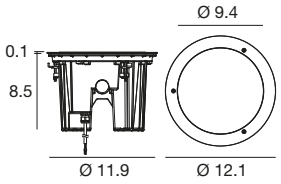


Integral 120/277VAC 0-10V dim Driver

E93099
Housing bottom plate
(optional)

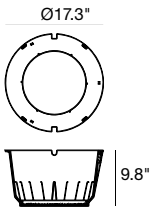


12.1" 48.2W

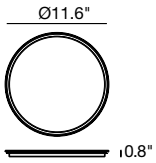


Housing

E83096
Recessed Housing

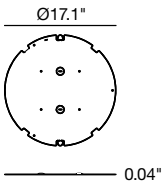


E83097
Concrete pour cover
(required)



Integral 120/277VAC 0-10V dim Driver

E93099
Housing bottom plate
(optional)



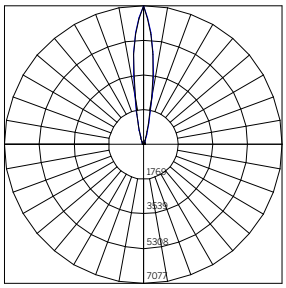
SUELO Adjustable Optics Vandal Resistant

inter·lux

SUR-SFSTVR-A-...-SP-...
Delivered Lumens - Spot

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	-	883
	30	-	921
	40	-	972

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	-	1.00



Beam Angle (0-180) = 15.7
Beam Angle (90-270) = 16.3

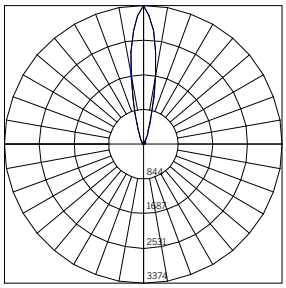
CONE OF LIGHT - 13W 3000K SPOT
SUR-SFSTVR-A-67-13-CC-30-SP*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	18	5.5
18	22	5.0
16	28	4.4
14	36	3.9
12	49	3.3
10	71	2.8
8	111	2.2
6	197	1.7
4	442	1.1
2	1769	0.6

SUR-SFSTVR-A-...-NFL-...
Delivered Lumens - Narrow Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	629	-
	30	629	-
	40	679	-

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	1.00	-



Beam Angle (0-180) = 20.0
Beam Angle (90-270) = 20.1

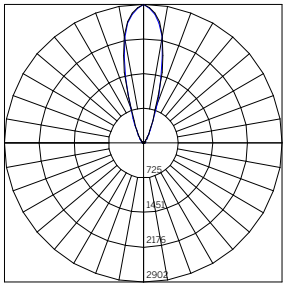
CONE OF LIGHT - 8W 3000K NARROW FLOOD
SUR-SFSTVR-A-44-8-CC-30-NFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	8	7.0
18	10	6.3
16	13	5.6
14	17	4.9
12	23	4.2
10	34	3.5
8	53	2.8
6	94	2.1
4	211	1.4
2	844	0.7

SUR-SFSTVR-A-...-FL-...
Delivered Lumens - Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	560	983
	30	560	1024
	40	605	1082

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	0.55	1.00



Beam Angle (0-180) = 29.7
Beam Angle (90-270) = 30.8

CONE OF LIGHT - 13W 3000K FLOOD
SUR-SFSTVR-A-67-13-CC-30-FL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	7	10.6
18	9	9.5
16	11	8.5
14	15	7.4
12	20	6.4
10	29	5.3
8	45	4.2
6	81	3.2
4	181	2.1
2	726	1.1

*Polar Plot and Cone of Light are applicable to part number noted; use Multiplication Factor table to approximate other models or refer to online photometry.

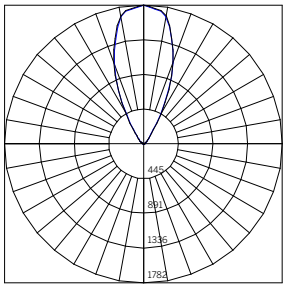
SUELO Adjustable Optics Vandal Resistant

inter·lux

SUR-SFSTVR-A-...-MWFL-...
Delivered Lumens - Medium Wide Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	-	1137
	30	-	1024
	40	-	1251

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	-	1.00



Beam Angle (0-180) = 46.3
Beam Angle (90-270) = 46.7

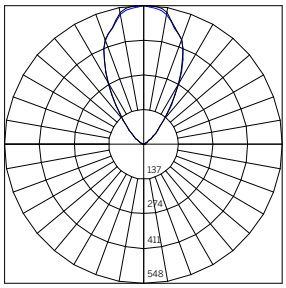
CONE OF LIGHT - 13W 3000K MEDIUM WIDE FLOOD
SUR-SFSTVR-A-67-13-CC-30-MWFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	4	17.1
18	6	15.4
16	7	13.7
14	9	12.0
12	12	10.3
10	18	8.6
8	28	6.8
6	50	5.1
4	111	3.4
2	446	1.7

SUR-SFSTVR-A-...-WFL-...
Delivered Lumens - Wide Flood

		Diameter [Wattage]	
		44 [8CC / 9CV]	67 [13 CC]
CCT	27	572	-
	30	572	-
	40	618	-

	Polar Plot / Cone Of Light Multiplier	
	44 [8CC / 9CV]	67 [13 CC]
	1.00	-



Beam Angle (0-180) = 60.6
Beam Angle (90-270) = 60.2

CONE OF LIGHT - 8W 3000K WIDE FLOOD
SUR-SFSTVR-F-44-8-CC-30-WFL*

Throw Distance [Ft]	Illuminance [fc at max cd]	Beam Diameter [Ft]
20	1	23.4
18	2	21.0
16	2	18.7
14	3	16.4
12	4	14.0
10	5	11.7
8	9	9.3
6	15	7.0
4	34	4.7
2	137	2.3

*Polar Plot and Cone of Light are applicable to part number noted; use Multiplication Factor table to approximate other models or refer to online photometry.

YOSEMITE LED INTEGRAL — IP66 RATED

DATE:	PROJECT:	TYPE:

CATALOG NUMBER LOGIC:

**120v only.*

CATALOG NUMBER LOGIC	
Example: YO - LED - TR - x130 - WW - BLP - 9 - 11 - CV - INC - MT	
MATERIAL	
Aluminum	
SERIES	
YO - Yosemite	
SOURCE	
LED - Chip on Board Technology	
HOUSING	
TR - Integral Driver	
LED TYPE	
x130 - 23W LED/2700K	x113 - 34W LED/2700K
x131 - 23W LED/3000K	x114 - 34W LED/3000K
x133 - 23W LED/4000K	x116 - 34W LED/4000K
OPTICS	
WW - Wall Wash	
FINISH (See page 2 for full-color swatches)	
Standard Finishes (BZP, BZW, BLP, BLW, WHP, WHW, SAP, VER)	
Premium Finish (ABP, AMG, AQW, BCM, BGE, BPP, CAP, CMG, CRM, HUG, NBP, OCP, RMG, SDS, SMG, TXF, WCP, WIR)	
Also available in RAL Finishes	
LENS TYPE	
9 - Clear (Standard)	
SHIELDING	
11 - Honeycomb Baffle	
ACCESSORIES	
CV - Cutoff Visor	
CS - Cutoff Snoot	
BD - Adjustable Barn Boors	
CONTROL OPTION	
ELV - Dimming Driver (For use with Electronic Low Voltage Dimmer)	
INC - Dimming Driver (For use with Incandescent Dimmer)	
0-10 - Dimming Driver (For use with 0-10 Dimmer)	
INPUT VOLTAGE	
MT - 120-277 VAC	

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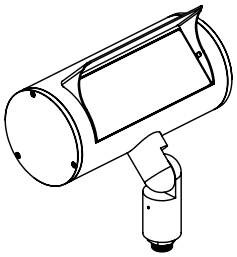
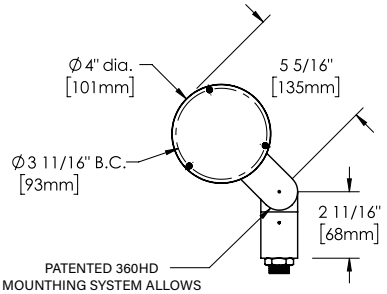
YOSEMITE LED INTEGRAL — IP66 RATED

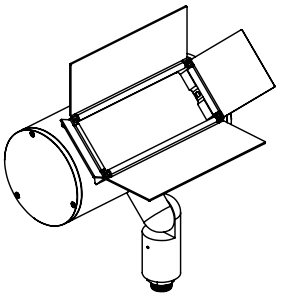
DATE: | PROJECT: | TYPE:



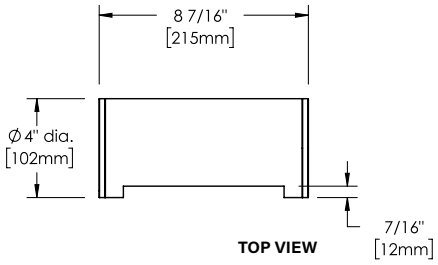
CUTOFF VISOR



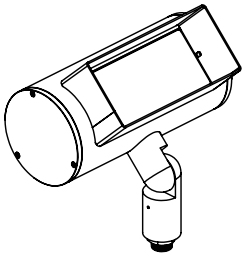
SIDE VIEW



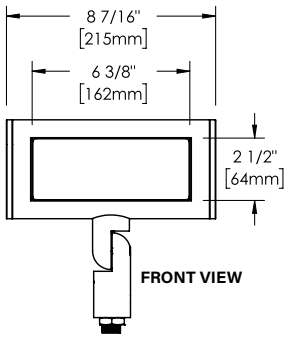
BARN DOOR



TOP VIEW



CUTOFF SNOOT



FRONT VIEW

STANDARD FINISHES

- Satin Black (BLP)
- Satin Bronze (BZP)
- Satin White (WHP)
- Satin Aluminum (SAP)
- Black Wrinkle (BLW)
- Bronze Wrinkle (BZW)
- White Wrinkle (WHW)
- Verde (VER)

Click Here to view larger, full-color swatches of all available finishes on our website.

PREMIUM FINISHES

- Cascade Mtn. Granite (CMG)
- Rocky Mtn. Granite (RMG)
- Sierra Mtn Granite (SMG)
- Aleutian Mtn Granite (AMG)
- Textured Forest (TXF)
- Black Chrome (BCM)
- Beige (BGE)
- Weathered Copper (WCP)
- Old Copper (OCP)
- Hunter Green (HUG)
- Antique Brass Powder (ABP)
- Brown Patina Powder (BPP)
- Sonoran Desert Sandstone (SDS)
- Weathered Iron (WIR)
- Clear Anodized Powder (CAP)
- Cream (CRM)
- Antique White (AQW)
- Natural Brass Powder (NBP)

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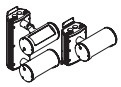
12/06/2022 SKU-1394
SUB-2845-00

YOSEMITE LED INTEGRAL — IP66 RATED

DATE:	PROJECT:	TYPE:

Accessories (Configure separately)



PM3DJ & PM3J

SPECIFICATIONS

ELECTRICAL	WATTAGE	23W or 34W LED
	WIRING	XLPE coated, 18AWG, 600V, 150° C rated and certified to UL 1569 standard.
	DRIVER	With one (1) 600mA or 900mA, Class II, constant current integral driver. 50/60Hz. >0.9 Power Factor,5A in-rush current (typical at 120VAC), ≤20%THD (nominal at 120VAC full load). Output over-voltage, over-current, and short circuit protection with auto recovery. Dimming driver for use with 0-10V, Incandescent, Standard TRIAC, or ELV dimmers. 1-100% range. *TRIAC/ELV dimming at 120VAC only
PHYSICAL	MATERIALS	Furnished in copper-free aluminum (6061-T6).
	BODY	Enclosed, water-proof wireway with machined end caps gasketed to create a water-tight seal for optical compartment.
	KNUCKLE	360HD Mounting System features a mechanical taperlock, allowing full 180° vertical adjustment without the use of aim-limiting serrated teeth. High temperature, silicone 'O' Ring provides water-tight seal and compressive resistance to maintain fixture position. Design withstands 73 lbs. static load prior to movement for optical alignment with a ½" pipe thread for mounting. Biaxial source control additionally provides 360° horizontal rotation in addition to vertical adjustment. Aim & Lock technology allows precision adjustment without the redundant tightening and loosening of knuckle screw. 360HD hardware is stainless steel with black oxide treatment for additional corrosion resistance.
	LENS	Shock-resistant, tempered glass lens is factory adhered to fixture cap and provides hermetically sealed optical compartment.
	LED	Integrated solid state system and modular design with electrical disconnects allow for easy field upgrade and maintenance. LM-80 certified. Minimum 50,000 hour rated life at 70% of initial lumens (L70). LED technology provides long life, significant energy reduction and exceptional thermal management.
	COLOR MANAGEMENT	Chip on board technology delivers natural white light. Exact color point conformity exceeds ANSI C78.377 standard. Module exceeds 80 CRI (RA>80, R9.16). Color point uniformity 2 SDCM color control for 2700K-4000K CCT.
	ACCESSORIES	Three (3) accessory options for optimum lighting control.
	HARDWARE	Tamper-resistant, stainless steel hardware. LOCK hardware is black oxide treated for additional corrosion resistance.
	FINSIH	StarGuard, our 15-stage chromate-free process cleans and conversion coats aluminum components prior to application of Class 'A' TGIC polyester powder coating and is RoHS compliant.
	WARRANTY	5-year limited warranty.
	CERTIFICATION & LISTING	UL tested to IESNA LM-79. UL Listed. Certified to CAN/CSA/ANSI Standards. RoHS compliant. Suitable for indoor or outdoor use, in wet locations, and for installation within 4' of the ground. IP65 Rated. Made in the USA with sustainable processes.

c UL us LISTED

RoHS

MADE IN THE USA

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12/06/2022 SKU-1394
SUB-2845-00

LAMP & DRIVER DATA

DATE:	PROJECT:	TYPE:

LM79DATA					L70 DATA
BK No.	**Delivered Lumens**	**CCT (Typ.)**	**CRI (Ra. Typ.)**	**InputWatts (Typ.)**	**Minimum Rated Life (hrs.) 70% of Initial Lumens (L70)**
x130	1884	2700K	80	23	50,000
x131	**1924**	**3000K**	**80**	**23**	**50,000**
x133	1965	4000K	80	23	50,000
x113	2611	2700K	80	34	50,000
x114	**2631**	**3000K**	**80**	**34**	**50,000**
x116	2744	4000K	80	34	50,000

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TROV®

OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

THE L50 INCLUDES PATENTED OPTICAL DESIGN THAT DELIVERS THE WIDEST RANGE OF BEAM ANGLE OPTIONS FOR PRECISE COVE, WALL GRAZING, WALL WASHING OR LINE OF LIGHT APPLICATIONS. EXCLUSIVE FLIP TO FLAT™ HINGE DESIGN PROVIDES FLEXIBILITY WHEN MANAGING SMALL COVE DETAILS. TROV OFFERS SMOOTH, FLICKER FREE DIMMING DOWN TO 0%.

FEATURES :

- DIM TO 0%, ELV REVERSE PHASE
- 24 BEAM ANGLES
- MULTI-VOLT
- FLIP TO FLAT™
- 6 CCT OPTIONS
- 80+ AND 90+ CRI OPTIONS
- IP54 INTERIOR AND IP66 EXTERIOR OPTIONS

MODEL/ SIZE	INTERIOR/ EXTERIOR	LENGTH	POWER	CCT		CRI	VOLTAGE	OPTICS	
L50	I E	12″ 48″	02 04 06 08 10 12	**WHITE CCT** 22 27 30 35 40 50	**MONO COLOR** GR**** BL AM RD***	80 90* Blank For Color	MULT (120-277V)	**GRAZING** 9 x 9 9 x 17 9 x 29 9 x 59 15 x 15 15 x 23 15 x 35 15 x 65 **COVE** 120** Asym **LINE OF LIGHT** LOL	**WASHING** 25 x 25 25 x 33 25 x 45 25 x 75 39 x 9 55 x 25 40 x40 40 x 48 40 x 60 40 x 90 45 x 15 70 x 40 70 x 70

3000K

EXAMPLE: L50-I-48-10-27-90-MULT-15x65

*90 CRI not available in 2200K or 5000K **120 is only available with Exterior option. See L35 spec sheet for interior cove options. ***Red is not available in 12W or 10W. ****Green is not available in 12W.

PERFORMANCE	WATTS	OPTIC	LUMEN OUTPUT	EFFICACY
	2W	9˚x 29˚	158 lm/LF (519 lm/m)	79 lm/W
	4W	9˚x 29˚	389 lm/LF (1277 lm/m)	97 lm/W
	6W	9˚x 29˚	620 lm/LF (2035 lm/m)	103 lm/W
	8W	9˚x 29˚	864 lm/LF (2833 lm/m)	108 lm/W
	10W	9˚x 29˚	1046 lm/LF (3432 lm/m)	105 lm/W
	12W	9˚x 29˚	1217 lm/LF (3990 lm/m)	101 lm/W

ALL LUMEN DATA IS FROM 4000K 80CRI FIXTURES. PLEASE SEE PHOTOMETRY SPEC SHEET FOR ADDITIONAL LUMEN DATA.

COLOR RENDERING INDEX 80+, 90+

COLOR CONSISTENCY 2-STEP MACADAM ELLIPSE

LUMEN DEPRECIATION / RATED LIFE

WATTS	L70 @ 25C	L70 @ 50C	L90 @ 25C	L90 @ 50C
2W-12W	>150,000	>70,000	>50,000	>25,000

*CALCULATIONS FOR LED FIXTURES ARE BASED ON MEASUREMENTS THAT COMPLY WITH IES LM-80 TESTING PROCEDURES AND IES TM-21 CALCULATOR

* CALCULATIONS FOR LED FIXTURES ARE BASED ON MEASUREMENTS THAT COMPLY WITH IES LM-80 TESTING PROCEDURES AND IES TM-21 CALCULATOR

ELECTRICAL

POWER CONSUMPTION 2W*/LF (6.6W/M) ; 4W/LF (13.2W/M) ; 6W/LF (19.8W/M) ; 8W/LF (26.4W/M) ; 10W/LF (33W/M) ; 12W/FL (39.6W/M)
* 3W/LF (9.9W/M) at 220V -277V

MAX FIXTURE RUN LENGTH

	2W/LF		4W/LF		6W/LF		8W/LF		10W/LF		12W/LF	
Volts	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'	Max Run all 1'	Max Run all 4'
120	214	214	186	186	152	152	114	114	91	91	76	76
220	374	392	340	340	277	277	209	209	95	167	95	139
277	374	494	374	428	349	349	263	263	95	190	95	175

POWER FACTOR 4W, 6W, 8W, 10W, 12W >0.9, 2W<0.9
OPERATING VOLTAGE MULTIVOLT: 110-277VAC, 50/60 Hz
DRIVER INTEGRAL TO FIXTURE; DE-RATED POWER AND SYNCHRONOUS START-UP AT FULL BRIGHTNESS
STARTUP TEMPERATURE -40˚F TO 122˚F (-40˚C TO 50˚C)
OPERATING TEMPERATURE -40˚F TO 122˚F (-40˚C TO 50˚C)
STORAGE TEMPERATURE -40˚F TO 176˚F (-40˚C TO 80˚C)

NOTE: Information on this Spec Sheet is subject to change, please visit ecosenselighting.com/downloads/rise for the most updated information.

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TROV®

OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

CONTROL	**DIMMING**	110-277VAC, ELV TYPE 0.07%-100%, REVERSE PHASE, TRAILING EDGE ETC control systems require 0-10V control using Ecosense LDCM. TROV will not work with ETC phase dimmers.
PHYSICAL	**DIMENSIONS**	W 1.6" x H 2" x L 12"/48" ; (41.6mm x 50.5mm x 304.7mm/1201mm)
	HOUSING /LENS	EXTRUDED ALUMINUM; UV STABILIZED POLYCARBONATE; STAINLESS STEEL FASTENERS; PLASTIC ENDCAPS RUBBER OVERMOLD FOR CABLE ASSEMBLY
	WEIGHT	1.52LBS / 0.69KG (1FT) ; 4.95LBS / 2.25KG (4FT)
	CONNECTORS	INTEGRAL MALE/ FEMALE CONNECTORS
	ENVIRONMENT	INDOOR • ETL CERTIFIED FOR DRY/DAMP LOCATIONS IP54 OUTDOOR • ETL CERTIFIED FOR WET LOCATIONS IP66 IMPACT RATED TO IK10 Not intended to be used in water features such as waterfalls, fountains, etc.
	BEAM ANGLE	GRAZING, WASHING, COVE, ASYMMETRIC, LINE OF LIGHT
	MOUNTING OPTIONS	INTEGRAL MOUNTING AND ADJUSTABLE AIMING FROM 0˚-180˚ IN 15˚ INCREMENTS
FIXTURE RATING & CERTIFICATIONS	**ETL CERTIFIED** **RoHS COMPLIANT** **RCM CERTIFIED**	Intertek · RoHS COMPLIANT · Title 24 JA8-2016 *90 CRI models only
LIMITED WARRANTY	**5 YEARS**	

WIRING OPTIONS (MVOLT): 110-277VAC

Power Cable Assembly, TROV, Leader/Jumper, 10 foot	**CBL-3P-L-UNV-10***
Power Cable Assembly, TROV, Leader/Jumper, 50 foot	**CBL-3P-L-UNV-50***
Power Cable Assembly, TROV, Jumper, 5 foot	**CBL-3P-L-UNV-05****
Power Cable Assembly, TROV, Jumper, 1 foot	**CBL-3P-L-UNV-01****
Power Cable Assembly, TROV, Adjustable Jumper, 0" to 7"	**CBL-3P-L-UNV-ADJ**
Power Cable Assembly, TROV, Male and Female terminator caps	**CBL-3P-L-UNV-CAPS**

*Two (2) terminators are included with the 10' and 50' power cable. One Leader need per circuit/fixture run. Cables are not plenum rated.
** If using the 5' or 1' power cable assembly as a leader to power a run, one set of CBL-3P-L-UNV-CAPS will also be needed per cable.

0-10V CONTROL OPTIONS

100-120VAC / 277VAC Linear Dimming Control Module 0-10V - Plenum Rated **LDCM-PL-120-277-010V-GR**
All products come standard with ELV dimming capabilities. 0-10V Control options required for operation at 0-10V.

OPTIONAL ACCESSORIES

Mounting

Mounting Track and Clips Set, 48 Inch Track, 8 Clips	**MNT-L-TRKCLIP-48**	48" track and clips set will work with one 48" fixture or four 12" fixtures. (FOR INTERIOR USE ONLY)
Mounting Track and Clips Set, 12 Inch Track, 2 Clips	**MNT-L-TRKCLIP-12**	12" track will not work with 48" fixtures. (FOR INTERIOR USE ONLY)
Mounting Track Clip, TROV, Set of 2	**MNT-L-CLIP**	Clips needed = 12" fixtures need 1 set of 2 and 48" fixture needs 2 sets of 2.
90 Degree L bracket, TROV, Set of 2	**MNT-L-LBKT**	L-Brackets needed = 12" fixtures need 1 set of 2 and 48" fixture needs 1 set of 2.
Angle Locking Clip, TROV, Pack of 10	**MNT-L-ANGLOCK**	Angle Locks needed = 12" fixtures need 1 and 48" fixtures need 2. (Must order separately)
Mounting, Fine Adjustment Bracket, TROV	**MNT-L-FAB**	Fine Adjustment Brackets needed = 12" fixtures need 1 and 48" fixtures need 2.
*Fine Adjustment Bracket is highly recommended for Grazing Optics.		
Mounting, Fine Adjustment L-Bracket, TROV	**MNT-L-LFAB**	Fine Adjustment L-Brackets needed = 12" fixtures need 1 and 48" fixtures need 2.
*Fine Adjustment L-Bracket is recommended for Asymetric Optics when aiming is needed.		

Snap-on Lenses

Snap-on Lens, Frosted, 12 inch, L50	**LENS-L50-FROST-12**
Snap-on Lens, Frosted, 48 inch, L50	**LENS-L50-FROST-48**
Snap-on Lens, Clear, 12 inch, L50	**LENS-L50-CLEAR-12**
Snap-on Lens, Clear, 48 inch, L50	**LENS-L50-CLEAR-48**

Snap-on Lenses need = One 12" lens is needed per 12" fixture and one 48" lens is needed per 48" fixture. Snap on Lenses will not work with the asymmetric fixture. Clear lenses can be used to hold colored filters to customize the output color of any TROV fixture, except the ASYM. Color filters supplied by others.

Wall Mount Arm

Wall Mount Arm, 6 inch, TROV	**WMA-L-CA-06**
Wall Mount Arm, 12 inch, TROV	**WMA-L-CA-12**
Wall Mount Arm, 18 inch, TROV	**WMA-L-CA-18**
Wall Mount Arm, 24 inch, TROV	**WMA-L-CA-24**
Wall Mount Arm End Plate Set, TROV, Includes Left and Right	**WMA-L-END**
Wall Mount Arm Joiner Plate, TROV	**WMA-L-JNR**

Wall Mount Arms needed = For individual fixture installations two arms and one end set will be needed per fixture. For continuous run installation one end set will be needed per run. Each end set contains one left and one right end plate. One joining set will be needed per joint. One arm per fixture will be needed plus one extra arm to complete the run. For example: A 10ft run made with two 4ft and two 1ft fixtures will contain; 1 x WMA-L-END, 3 x WMA-L-JNR, and 5 x WMA-L-CA-12. Leader cables are not included with wall mount arms, end sets, or joiners sets.

Louvers

Louver, Asymmetric, 12 inch, L50	**LV-L50-ASYM-12**
Louver, Asymmetric, 48 inch, L50	**LV-L50-ASYM-48**
Louver, Symmetric, 12 inch, L50	**LV-L50-SYM-12**
Louver, Symmetric, 48 inch, L50	**LV-L50-SYM-48**
Louver, Honeycomb, 12 inch, L50	**LV-L50-HCOMB-12**
Louver, Honeycomb, 48 inch, L50	**LV-L50-HCOMB-48**

Louvers Needed = One 12" louver is needed per 12" fixture and one 48" louver is needed per 48" fixture. 48" louver is made up of four 12" louvers. Louvers cannot be used with the asymmetric fixture

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OVERVIEW • SPECIFICATIONS • ORDERING

INTERIOR + EXTERIOR | **L50 GRAZE**

DATE	PROJECT	FIRM	TYPE

OPTIONAL ACCESSORIES

Masking Plates

Masking Plate, 3 inch high, 12 inch, L50 & L35 ..... **MP-L50-3H-12**
Masking Plate, 3 inch high, 48 inch, L50 & L35 ..... **MP-L50-3H-48**

Masking Plates needed = One 12" plate is needed per 12" fixture and one 48" plate is needed per 48" fixture.

Landscape Stake

Landscape Stake, 6 inch, TROV, Set of 2 ..... **LS-L-STK-06**
Landscape Stake, 12 inch, TROV, Set of 2 ..... **LS-L-STK-12**
Landscape Stake, 18 inch, TROV, Set of 2 ..... **LS-L-STK-18**

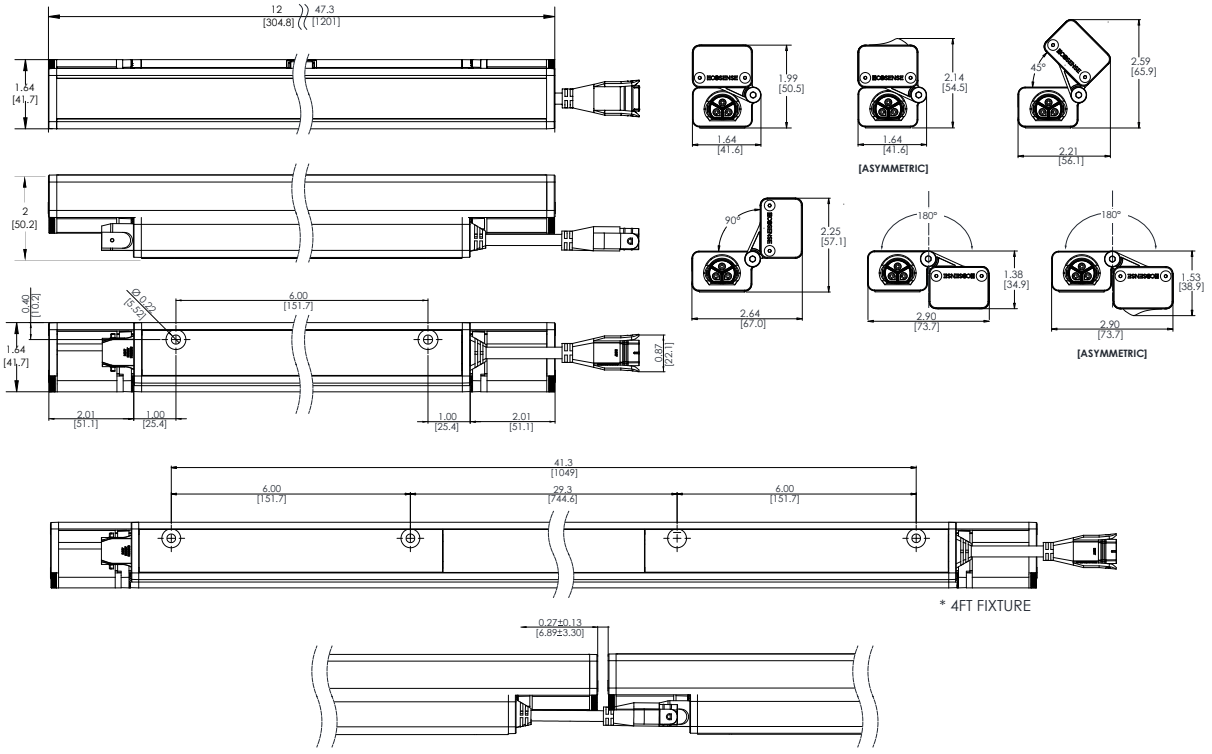
Landscape Stakes needed = 12" and 48" fixtures both need one set of 2.

Wire Box

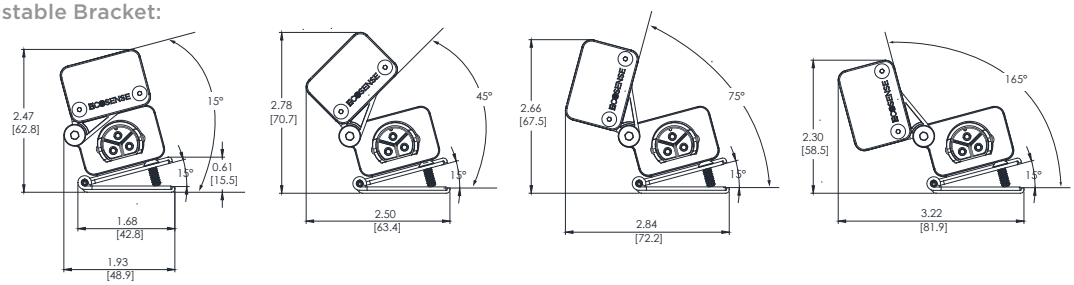
Conduit Connection, Wire Box, TROV, Interior Only, L50 .....**CC-L-WIREBOX**

Wire box can be used instead of a leader cable to start a run. 1/2" conduit fitting can attach directly to the box on one end and the fixture to the other.

DIMENSIONS + MOUNTING



Fine Adjustable Bracket:



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M Series Commercial

Project:	Type:
Product Code:	Date:

V 102423

4" Round Downlight

Versatile Solution for all spaces providing high quality lighting ranging from 750lm all the way up to 3500lm

Expedited Install with our easily adjustable universal housing and bar hanger systems allowing for application in most ceiling types

Enhanced Serviceability is achieved through interchangeable modules, optics, and trims, all of which allow for ease of maintenance and implementation of design changes below the ceiling plane

Seamless Integration with several control systems allowing two-channel control dimming options down as low as 0.1%

INSTALLATION

Ceiling Thickness
½" up to 2"

Ceiling Material
Drywall, Millwork

TRIMS

Aperture
4"

Shape
Round

Style
Standard, Hyperbolic, Pinhole, Wall Wash, Flangeless, Decorative

Finish
White, Black, Bronze, Clear Diffused, Warm Diffused, Custom

LIGHT OUTPUT & DISTRIBUTION

Module
Downlight

Lumens (Power)
750 lm (9.5W), 1000 lm (12.5W), 1250 lm (14.3W), 1500 lm (16.5W), 2000 lm (24.5W), 2500 lm (27.5W), 3000 lm (34.0W), 3500 lm (40.5W)

Color Quality
93+ CRI, 2-step SDCM

Color Temperature
2700K | 3000K | 3500K
4000K | Warm Dim (3000-1800K)
Tunable White (4000–1800K) | Tunable White (6500–2700K)

Beam Spread
Narrow Spot (15°) | Wide Flood (60°)
Spot (25°) | General (90°+)
Flood (40°)

POWER & CONTROLS

Input Voltage
120/277V

Dimming
0-10V (1%), DALI-2 (0.1%)

RATINGS & CERTIFICATIONS

Housing
RoHS Compliant

Module and Trim
UL Listed for Wet Location (Flanged Trims Only)
NSF Listed (White and Black Finish Only)

Warranty
5 year limited warranty; 50,000 hours

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M Series Commercial
4" Round Downlight

PRODUCT BUILDER | ROUND | DOWNLIGHT | 0-10V & DALI-2

HOUSING

PRODUCT CODE	
M4NCRN	4" Round Housing, New Construction, Non-IC Rated

LIGHT MODULE

PRODUCT CODE		LUMENS		CRI		CCT		BEAM SPREAD		DIMMING	
MD	Downlight Module	07	750 lm	9	93+ CRI	27	2700K	GA	General Ambient (90°+) [3]	O	0-10V
		10	1000 lm			30	3000K	NS	Narrow Spot (15°) [3]	D	DALI-2 [4]
		12	1250 lm			35	3500K	SP	Spot (25°)		
		15	1500 lm			40	4000K	FL	Flood (40°)		
		20	2000 lm			3W	Warm Dim (3000–1800K) [1]	WF	Wide Flood (60°)		
		25	2500 lm			T1	Tunable White (4000–1800K) [2]				
		30	3000 lm			T2	Tunable White (6500–2700K) [2]				
		35	3500 lm								

[1] *Only available in 1000 lm; not available in Narrow Spot beam spread*
[2] *Only available in 1000 lm, DALI-2 dimming; not available in Narrow Spot beam spread*
[3] *Only available in 750-2000 lm*
[4] *Only available in 1000 lm with Warm Dim or Tunable White CCT or 1250 lm with static CCT*

TRIM | STANDARD

PRODUCT CODE		FINISH		OPTION	
M4TRS	Standard Trim	WH	White	[Blank]	None
M4TRL	Wall Wash Trim [5,10]	BK	Black	FL	Flangeless [6,7]
M4TRP	Pinhole Trim [6,8,10]	BZ	Bronze		
M4TRH	Hyperbolic Trim [6,10]	CW	Clear Diffuse, White Flange		
		WW	Warm Diffuse, White Flange		
		CC	Custom Color		

TRIM | DECORATIVE

PRODUCT CODE	
M4TRSWHDOF	Decorative Open, Frosted [8,9]
M4TRSWHDCF	Decorative Closed, Frosted [8,9]
M4TRSWHDCC	Decorative Closed, Clear Frosted Side [8,9]
M4TRSWHDCCF	Decorative Closed, Clear Frosted Inside [8,9]

[5] *Recommended with Spot beam spread for Warm Dim & Tunable White CCT and Narrow Spot beam spread for all static CCT; available in 750-1250 lm only*
[6] *Only available in White, Black, Bronze or Custom Color finish*
[7] *Mud plate required for FL installation, except for wood ceiling*
[8] *Only available in 750-1000 lm*
[9] *Only available in General Ambient beam spread*
[10] *Available in 750-1500 lm only*

ACCESSORIES

M4XRMUD	Flangeless Mud Plate *(Required for Flangeless Trim drywall installation)*
M4KRTEMPLATE	Flangeless Wood Template (Recommended for Flangeless Trim wood installation)
MDLX-GA	Low Lumen (750-2000LM) Downlight Optic GA 90 Degree Beam Spread
MDLX-NS	Low Lumen (750-2000LM) Downlight Optic NS 15 Degree Beam Spread
MDLX-SP	Low Lumen (750-2000LM)Downlight Optic SP 25 Degree Beam Spread
MDLX-FL	Low Lumen (750-2000LM)Downlgiht Optic FL 40 Degree Beam Spread
MDLX-WF	Low Lumen (750-2000LM)Downlight Optic WF 60 Degree Beam Spread
MDHX-SP	High Lumen (2500LM-3500LM)Downlight Optic SP 25 Degree Beam Spread
MDHX-FL	High Lumen (2500LM-3500LM)Downlgiht Optic FL 40 Degree Beam Spread
MDHX-WF	High Lumen (2500LM-3500LM)Downlight Optic WF 60 Degree Beam Spread

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M Series Commercial
4" Round Downlight

PRODUCT BUILDER | ROUND | DOWNLIGHT | EMERGENCY LIGHTING

HOUSING

PRODUCT CODE		INSTALLATION		SHAPE		RATING		LUMEN		DIMMING		OPTION	
M4	4" Housing	NC	New Construction	R	Round	N	Non-IC	07	750 lm	O	0-10V for EM only	EM	Emergency driver, Integrated switch [1]
								10	1000 lm			EMS	Emergency driver, Remote switch
								12	1250 lm				
								15	1500 lm				
								20	2000 lm				
								25	2500 lm				
								30	3000 lm				
								35	3500 lm				

[1] *Integrated test switch required for both housing and trim*

LIGHT MODULE

PRODUCT CODE		LUMENS		CRI		CCT		BEAM SPREAD		DIMMING	
MD	Downlight Module	07	750 lm	9	93+ CRI	27	2700K	GA	General Ambient (90°+) [3]	A	Alternate
		10	1000 lm			30	3000K	NS	Narrow Spot (15°) [3]		
		12	1250 lm			35	3500K	SP	Spot (25°)		
		15	1500 lm			40	4000K	FL	Flood (40°)		
		20	2000 lm			3W	Warm Dim (3000–1800K) [2]	WF	Wide Flood (60°)		
		25	2500 lm								
		30	3000 lm								
		35	3500 lm								

[2] *Only available in 1000 lm; Not available in Narrow Spot beam spread*

[3] *Only available in 750-2000 lm*

TRIM | STANDARD

PRODUCT CODE		FINISH		OPTION	
M4TRS	Standard Trim	WH	White	[Blank]	None
M4TRL	Wall Wash Trim [4]	BK	Black	FL	Flangeless [5,6]
M4TRP	Pinhole Trim [5,10]	BZ	Bronze	EM	Integrated test switch [1,8,9]
M4TRH	Hyperbolic Trim [5]	CW	Clear Diffuse, White Flange		
		WW	Warm Diffuse, White Flange		
		CC	Custom Color		

TRIM | DECORATIVE

PRODUCT CODE	
M4TRSWHDOF	Decorative: Open, Frosted [7]
M4TRSWHDCF	Decorative: Closed, Frosted [7]
M4TRSWHDCC	Decorative: Closed, Clear Frosted Side [7]
M4TRSWHDCCF	Decorative: Closed, Clear Frosted Inside [7]

[4] *Recommended with Spot beam spread for Warm Dim & Tunable White CCT and Narrow Spot beam spread for all static CCT and available in 750-1250 lm only*

[5] *Only available in White, Black, Bronze or Custom Color finish*

[6] *Mud Plate required for FL Install except for wood ceiling*

[7] *Only available in 750-1000 lm in General Ambient beam spread*

[8] *Only available in Standard style*

[9] *Only available in White Clear Diffuse Warm Diffuse or Custom Color*

[10] *Only available in 750 or 1000 lm*

ACCESSORIES

M4XRMUD	Flangeless Mud Plate *(Required for Flangeless Trim drywall installation)*
M4KRTEMPLATE	Flangeless Wood Template *(Recommended for Flangeless Trim wood installation)*

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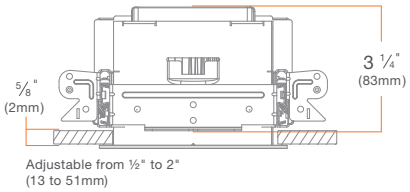
M Series Commercial
4" Round Downlight

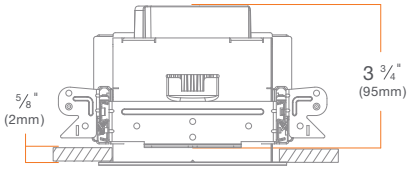
MODULE

750LM-1250LM



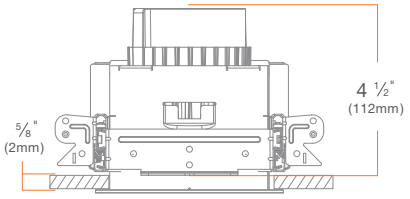
Adjustable from ½" to 2"
(13 to 51mm)

1500LM, DALI-2



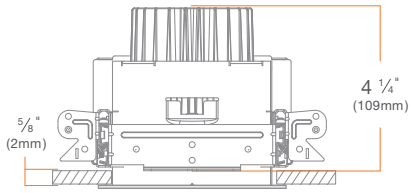
Adjustable from ½" to 2"
(13 to 51mm)

2000LM



Adjustable from ½" to 2"
(13 to 51mm)

2500LM-3500LM



Adjustable from ½" to 2"
(13 to 51mm)

PERFORMANCE SUMMARY

	STATIC CCT	WARM DIM	TUNABLE WHITE
CCT	2700K, 3000K, 3500K, 4000K	3000K - 1800K	4000K - 1800K; 6500K - 2700K
LUMENS (POWER)	750 lm (9.5W), 1000 lm(12.5W), 1250 lm(14.3W), 1500 lm (16.5W), 2000 lm(24.5W), 2500 lm(27.5W), 3000 lm(34.0W), 3500 lm(40.5W)	1000 lm (12.5W)	1000 lm (14.5W)
EFFICACY	77 lm/W, 80 lm/W, 87 lm/W, 91 lm/W, 82 lm/W, 91 lm/W, 89 lm/W, 87 lm/W	83 lm/W	71 lm/W
COLOR QUALITY	93+ CRI [1], 2-step SDCM	93+ CRI [1], 2-step SDCM	93+ CRI [1], 3-step SDCM
BEAM SPREAD	General Ambient (90°+), Narrow Spot (15°), Spot (25°), Flood (40°), Wide Flood (60°)	General Ambient (90°+), Spot (25°), Flood (40°), Wide Flood (60°)	General Ambient (90°+), Spot (25°), Flood (40°), Wide Flood (60°)
DIMMING	0-10V, DALI-2	0-10V, DALI-2	DALI-2
LED CHIP	Cree	Bridgelux	Bridgelux
LISTINGS	ENERGY STAR® qualified [2], UL Listed for Wet Location, UL Certified US·CA, Declare, RoHS compliant, NSF/ANSI 2 listed, suitable for splash-zone, DALI-2 Compliant		

[1] Tested in accordance to IESNA LM-79-2008
[2] Refer to ENERGY STAR Certified light fixtures database

ADDITIONAL

INPUT VOLTAGE: 120/277V, 50/60Hz

MAX INPUT CURRENT (120V): 0.350 amps

MAX INPUT CURRENT (277V): 0.165 amps

AC CONNECTOR: 6 pin Molex
DC CONNECTOR: Male 4-Pin Low Voltage Connector

POWER FACTOR: Greater than 0.9

TOTAL HARMONIC DISTORTION: Less than 20%

AMBIENT OPERATING TEMPERATURE: -20°C to 40°C

WARRANTY: 5 year limited warranty; 50,000 hours at 70% lumen maintenance

DMF LIGHTING 1118 E. 223rd St. Carson, CA 90745 323.934.7779 info@dmflighting.com dmflighting.com
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dmf

M Series Commercial
4" Round Downlight

HOUSING

New Construction M4NCRN

SUMMARY

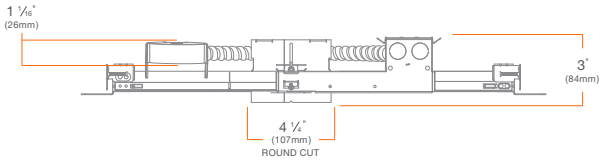
JUNCTION BOX: Equipped with 6 knockouts: two ½" and two ¾" trade size knockouts on top, two ½" trade size knockouts on side. Approved for 8 (four in, four out) #12 AWG 70°C.

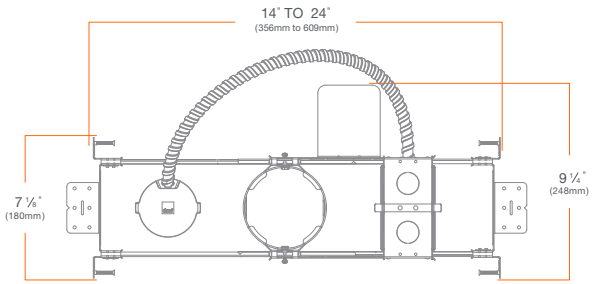
BAR HANGER MOUNTING: Adjustable Bar Hangers for 14"-24" joist spacing. Compatible with traditional joists, Armstrong™ ceiling, Hat Channel, T-Bar.

CEILING: ½" up to 2"

CUTOUT: 4 ¼" (107mm) round opening

WARRANTY: 5 year limited warranty





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M Series Commercial
4" Round Downlight

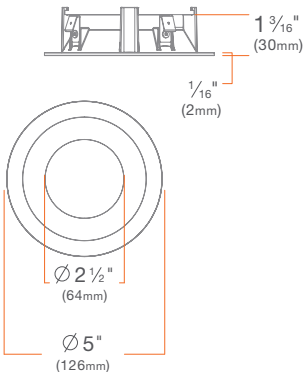
TRIMS

SUMMARY

CONSTRUCTION: Die-cast aluminum
DECORATIVE: Acrylic diffuser
INSTALLATION: Twist & Lock

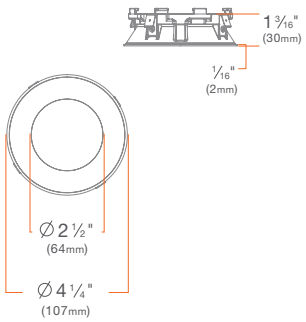
Standard

M4TRSWH



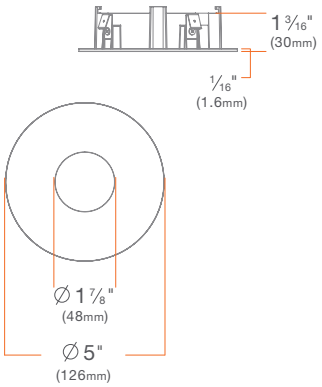
Flangeless

M4TRSWHFL



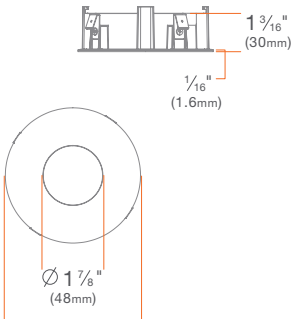
Pinhole

M4TRPWH



Flangeless Pinhole

M4TRPWHFL



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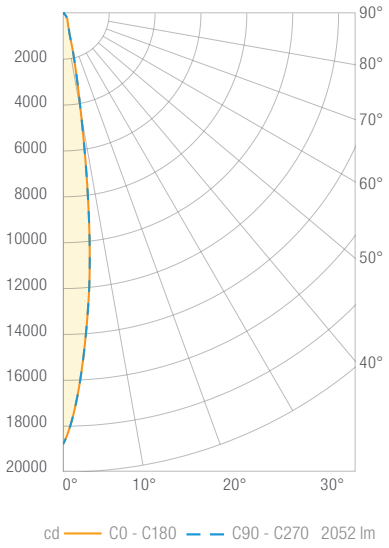
M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, Narrow Spot

MD20930NS | M4TRSWH



Luminous Intensity

Gamma	C 0˚
0º	18766
5º	12609
10º	4461
15º	1402
20º	682
25º	466
30º	372
35º	304
40º	221
45º	162
50º	116
55º	81
60º	53
65º	30
70º	13
75º	8
80º	5
85º	2
90º	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1625	79
0-40	1810	88
0-60	2010	98
0-90	2052	100
0-180	2052	100

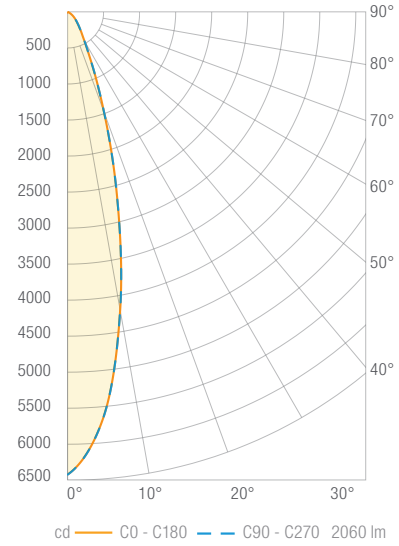
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	2085.2	0.7'
6'	521.3	1.5'
9'	231.7	2.2'
12'	130.3	2.9'

Beam Angle: 14°

MD 2000 lm, 3000K, Spot

MD20930SP | M4TRSWH



Luminous Intensity

Gamma	C 0˚
0º	6422
5º	5661
10º	4202
15º	2653
20º	1478
25º	799
30º	472
35º	319
40º	227
45º	166
50º	119
55º	82
60º	50
65º	29
70º	13
75º	8
80º	4
85º	2
90º	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1612	78
0-40	1817	88
0-60	2020	98
0-90	2060	100
0-180	2060	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	713.5	1.4'
6'	178.4	2.8'
9'	79.3	4.2'
12'	44.6	5.6'

Beam Angle: 26°

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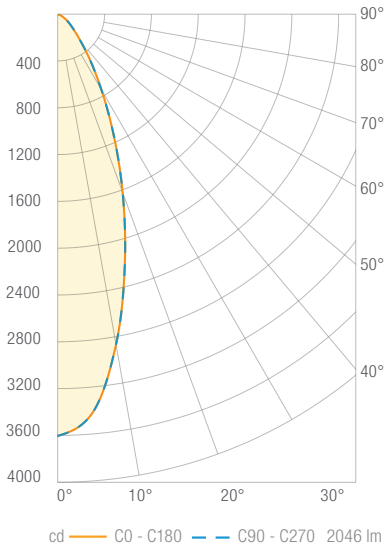
M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, Flood

MD20930FL | M4TRSWH



Luminous Intensity

Gamma	C 0°
0°	3604
5°	3418
10°	2867
15°	2215
20°	1620
25°	1123
30°	746
35°	487
40°	309
45°	204
50°	141
55°	98
60°	57
65°	34
70°	15
75°	10
80°	6
85°	3
90°	0

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1438	70
0-40	1748	85
0-60	1998	98
0-90	2046	100
0-180	2046	100

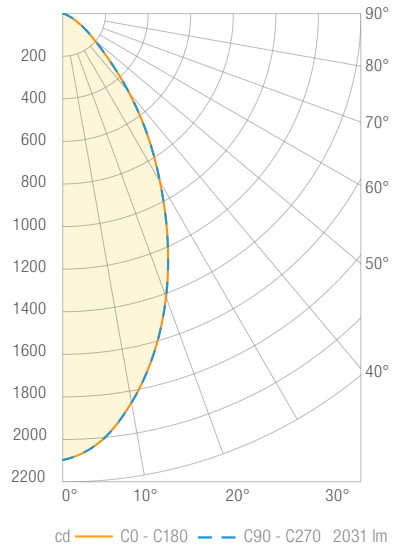
Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	400.5	2.0'
6'	100.1	4.0'
9'	44.5	6.0'
12'	25.0	8.0'

Beam Angle: 37°

MD 2000 lm, 3000K, Wide Flood

MD20930WF | M4TRSWH



Luminous Intensity

Gamma	C 0°
0°	2096
5°	2018
10°	1855
15°	1651
20°	1416
25°	1162
30°	912
35°	689
40°	480
45°	307
50°	195
55°	129
60°	78
65°	45
70°	22
75°	12
80°	7
85°	4
90°	1

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	1179	58
0-40	1605	79
0-60	1967	97
0-90	2031	100
0-180	2031	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	232.9	3.1'
6'	58.2	6.2'
9'	25.9	9.3'
12'	14.6	12.4'

Beam Angle: 55°

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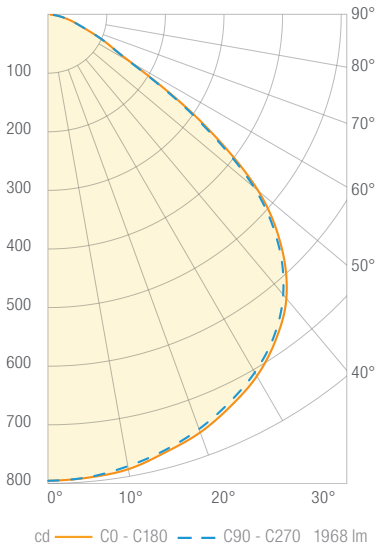
M Series Commercial
4" Round Downlight

PHOTOMETRY

MD 2000 lm, 3000K, General Ambient

MD20930GA



Luminous Intensity

Gamma	C 0°
0°	796
5°	793
10°	788
15°	773
20°	759
25°	737
30°	712
35°	677
40°	632
45°	564
50°	468
55°	318
60°	163
65°	103
70°	62
75°	41
80°	24
85°	11
90°	3

Values in candela

Zonal Lumen Summary

Zone	Lumens	Luminaire %
0-30	640	32
0-40	1067	54
0-60	1798	91
0-90	1968	100
0-180	1968	100

Illuminance Chart

Distance from LED	Foot Candles	Diameter
3'	88.4	7.8'
6'	22.1	15.5'
9'	9.8	23.3'
12'	5.5	31.1'

Beam Angle: 105° x 104°

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Wall luminaire · Directed light

BEGA

Type:
BEGA Product:
Project:
Modified:

Application
Wall mounted luminaire with directed light designed to be mounted at various heights for general purpose illumination or glare free illumination when below eye level.

Materials
Clear safety glass with matte finish
Marine grade, copper free (≤ 0.3% copper content) A360.0 aluminum alloy
High temperature silicone gasket
Mechanically captive stainless steel fasteners
Silicone applied robotically to casting, plasma treated for increased adhesion

NRTL listed to North American Standards, suitable for wet locations
Protection class IP 65

Weight: 3.1 lbs.

Electrical

Operating voltage	120-277V AC
Minimum start temperature	-30° C
LED module wattage	6.1 W
System wattage	8.0 W
Controllability	0-10V, TRIAC, and ELV dimmable
Color rendering index	Ra > 90
Luminaire lumens	459 lm
LED service life (L70)	60000 hrs

LED color temperature
☐ 4000K (K4)
☐ 3500K (K35)
☐ 3000K (K3)
☐ 2700K (K27)

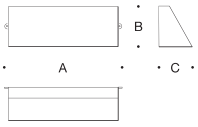
BEGA can supply you with suitable LED replacement modules for up to 20 years after the purchase of LED luminaires - see website for details

Finish
All BEGA standard finishes are matte, textured powder coat with minimum 3 mil thickness. BEGA Unidure® finish provides superior fade protection in Black, Bronze, and Silver. BEGA standard White is a super durable polyester powder. Optionally available RAL and custom color finishes provided in either polyester powder or liquid paint.

Available colors
☐ Black (BLK)
☐ Bronze (BRZ)
☐ Silver (SLV)
☐ White (WHT)
☐ RAL:
☐ CUS:

Available options

☐ CUS	Custom finish
☐ FSC	Fusing
☐ MGU	Marine grade undercoat
☐ RAL	RAL finish



Wall luminaire · Directed light

		LED	A	B	C
B24372	ADA	6.1 W	7 7/8	4 3/8	3 3/8

BEGA 1000 BEGA Way, Carpinteria, CA 93013 (805) 684-0533 info@bega-us.com

Due to the dynamic nature of lighting products and the associated technologies, luminaire data on this sheet is subject to change at the discretion of BEGA North America. For the most current technical data, please refer to bega-us.com
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Updated 08/27/24

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Downtown

Round Outdoor Ceiling Mount

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ FM-W47205 5"	❍ 3000K	❍ BK Black	11.9W	900	607
	❍ 3500K	❍ WT White	11.9W	925	647
	❍ 4000K		11.9W	950	618

Example: **FM-W47205-40-WT**

For custom requests please contact customs@waclighting.com

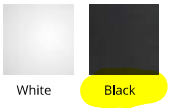
FEATURES

- Built in color temperature adjustability. Switch from 3000K/3500K/4000K
- Option to pre-select color temperature or adjust in the field
- ACLED driverless technology
- 5 Year warranty

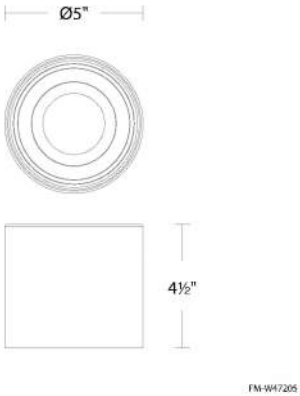
SPECIFICATIONS

Color Temp:	3500K,3000K,4000K
Input:	120 VAC,50/60Hz
CRI:	90
Dimming:	ELV: 100-10% ,TRIAC: 100-10%
Rated Life:	54000 Hours
Mounting:	Can be mounted on ceiling or wall in all orientations
Standards:	ETL, cETL,IP65,Title 24 JA8 Compliant
	Wet Location Listed
Construction:	Aluminum body, glass diffuser

FINISHES:



LINE DRAWING:



VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

- Wet-rated VERSatile fixture encapsulated in polyurethane
- The polyurethane encapsulation provides optimal delivered lumens
- Features integrated metal endcaps
- Mounting options include a concealed or magnetic clip
- With an internal White Optics coating, the fixture achieves greater lumen output
- Durable anodized aluminum housings
- Consult factory for field assembly options

1 PRODUCT	2 WATTS/ FT	3 CCT	4 RATED	5 LENS	6 EXTERNAL LOUVER	7 WIRE IN/ OUT	8 CONN/ WIRE IN	9 CONN/ WIRE OUT	10 END CAP IN	11 END CAP OUT	12 WIRE COLOR	13 WIRE TYPE	14 MOUNTING	15 FINISH	16 LENGTH (IN)	17 EXACT/ OPTIMAL
VERS-06-SW																

Sample Part Number: **VERS-06-SW-5.0-30-DRY-ENC/TL-L1-BK-P1-BW-BW-STD-STD-BK-CL2-CC-BK-48"-E**

1 PRODUCT

VERS-06-SW

See following pages for compatible power supplies.

2 WATTS/FT

1.5	1.5W/ft
3.0	3.0W/ft
4.0	4.0W/ft
5.0	5.0W/ft
1.5HE	1.5W/ft HE
3.0HE	3.0W/ft HE
6.0HE	6.0W/ft HE

3 CCT

24	2400K
27	2700K
30	3000K
35	3500K
40	4000K

4 RATED

DRY	IP20
WET	IP67

5 LENS

ENC/CL	Encapsulated in Clear
ENC/TL	Encapsulated in Translucent

For representation of LED visibility, see Diode Visibility section on following pages.
For beam angles, see Photometric Performance section on following pages

6 EXTERNAL LOUVER

L1-WH	White Plastic
L1-BK	Black Plastic
L2-ST	Satin Anodized Aluminum
L2-BK	Black Anodized Aluminum
L2-WH	White Powder Coated Aluminum
N/A	No Louver

Plastic Louvers come in 12" lengths, multiple pieces will be used to match fixture length. Aluminum louvers come in maximum 98" lengths and will be cut to match fixture length.

7 WIRE IN/OUT

S1	Single 1 - End Feed
S2	Single 2 - Bottom Feed
S3	Single 3 - Left Side Feed
S4	Single 4 - Right Side Feed

P1	Pass Through 1 - End Feed
P2	Pass Through 2 - Bottom Feed
P3	Pass Through 3 - Left Side Feed
P4	Pass Through 4 - Right Side Feed

P2, P3, P4 options not compatible with external louver

8 CONN/WIRE IN

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

9 CONN/WIRE OUT

CLS	Closed End (No feed)

BW	Bare Wire (Standard 36")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire Out not needed to specify product. Typical selection is CLS or BW.
BW: Standard length is 36", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

10 END CAP IN

STD	Standard
CL	Clear

STD - End cap matches fixture finish chosen
Select CL for continuous runs

11 END CAP OUT

STD	Standard
CL	Clear

STD - End cap matches fixture finish chosen
Select CL for continuous runs

12 WIRE COLOR

WH	White
BK	Black

13 WIRE TYPE

CL2	Class 2
CL2P	Plenum Rated

CL2P only available with bare wire leads (BW)

14 MOUNTING

CC	Concealed Clip
MG	Magnet

15 FINISH

ST	Satin
BK	Black
BZ	Bronze
WH	White
CU	Custom

16 LENGTH (IN)

Fixture length min 12", max 98.43" not including end caps. Consult factory for lengths under 12".

17 EXACT/OPTIMAL

O	Optimal Illumination
E	Exact Specified Length

Exact fixtures are the exact length specified +0 – 1/8".
Optimal fixtures' length is rounded down with illumination end to end.
See Exact/Optimal Fixture Length charts.

5 year warranty | Warranty only valid with QTL power supplies | Field modifications void warranty | Data subject to change, all data has +/- 5% tolerance

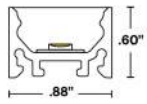
© 2024 QTL. All rights reserved | 155 Hill St. Milford, CT 06460 | 203-367-8777 | sales@QTL.lighting | www.QTL.lighting

Specification subject to change. Rev-08-30-24

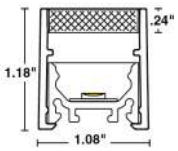
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

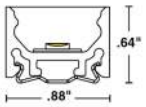
1 PRODUCT - DIMENSIONS



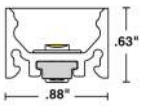
Profile



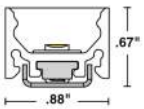
VERS-06 with L1/L2 Louver



Profile with concealed clip



Profile with magnetic clip



Profile with magnet mount clip
& magnetic mount accessory

2 DELIVERED LUMENS

[Calculated L70 = 40000 hrs]
Tested with VERS-06-SW-**-30-DRY

	1.5 W/FT		1.5HE W/FT		3.0 W/FT		3.0HE W/FT		4.0 W/FT		5.0 W/FT		6.0HE W/FT	
	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI	LM/FT	CRI
ENC/CL	139	96	185	97	242	96	335	96	286	96	347	96	575	96
ENC/TL	125	96	154	97	204	96	283	96	273	96	307	96	490	96

5 DIODE VISIBILITY

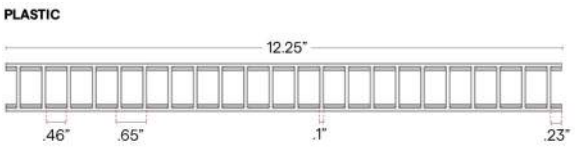
ENC/CL - Clear encapsulation

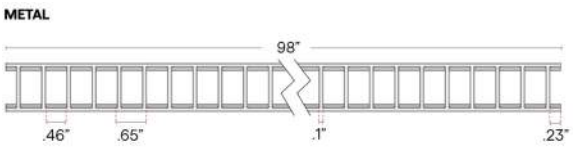
ENC/TL - Translucent encapsulation

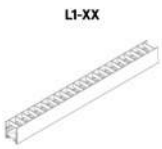
PHOTOMETRIC PERFORMANCE

Nominal beam spread shown, beam spread varies based on light engine. For more detailed information, see photometric data.

6 EXTERNAL LOUVER







Lumen Multiplier

WH	BK
0.70	0.54

Lumen Multiplier

WH	BK	ST
0.64	0.39	0.59

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VERS-ENCAPSULATED (06) STATIC WHITE

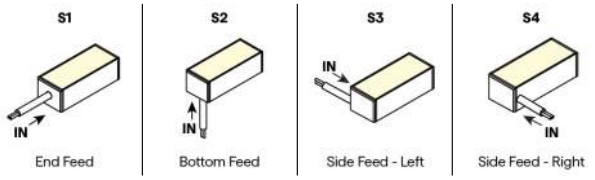
Linear Fixtures - Surface

TEMPERATURE RATINGS

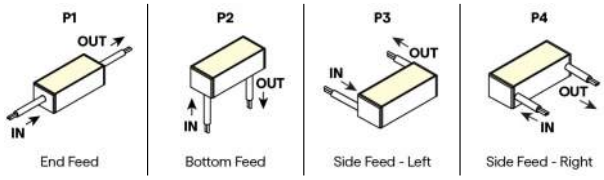
	1.5 W/FT		1.5 HE W/FT		3.0 W/FT		3.0 HE W/FT		4.0 W/FT		5.0 W/FT		6.0 HE W/FT	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Ambient Operating Temp - Surface	-4°F	130°F	-4°F	135°F	-4°F	120°F	-4°F	125°F	-4°F	115°F	-4°F	105°F	-4°F	105°F

7 WIRE INPUT/OUTPUT

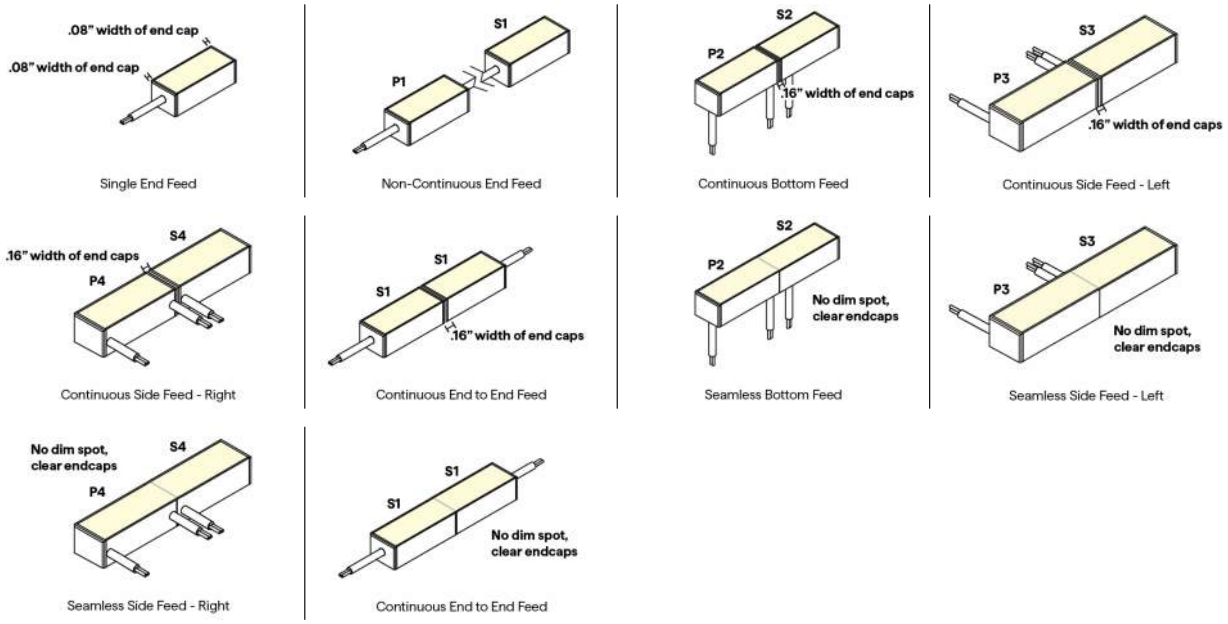
SINGLE (Input only)



PASS THROUGH (Input/Output)



CONFIGURATION OPTIONS



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VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

8/9 CONNECTOR/WIRE – IN/OUT

Connector/Wire In or Out not needed to specify product.

BW

Bare Wire 36"
Stranded 22 AWG

CON6/CON24

6" or 24" Overall
Wire Connector | 22 AWG
IP67 Rated, UL Listed

10/11 END CAP – IN/OUT

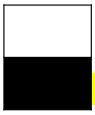
STD

End cap matches fixture finish chosen

CL

Clear end cap

12 WIRE COLOR



White

Black

14 MOUNTING

CC (CC-01)

Concealed Clip

2 pieces of hardware provided for 4' or less; 4 pieces of hardware provided for greater than 4'

To order separately use CC-01

Each clips comes with a #4 x 5/8" Flat Head screw.

CC (CC-02)

Louver Concealed Clip
Required if L1 or L2 Louver is selected

2 pieces of hardware provided for 4' or less; 4 pieces of hardware provided for greater than 4'

To order separately use CC-02

Each clips comes with a #4 x 5/8" Flat Head screw.

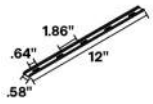
MG

Magnet Clip

One MG provided per foot

To order separately use MG-02

MMA-02



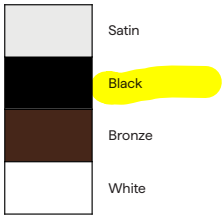
Magnet Mount
Accessory for MG-02

Sold separately, to order use MMA-02

Each clip comes with a #6 Flat Screw

Required when mounting to a non-magnetic surface

15 FINISH



Satin

Black

Bronze

White

Custom color available

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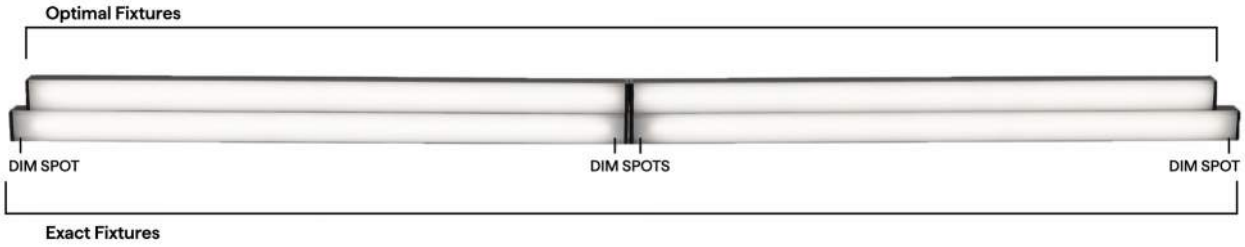
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

17 EXACT/OPTIMAL FIXTURE LENGTH

Exact fixtures are the exact length specified. Optimal fixtures' length is rounded down based on LED cut points to allow the fixture to be illuminated end to end. For runs with multiple fixtures that need to fill a specific length, it's recommended to order all optimal fixtures with an exact fixture at the end of the run.



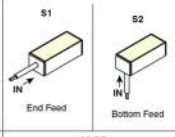
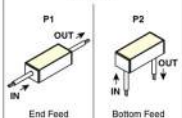
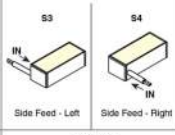
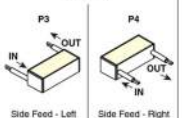
SW DRY LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	.5"
13"	.5"
14"	.5"
15"	.5"
16"	.5"
17"	.5"
18"	.5"
19"	.5"
20"	.5"
21"	.5"
22"	.5"
23"	.5"
24"	.5"
36"	.5"
48"	.5"
60"	.5"
72"	.5"
84"	.5"
96"	.5"

OPTIMAL LENGTH

Requested Nominal Length	S1 & S2		P1 & P2		S3 & S4		P3 & P4	
								
	End Feed	Bottom Feed	End Feed	Bottom Feed	Side Feed - Left	Side Feed - Right	Side Feed - Left	Side Feed - Right
12"	11.5"		11.75"		11.375"		11.375"	
13"	12.5"		12.75"		12.375"		12.375"	
14"	13.5"		13.75"		13.375"		13.375"	
15"	14.5"		14.75"		14.375"		14.375"	
16"	15.5"		15.75"		15.375"		15.375"	
17"	16.5"		16.75"		16.375"		16.375"	
18"	17.5"		17.75"		17.375"		17.375"	
19"	18.5"		18.75"		18.375"		18.375"	
20"	19.5"		19.75"		19.375"		19.375"	
21"	20.5"		20.75"		20.375"		20.375"	
22"	21.5"		21.75"		21.375"		21.375"	
23"	22.5"		22.75"		22.375"		22.375"	
24"	23.5"		23.75"		23.375"		23.375"	
36"	35.5"		35.75"		35.375"		35.375"	
48"	47.5"		47.75"		47.375"		47.375"	
60"	59.5"		59.75"		59.375"		59.375"	
72"	71.5"		71.75"		71.375"		71.375"	
84"	83.5"		83.75"		83.375"		83.375"	
96"	95.5"		95.75"		95.375"		95.375"	

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Specification subject to change. Rev-08-30-24

VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

SW WET LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	.5"
13"	.5"
14"	.5"
15"	.5"
16"	.5"
17"	.5"
18"	.5"
19"	.5"
20"	.5"
21"	.5"
22"	.5"
23"	.5"
24"	.5"
36"	.5"
48"	.5"
60"	.5"
72"	.5"
84"	.5"
96"	.5"

OPTIMAL LENGTH

Requested Nominal Length	S1 & S2 (S1: End Feed; S2: Bottom Feed)	P1 & P2 (P1: End Feed; P2: Bottom Feed)	S3 & S4 (S3: Side Feed - Left; S4: Side Feed - Right)	P3 & P4 (P3: Side Feed - Left; P4: Side Feed - Right)
12"	11.625"	11.75"	11.5"	11.375"
13"	12.625"	12.75"	12.5"	12.375"
14"	13.625"	13.75"	13.5"	13.375"
15"	14.625"	14.75"	14.5"	14.375"
16"	15.625"	15.75"	15.5"	15.375"
17"	16.625"	16.75"	16.5"	16.375"
18"	17.625"	17.75"	17.5"	17.375"
19"	18.625"	18.75"	18.5"	18.375"
20"	19.625"	19.75"	19.5"	19.375"
21"	20.625"	20.75"	20.5"	20.375"
22"	21.625"	21.75"	21.5"	21.375"
23"	22.625"	22.75"	22.5"	22.375"
24"	23.625"	23.75"	23.5"	23.375"
36"	35.625"	35.75"	35.5"	35.375"
48"	47.625"	47.75"	47.5"	47.375"
60"	59.625"	59.75"	59.5"	59.375"
72"	71.625"	71.75"	71.5"	71.375"
84"	83.625"	83.75"	83.5"	83.375"
96"	95.625"	95.75"	95.5"	95.375"

SW-HE DRY LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	1"
13"	0.5"
14"	1"
15"	0.5"
16"	1"
17"	0.5"
18"	1"
19"	0.5"
20"	1"
21"	0.5"
22"	1"
23"	0.5"
24"	1"
36"	1"
48"	1"
60"	1"
72"	1"
84"	1"
96"	1"

OPTIMAL LENGTH: highlighted rows are closest to requested nominal length

Requested Nominal Length	S1 & S2 (S1: End Feed; S2: Bottom Feed)	P1 & P2 (P1: End Feed; P2: Bottom Feed)	S3 & S4 (S3: Side Feed - Left; S4: Side Feed - Right)	P3 & P4 (P3: Side Feed - Left; P4: Side Feed - Right)
12"	10.5"	10.75"	10.375"	10.375"
13"	12.5"	12.75"	12.375"	12.375"
14"	12.5"	12.75"	12.375"	12.375"
15"	14.5"	14.75"	14.375"	14.375"
16"	14.5"	14.75"	14.375"	14.375"
17"	16.5"	16.75"	16.375"	16.375"
18"	16.5"	16.75"	16.375"	16.375"
19"	18.5"	18.75"	18.375"	18.375"
20"	18.5"	18.75"	18.375"	18.375"
21"	20.5"	20.75"	20.375"	20.375"
22"	20.5"	20.75"	20.375"	20.375"
23"	22.5"	22.75"	22.375"	22.375"
24"	22.5"	22.75"	22.375"	22.375"
36"	34.5"	34.75"	34.375"	34.375"
48"	46.5"	46.75"	46.375"	46.375"
60"	58.5"	58.75"	58.375"	58.375"
72"	70.5"	70.75"	70.375"	70.375"
84"	82.5"	82.75"	82.375"	82.375"
96"	94.5"	94.75"	94.375"	94.375"

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Specification subject to change. Rev-08-30-24

VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

SW-HE-WET LENGTHS BY INCH

Available in any length in between 12" and 98" not including end caps, chart below shows example lengths. Exact fixtures are the length specified. Optimal fixtures' length is rounded down with illumination end to end. All fixtures' tolerance is +0 – 1/8". Consult factory for lengths under 12".

EXACT LENGTH

Requested Length	Potential dim spot on either end of fixture
12"	1"
13"	0.5"
14"	1"
15"	0.5"
16"	1"
17"	0.5"
18"	1"
19"	0.5"
20"	1"
21"	0.5"
22"	1"
23"	0.5"
24"	1"
36"	1"
48"	1"
60"	1"
72"	1"
84"	1"
96"	1"

OPTIMAL LENGTH: highlighted rows are closest to requested nominal length

Requested Nominal Length	S1 & S2 (S1 End Feed, S2 Bottom Feed)	P1 & P2 (P1 End Feed, P2 Bottom Feed)	S3 & S4 (S3 Side Feed - Left, S4 Side Feed - Right)	P3 & P4 (P3 Side Feed - Left, P4 Side Feed - Right)
12"	10.625"	10.875"	10.625"	10.625"
13"	12.625"	12.875"	12.625"	12.625"
14"	12.625"	12.875"	12.625"	12.625"
15"	14.625"	14.875"	14.625"	14.625"
16"	14.625"	14.875"	14.625"	14.625"
17"	16.625"	16.875"	16.625"	16.625"
18"	16.625"	16.875"	16.625"	16.625"
19"	18.625"	18.875"	18.625"	18.625"
20"	18.625"	18.875"	18.625"	18.625"
21"	20.625"	20.875"	20.625"	20.625"
22"	20.625"	20.875"	20.625"	20.625"
23"	22.625"	22.875"	22.625"	22.625"
24"	22.625"	22.875"	22.625"	22.625"
36"	34.625"	34.875"	34.625"	34.625"
48"	46.625"	46.875"	46.625"	46.625"
60"	58.625"	58.875"	58.625"	58.625"
72"	70.625"	70.875"	70.625"	70.625"
84"	82.625"	82.875"	82.625"	82.625"
96"	94.625"	94.875"	94.625"	94.625"

COMPATIBLE POWER SUPPLIES

See power supplies cut sheets for more information. Data subject to change, all data has +/- 5% tolerance.

DIM TO LEVEL	INDOOR		OUTDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Dim to Black	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	QOM-DC+CAP QOM-PH	QOM-DC+CAP QOM-PH
0.1%	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V
1%	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
10%	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle	Q-HEX-mini-DC Q-SET-mLED	

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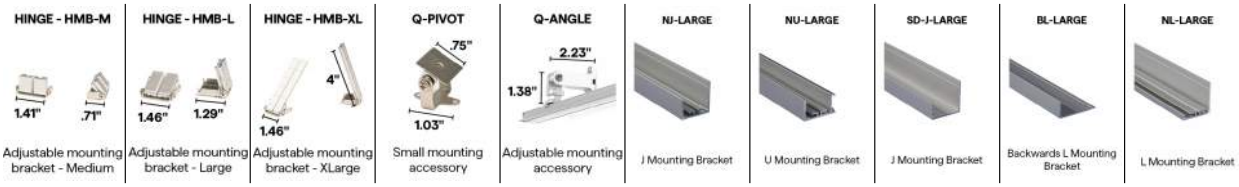
VERS-ENCAPSULATED (06) STATIC WHITE

Linear Fixtures - Surface

DIMMING PROTOCOL	INDOOR		OUTDOOR	
	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+	SW24/1.5-4.0	SW24/5.0, SW-HE, SW-HE+
Non-Dim	QTM-eLED+CAP QTM-eLED-ND QZ-ND	QTM-eLED+CAP QTM-eLED-ND QZ-ND	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65
Phase	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q-HEX-mini-DC Q-SET-QZ-PH/0-10V Q-SET-mLED QOM-DC+CAP QOM-PH QZ-PH/0-10V	Q-SET-QZ-PH/0-10V QOM-DC+CAP QOM-PH QZ-PH/0-10V
0-10V	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V
Lutron Athena	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN		
ECO System	QTM-eLED(E)	QTM-eLED(E)		
DMX	QZ-DMX	QZ-DMX	Q-SET-QZ-DMX QZ-DMX	Q-SET-QZ-DMX QZ-DMX
DALI-2: DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
SCENE App Dimmed	Non-Dim Power Supply with SW App Dongle	Non-Dim Power Supply with SW App Dongle		

COMPATIBLE MOUNTING ACCESSORIES



© 2024 QTL. All rights reserved | 155 Hill St. Milford, CT 06460 | 203-367-8777 | sales@QTLlighting | www.QTLlighting

Specification subject to change. Rev-08-30-24

MINI ACCENT 12V

5111

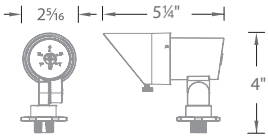
WAC
LANDSCAPE LIGHTING

Fixture Type:

Catalog Number:

Project:

Location:



PRODUCT DESCRIPTION

Landscape mini accent luminaire. One fixture replaces all older halogen landscape accent lights

FEATURES

- Continuously Adjustable Beam Angles. Indexed at 10º, 25°, 40°, 50°
- Continuously Adjustable brightness control. Indexed at 1W, 2W, 4W, 6W, 7W
- IP66 rated, Protected against high-pressure water jets
- Solid diecast brass or corrosion resistant aluminum
- Factory sealed water tight fixtures
- Constant output for 9V-15V input
- Can be used as an uplight or downlight
- 2700K or 3000K color temperature
- Mounting stake, detachable shroud, 6' lead wire and direct burial gel filled wire nuts included
- MLV dimmable with remote MLV dimmers

SPECIFICATIONS

Input:	9 -15VAC
Power:	1W to 7W / 2VA -10.5VA
Brightness:	45 lm to 365 lm
Beam Angle:	10° to 50°
CRI:	85
Rated Life:	70,000 hours

ORDERING NUMBER

		Color Temp		Finish	
5111	*Mini Accent 12V*	**27**	*2700K Warm White*	**BK**	*Black on Aluminum*
		30	*3000K Pure White*	**BZ**	*Bronze on Aluminum*
				BBR	*Bronze on Brass*
				WT	*White on Aluminum*

5111-30____

Example: **5111-30BBR**

waclighting.com
Phone (800) 526.2588
Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive
Port Washington, NY 11050

Central Distribution Center
1600 Distribution Ct
Lithia Springs, GA 30122

Western Distribution Center
1750 Archibald Avenue
Ontario, CA 91760

WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. MAR 02 2021

MINI ACCENT 12V

5111

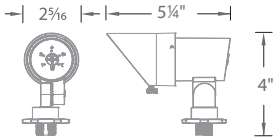
WAC
LANDSCAPE LIGHTING

Fixture Type:

Catalog Number:

Project:

Location:



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- IP66 rated, Protected against high-pressure water jets
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- Factory sealed water tight fixtures
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- Can be used as an uplight or downlight
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- Mounting stake, detachable shroud, 6' lead wire and direct burial gel filled wire nuts included
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		30	*3000K Pure White*	**BZ**	*Bronze on Aluminum*
				BBR	*Bronze on Brass*
				WT	*White on Aluminum*

5111-30____

Example: **5111-30BBR**

waclighting.com
Phone (800) 526.2588
Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive
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MINI ACCENT 12V

5111

WAC
LANDSCAPE LIGHTING

Accessories

Accent Snoot		**5111-SNOOT-BK** **5111-SNOOT-BZ** **5111-SNOOT-BBR**	*Black on Aluminum* *Bronze on Aluminum* *Bronze on Brass*	*Shields lamp and reduces glare*
5" Long Shroud		**5111-LSHR-BK** **5111-LSHR-BZ** **5111-LSHR-BBR**	*Black on Aluminum* *Bronze on Aluminum* *Bronze on Brass*	*Reduce glare. Ideal for downlighting application*
Additional Stake		**9000-ST9-BZ**	*Bronze*	*Durable PVC stake*
Surface Mount Flange/Stake		**5000-SCP-BZ** **5000-SCP-BBR** **5000-SCP-BK**	*Bronze on Aluminum* *Bronze on Brass* *Black on Aluminum*	*Includes three 7 inch threaded stainless steel stabilizing pins for ground mounting or surface mounts with four screws or over a junction box*
Guardian Mount		**9000-SP9-BZ**	*Stainless Steel*	*Heavy duty stainless steel spike to position fixture* *Formed from a single piece of metal*
Gutter Mount Bracket		**5000-GM-BZ** **5000-GM-Bk**	*Stainless Steel*	*Stainless Steel universal mounting bracket for gutter mounting fixture*
Tree Mount Junction Box		**5000-TCP-BZ** **5000-TCP-BK**	*Bronze on Aluminum* *Black on Aluminum*	*Bronze on Aluminum box with Stainless steel mounting screws. Two ½" NPT threaded holes*
Optics		**LENS-16-AMB** *Amber* **LENS-16-GRN** *Green* **LENS-16-RED** *Red* **LENS-16-BLU** *Blue*	**LENS-16-FR** *Frosted* **LENS-16-SPR** *Spread* **LENS-16-BEL** *Elongating*	*Enhances saturation of florals and foliage*
Extension Rods		**5000-X04-BZ** *4 in* **5000-X04-BK** *4 in* **5000-X08-BZ** *8in* **5000-X08-BK** *8 in* **5000-X12-BZ** *12 in* **5000-X12-BK** *12 in*	**5000-X18-BZ** *18 in* **5000-X18-BK** *18 in* **5000-X24-BZ** *24 in* **5000-X24-BK** *24 in*	*Extends distance between Accent light and Surface Mount Canopy, Stake, or Tree Mount box*
Rod L-Coupler		**5000-LCO-BZ**	*Bronze*	

Magnetic Transformers

Stainless Steel, 12-15V output, IP65 rated, UL 1838 listed
See transformer spec sheet for details and its accessories

9075-TRN-SS	**9150-TRN-SS**	**9300-TRN-SS**	**9600-TRN-SS**
75W Max	*150W Max*	*300W Max*	*600W Max*

WAC LIGHTING

Fixture Type:
Catalog Number:
Project:
Location:

Mod

6" Outdoor Wall Sconce 3000K

Model & Size	Color Temp	Finish	LED Watts	LED Lumens	Delivered Lumens
❍ WS-W65607 6"	3000K	❍ BK Black ❍ BZ Bronze ❍ GH Graphite ❍ WT White	12W	1165	553

Example: **WS-W65607-WT**

For custom requests please contact customs@waclighting.com

FEATURES

- Weather resistant powder coat finish
- Low profile with effective path illumination
- Light engine is factory sealed for maximum protection from the elements
- Driver concealed within the fixture
- 5 year warranty

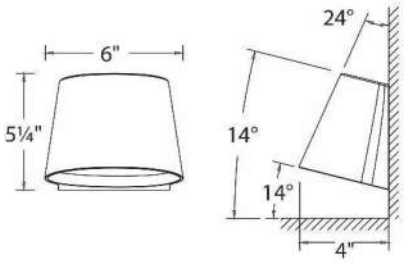
SPECIFICATIONS

Color Temp:	3000K
Input:	120-277V,50/60Hz
CRI:	90
Dimming:	ELV: 100-5% , 0-10V: 100-10%,TRIAC: 100-10%
Rated Life:	70000 Hours
Mounting:	Can be mounted on wall in all orientations
Standards:	ETL, cETL,IP65,Title 24 JA8 Compliant,ADA
	Wet Location Listed
Construction:	Aluminum hardware with glass diffuser

FINISHES:

White Bronze Graphite Black

LINE DRAWING:



WS-W65607

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

- Wet rated extreme temperature static white LED strip
- Suitable for saunas and steam rooms
- Ambient or mounting surface temperature must not be lower than -40° or higher than 195°F

1 V/WATTS	2 RATED	3 CCT - LUMENS/CRI	4 CONNECTOR/WIRE IN	5 CONNECTOR/WIRE OUT	6 WIRE COLOR	7 WIRE TYPE	8 ILLUMINATED LENGTH

Sample Part Number: **SW-XT24/3.0-WET-30-BW-BW-WH-CL2-48"**

1 V/WATTS

SW-XT24/3.0

Voltage: 24VDC
Wattage: 3.0W/ft
See following pages for compatible power supplies.

2 RATED

WET	IP67

3 CCT - LUMENS/CRI

27	2700K	238/91
30	3000K	261/92
35	3500K	271/92
40	4000K	274/91

4 CONNECTOR/WIRE IN

BW	Bare Wire (Standard 24")
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire In not needed to specify product. Typical selection is BW.
BW: Standard length is 24", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

5 CONNECTOR/WIRE OUT

BW	Bare Wire (Standard 24")
CLS	Closed End (No feed)
CON6	Connector 6"
CON24	Connector 24"

Connector/Wire Out not needed to specify product. Typical selection is CLS or BW.
BW: Standard length is 24", Max length is 120". Request custom length by writing in part number next to BW (example: BW48)

6 WIRE COLOR

WH	White
BK	Black

7 WIRE TYPE

CL2	Class 2

8 ILLUMINATED LENGTH

2"-360"	2" increments

5 year warranty | Warranty only valid with QTL power supplies | Field modifications must comply with QTL's installation methods otherwise warranty is null & void | All data has +/- 5% tolerance | UL Listed | Title 24 - JA8-2019 Strips: WET rated, 2700K and above

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

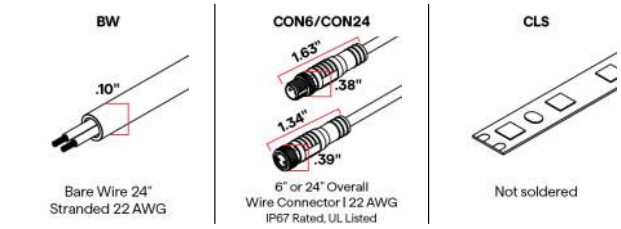
3 CCT – LUMENS/CRI - DELIVERED LUMENS

[Calculated L70 = 140000 hrs]
Tested with SW-XT24/3.0-DRY

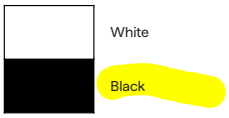
CCT	Lumen/ft	Luminous Efficacy	CRI Ra	CRI R9	TM30 Rf	TM30 Rg
2700K	238	81 Lm/W	91	50	90	100
3000K	261	89 Lm/W	92	54	90	98
3500K	271	93 Lm/W	92	58	90	98
4000K	274	94 Lm/W	91	53	86	93

4/5 CONNECTOR/WIRE – IN/OUT

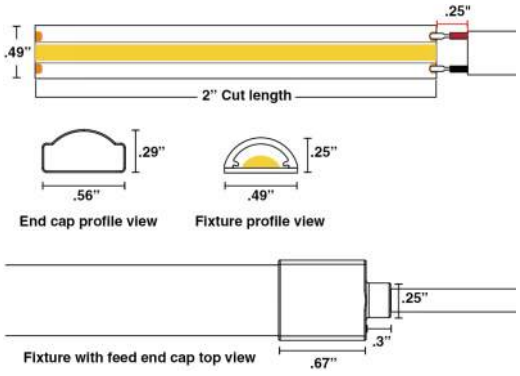
Connector/Wire In or Out not needed to specify product. Standard configuration is BW for Wire In and CLS for Wire out



6 WIRE COLOR



8 ILLUMINATED LENGTH - DIMENSIONS



SW-XT24/3.0

LED Strips - Static White Extreme Temperature

COMPATIBLE EXTRUSIONS

The lenses in these extrusions are only rated for applications below 150°F.
Extrusions without lenses are useful for shielding, glare control, and improving aesthetics.

	WIDE	ROND	TORQ	TRE3	LALO	TALO	ARKA	TELA	VEVE	FLUR	EMBD	LATO	MDIN	OPTI	THIN
DRY															
DMP															
WET	✓ NO LENS			✓ WITH LENS	✓ NO LENS	✓ WITH OR WITHOUT LENS					✓ WITH OR WITHOUT LENS EXCLUDES 30°, 45°, 60° LENS				

COMPATIBLE POWER SUPPLIES

See power supplies cut sheets for more information. Data subject to change, all data has +/- 5% tolerance. Power supply must be located outside of sauna or steam room.

DIM TO LEVEL	INDOOR	OUTDOOR
	SW-XT	SW-XT
Dim to Black	Q6M-DC+CAP QTM-DC+CAP iQ-PH iQ-PH+QD1	QOM-DC+CAP QOM-PH
0.1%	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-DMX QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-DMX Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-DMX QZ-PH/0-10V
1%	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED(E) QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
10%	Non-Dim Power Supply with SW App Dongle	Q-HEX-mini-DC Q-SET-mLED

SW-XT24/3.0

LED Strips - Static White Extreme Temperature

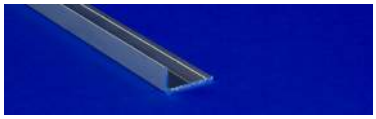
DIMMING PROTOCOL	INDOOR	OUTDOOR
	SW-XT	SW-XT
Non-Dim	QTM-eLED+CAP QTM-eLED-ND QZ-ND	Q-SET-QZ-ND Q-SET-eLED-ND QOM-eLED-ND QZ-ND iQ-ND-50-65
Phase	Q6M-DC+CAP QT-CAB-QZ-PH/0-10V QTM-DC+CAP QTM-eLED(E) QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP iQ-PH iQ-PH+QD1	Q-HEX-mini-DC Q-SET-QZ-PH/0-10V Q-SET-mLED QOM-DC+CAP QOM-PH QZ-PH/0-10V
0-10V	QT-CAB-QZ-PH/0-10V QT-CAB-eLED+0-10V QT-CAB-eLED+0-10V-AWN QT-CAB-eLED-ND QTM-eLED+0-10V QTM-eLED-AWN QZ-PH/0-10V QZ-STICK-PH/0-10V QZLP	Q-SET-QZ-PH/0-10V Q-SET-eLED+0-10V QOM-eLED+0-10V QZ-PH/0-10V
Lutron Athena	QT-CAB-eLED+0-10V-AWN QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6-AWN QTM-eLED-AWN	
ECO System	QTM-eLED(E)	
DMX	QZ-DMX	Q-SET-QZ-DMX QZ-DMX
DALI-2: DT6	QT-CAB-eLED+DALI-DT6 QT-CAB-eLED+DALI-DT6-AWN QTM-eLED+DALI-DT6 QTM-eLED+DALI-DT6-AWN QZ-DALI-DT6	Q-SET+QZ-DALI-DT6 QOM-eLED+DALI-DT6
SCENE App Dimmed	Non-Dim Power Supply with SW App Dongle	

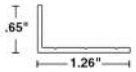
COMPATIBLE MOUNTING ACCESSORIES

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

RoHS COMPLIANT





- Backwards L bracket with no reveal, creating the least amount of cutoff
- Surface mount from the bottom, ideal for illuminating pre-existing cove applications
- Mounts the MICRO 5 family of fixtures, LED light engines, and SHIELD
- Paintable finish
- Intended for indoor use only
- Mounting clips conveniently preinstalled for hassle-free installation
- Durable anodized aluminum

1 PRODUCT	2 FINISH	3 MOUNTING	4 LENGTH (IN)
BL-MICRO			

Sample Part Number: **BL-MICRO-ST-SST-08-48"**

1 PRODUCT

BL-MICRO

2 FINISH

ST	Satin
BK	Black

3 MOUNTING

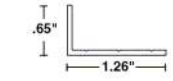
SST-08	Stainless Steel Clip
WSC-02	White Snug Clip
VHB	VHB Tape
N/A	No Clip (For Light Engine)

Mounting clips preinstalled
See MOUNTING COMPATIBILTY CHART for more information

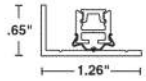
4 LENGTH (IN)

1" increments from 2" - 98.43"
Tolerance +0.0/-0.5"
Light engine ordered separately

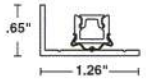
1 PRODUCT - DIMENSIONS WITH RECOMMENDED PROFILES



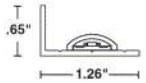
Profile



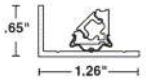
profile with: ALTA-01



profile with: ATOM-01



profile with: SHLD-B



profile with: TILT-01

Field modifications must comply with Q-Tran's installation methods otherwise warranty is null & void | Surface mount

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

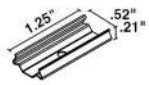
2 FINISH

Satin

Black

3 MOUNTING

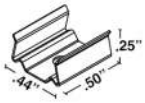
SST
(SST-08)



Stainless Steel Clip

To order separately use SST-08

WSC
(WSC-02)



White Snug Clip

To order separately use WSC-02

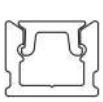
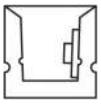
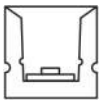
VHB TAPE
(TAPE-VHB-IP67-5)

Sold separately

10MM wide VHB Tape

To order separately use TAPE-VHB-IP67-5

COMPATIBILITY CHART

	 ATOM	TILT	 WALA	 WAVE	NEXUS	ALTA	ANYBEND	SHIELD-B	LIGHT ENGINE
Lens Notes	Works with: ATOM-01, ATOM-03	Works with: TILT-01				Works with: ALTA-01, ALTA-03			
SST-08 Stainless Steel Clip	✓	✓				✓			
WSC-02 White Snug Clip			✓	✓	✓		✓		
VHB	✓	✓	✓	✓	✓		✓		
N/A								✓	✓

BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

LIGHT ENGINE COMPATIBILITY CHART

Order Separately

LED Strips No extrusion	STATIC WHITE (SW)	STATIC WHITE INDIVIDUALLY ADDRESSABLE (SW-IA)	STATIC WHITE STOCKING DISTRIBUTOR (SD-SW)	STATIC WHITE HIGH EFFICACY (SW-HE)	STATIC WHITE HIGH EFFICACY PLUS (SW-HE+)	STATIC WHITE EXTREME TEMP (SW-XT)	DYNAMIC WHITE HIGH EFFICACY (DW-HE)	WARM DIM (WD)	STATIC COLOR (SC)	RGB	RGBW	RGBW HIGH EFFICACY (RGBW-HE)
DRY	✓ W/FT: 1.5, 3.0, 4.0, 5.0	✓ W/FT: 5.0	✓ W/FT: 1.0, 2.0, 4.0, 6.0	✓ W/FT: 1.5, 3.0, 6.0, 9.0	✓ W/FT: 3.0, 6.0		✓ W/FT: 1.5, 2.5, 4.0	✓ W/FT: 6.0	✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0, 8.0
DMP	✓ W/FT: 1.5, 3.0, 4.0, 5.0			✓ W/FT: 1.5, 3.0, 6.0					✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0
WET	✓ W/FT: 1.5, 3.0, 4.0, 5.0		✓ W/FT: 1.0, 2.0, 4.0, 6.0	✓ W/FT: 1.5, 3.0, 6.0	✓ W/FT: 3.0, 6.0	✓ W/FT: 3.0		✓ W/FT: 6.0	✓ W/FT: 5.0	✓ W/FT: 6.0	✓ W/FT: 6.0	✓ W/FT: 4.0

ACCESSORY COMPATIBILITY CHART

Order Separately | Only Compatible with DRY

LED Strips No extrusion		STATIC WHITE (SW)	STATIC WHITE INDIVIDUALLY ADDRESSABLE (SW-IA)	STATIC WHITE STOCKING DISTRIBUTOR (SD-SW)	STATIC WHITE HIGH EFFICACY (SW-HE)	STATIC WHITE HIGH EFFICACY PLUS (SW-HE+)	STATIC WHITE EXTREME TEMP (SW-XT)	DYNAMIC WHITE HIGH EFFICACY (DW-HE)	WARM DIM (WD)	STATIC COLOR (SC)	RGB	RGBW	RGBW HIGH EFFICACY (RGBW-HE)
SHIELD-B	S	✓ W/FT: 1.5, 3.0, 4.0, 5.0		✓ W/FT: 2.0, 4.0, 6.0						✓ W/FT: 5.0			
	M		✓ W/FT: 5.0			✓ W/FT: 3.0, 6.0		✓ W/FT: 1.5, 2.5	✓ W/FT: 6.0		✓ W/FT: 6.0		✓ W/FT: 4.0
	L				✓ W/FT: 1.5, 3.0, 6.0							✓ W/FT: 6.0	

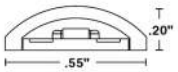
BL-MICRO

MICRO 5 BACKWARDS L BRACKET - ALUMINUM EXTRUSION

COMPATIBLE SHIELD

Order separately | See SHIELD cut sheet for more information

Profile - S

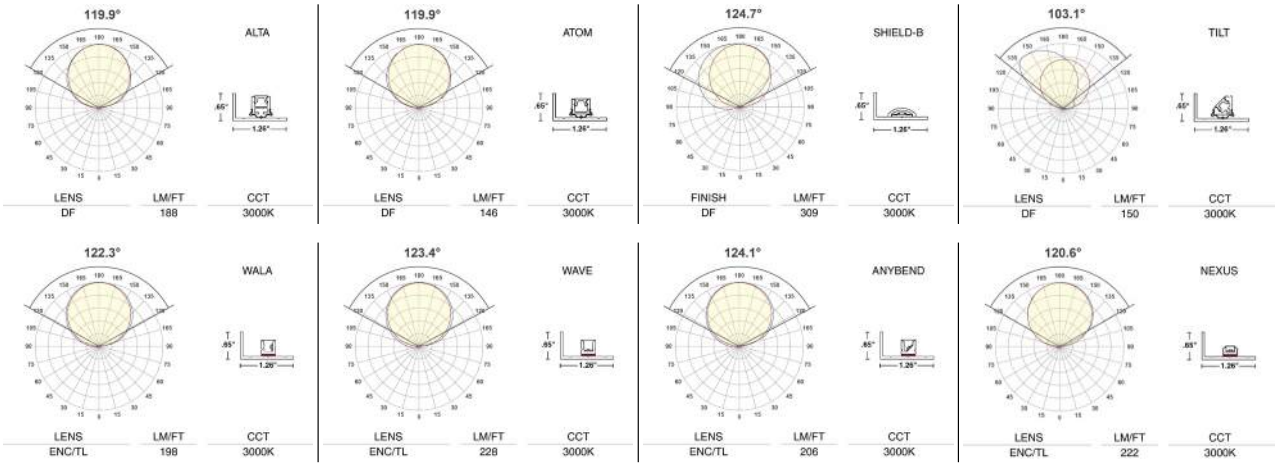


Profile - M

Profile - L

PHOTOMETRIC PERFORMANCE

Tested with SW24/4.0 at 3000K



QZ-PH/0-10V

24V DC Power Supply - 30W-288W

- Versatile Class 2 LED driver controlled with phase (forward or reverse) or 0-10V dimming down to 0.1%
- Pulse Width Modulation (PWM) output provides smooth flicker-free dimming
- 24VDC constant voltage output
- Available in various wattage options: 30W, 60W, 96W, 192W, and 288W
- Housing is listed for indoor or outdoor use

1 PRODUCT	2 WATTAGE	3 PRIMARY VOLTAGE	4 SECONDARY VOLTAGE	5 CONTROL	6 COLOR
QZ		UNV	24V	PH/010	

Sample Part Number: **QZ-60W-UNV-24V-PH/010-BK**

1 PRODUCT

QZ	

2 WATTAGE

30W	
60W	
96W	
192W	
288W	

3 PRIMARY VOLTAGE

UNV	Universal (120-277V)

4 SECONDARY VOLTAGE

24V	

5 CONTROL

PH/010	Phase or 0-10V dimming

6 COLOR

WH	White (Standard)
BK	Black Powder Coat Finish

COMPATIBLE LEDS

STATIC WHITE

SW24/1.5-4.0	✓
SW24/5.0, SW-HE, SW-HE+	✓
SD-SW24/1.0-4.0	✓
SD-SW24/6.0	✓
SW-IA	
SW-XT	✓

OTHER

DW-HE Tunable Applications	
DW-HE Warm Dim Applications	
WD	✓
SC	✓
RGB	
RGBW, RGBW-HE	

SHEETS

Q-SHEETS SW	✓
Q-SHEETS DW Tunable Applications	
Q-SHEETS DW Warm Dim Applications	
Q-SHEETS RGB	
Q-SHEETS RGBW	

MICRO 5

MICRO 5-SW	✓
MICRO 5-DW Tunable Applications	
MICRO 5-DW Warm Dim Applications	
MICRO 5-RGB	

PRODUCT INFORMATION

- Vertical or horizontal surface mount
- Constant voltage output
- PH/010 Dimming:
  - Phase dimming: works with forward phase / leading edge, MLV and Reverse phase / trailing edge, ELV, TRIAC dimmers
  - Dimming range: 0.1% - 100%
  - 0-10V dimming
  - 1-10V dimming
  - 10V PWM
  - Potentiometer
  - Flicker-free dimming
  - PWM (high frequency) output reduces visible flicker
- IP66 Rated
- Follows recommended practices of IEEE standard P1789 to mitigate flicker-induced health risks
- Suitable for dry, damp and wet locations
- Suitable for indoor & outdoor use
- Primary voltage - universal (110-277V)
- Wide operating temperature range: -40˚F to +140˚F
- UL, cUL listed
- Type HL rated
- Compliant to FCC Part 15B
- 5 year warranty

QZ-PH/0-10V

24V DC Power Supply - 30W-288W

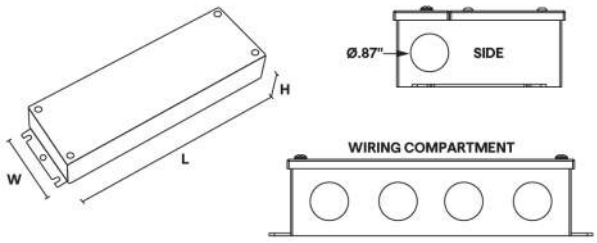
VOLTAGE DROP CHART

Wiring from power supply to light fixture must be two conductor cable

VDC	Load Wattage (W)	Distance from PS for 5% Voltage Drop								
		10 AWG	12 AWG	14 AWG	16 AWG	18 AWG	20 AWG	22 AWG	24 AWG	26 AWG
24	15	913	574	361	227	143	90	55	35	22
	30	456	287	181	114	71	45	28	17	11
	60	228	143	90	57	36	22	14	9	5
	80	171	108	68	43	27	17	10	7	4
	96	143	90	56	35	22	14	9	5	3

1 PRODUCT - DIMENSIONS

Size	Length (in)	Width (in)	Height (in)
30W	6.5	3.75	1.58
60W	7.5	3.75	1.58
96W	8.68	3.75	1.58
192W	10.94	4.33	1.77
288W	11.87	4.33	1.77



2 TECHNICAL INFORMATION

Wattage	Primary Voltage	Secondary Voltage	Secondary Current
30W	110-277V	24VDC	1.25 A
60W	110-277V	24VDC	2.5 A
96W	110-277V	24VDC	1x4 A
192W	110-277V	24VDC	2x4 A
288W	110-277V	24VDC	3x4 A

QZ-PH/0-10V

24V DC Power Supply - 30W-288W

SPECIFICATIONS

Input	
Input Voltage (Vrms)	110-277V
Input Current, max (Arms)	3.3A @ 110V
Inrush Current, max* (Apk)	43A@277V
Input Frequency (Hz)	50/60
Input Power (W)	330

Output	
Output Voltage, nom (V)	24
Output Current (A)	288W, 3×4A @ 24V
Output Power (Wmax)	288W

Environmental	Min	Nom	Max
THD (%)	-	-	20
PF (%)	0.94	-	-
Working Temp (°F)	-	-	140
IP Rating	66	-	-

*-200us event

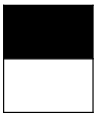
PROTECTIONS

- Short Circuit Protection (SCP)
- Over Loading Protection (OLP)
- Over Temperature Protection (OTP)
- I/P-O/P: 1.88KVAC
- I/P-O/P: 100MΩ / 500VDC / 77°F / 70%RH

COMPLIANCE

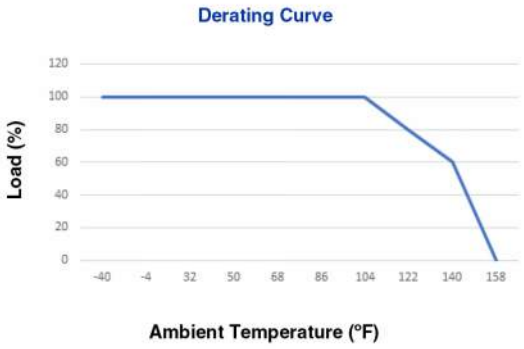
- EMI/RFI
  - FCC 47 CFR Part 15 Subpart B
- Certified
  - UL8750

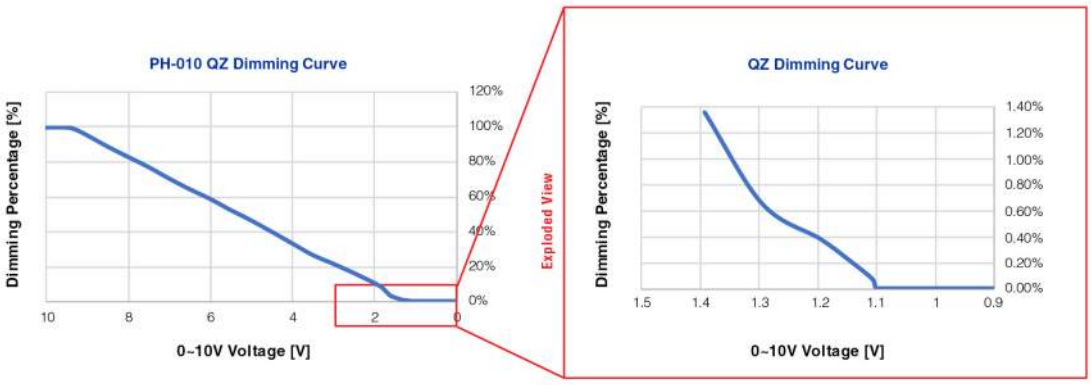
6 COLOR



Black Powder Coat Finish

White (Standard)

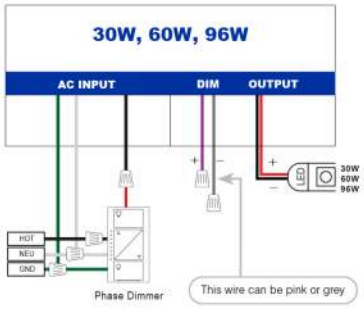


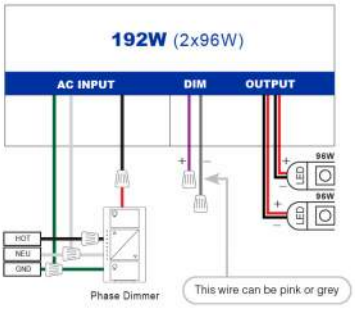


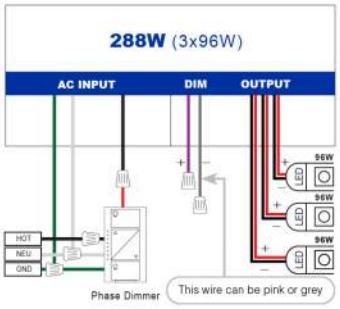
QZ-PH/0-10V

24V DC Power Supply - 30W-288W

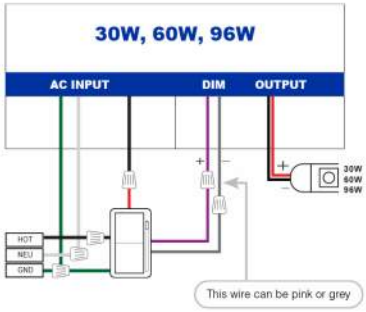
PHASE DIMMING

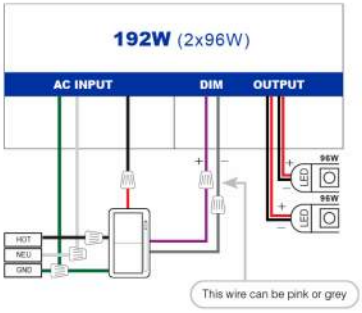


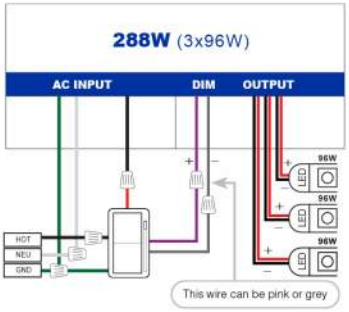




0-10V DIMMING







Wiring from power supply to light fixture must be two conductor cable

COMPATIBLE WIRING ACCESSORIES