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Addendum 01

Date 10 January 2014

To: All Contract Document Holders

This Addendum forms a part of the Contract Documents and modifies the original Project Manual and Drawings, dated 12/20/2013 as noted below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject bidder to disqualification.

This Addendum consists of eleven addendum pages and one hundred and eleven attachment pages:

ATTACHMENTS

1. Sheets:

Architectural – GC001, GC003, DAC150, AC101, AC110, AC115, AC116, AC119, AC150, AC151, AC401, AC502.1, AC502.2, AC701, AC702, AC703, AC800, AC804, AC900
Mechanical – MC001, MC002, MC100, MC101m, MC200, MC601, MC602, MC802
Electrical – EC002, EC100, EC200, E300, EC501, EC504, EC601, EC701
Plumbing – PC100, PC101, PC502, PC503
Civil – CC001, CC002, CC100
Landscape- LC001, LC002

2. Specification Sections:

03 30 00 – CAST-IN-PLACE CONCRETE
03 35 16 – CONCRETE FLOOR FINISHING
08 11 13 – HOLLOW METAL DOORS AND FRAMES
08 33 23 – OVERHEAD COILING DOORS
08 44 13 – ALUMINUM FRAMED CURTAIN WALL
08 71 00 – DOOR HARDWARE and HARDWARE SCHEDULE
10 11 01 – VISUAL DISPLAY BOARDS
10 51 00 – LOCKERS
11 24 16 – FALL PROTECTION SYSTEM
21 10 00 – FIRE PROTECTION
22 05 00 – BASIC MATERIALS AND METHODS – PLUMBING
22 05 01 – PLUMBING
22 11 23 – PLUMBING EQUIPMENT
26 05 13 – MEDIUM VOLTAGE CABLING

3. Substitution Request Package

SUBSTITUTIONS

1. Section 07 14 00, Bentonite sheet waterproofing, Tremco – Approved
2. Section 09 21 16, Gypsum board assemblies, Mold Tough Firecode X – Rejected
3. Section 09 51 00, Acoustical ceilings, Armstrong interlude – Rejected
4. Section 09 51 16, Impact rated gypsum board, Mold tough VHI – Rejected
5. Section 06 16 53, Moisture resistant gypsum sheathing, Securock – Rejected
6. Section 05 40 00, Cold-formed metal framing, SAFCO – Approved
7. Section 07 54 00, Thermoplastic membrane roofing, GAF – Rejected
8. Section 26 51 00, Interior lighting, Cascade lighting – Approved as noted
9. Section 26 51 00, Interior lighting, Solus – Rejected

PROJECT MANUAL

Section 00 01 10 – TABLE OF CONTENTS

1. **Revise:** Section 03 35 16 title to read: CONCRETE FLOOR FINISHING
2. **Delete:** Section 06 15 00 WOOD DECKING
3. **Delete:** Section 06 18 00 GLUE-LAMINATED CONSTRUCTION
4. **Add:** Section 11 24 16 FALL PROTECTION SYSTEM

Section 01 23 00 – ALTERNATES

1. **Revise:** Article 1.05 H. 2 to read:
 2. Reuse existing opening between bench room and wood shop.
2. **Revise:** Article 1.05 I. to read:
 - I. Alternate No. 9 - Craft Center Cover:
 1. Alternate Description: Provide cover for the remainder of the outdoor space; Grid 7-9 identical to cover shown at Grids 5-7.
 2. Base Bid relative to Alternate: Provide covered area at Grids 5-7 for 50% of the Craft Center outdoor space, plus \$20,000 for additional equipment specific covers. Provide footings, columns and MEP infrastructure to allow covering the remainder of the outdoor space at a later time.

Section 03 30 00 – CAST-IN-PLACE CONCRETE

1. **Replace:** Section with revised and attached Section 03 30 00

Section 03 35 16 – CONCRETE FLOOR FINISHING

1. **Replace:** Section with revised and renamed attached section.

Section 06 41 00 – ARCHITECTURAL WOOD CASEWORK

1. **Add:** Article 1.01 D to read:
 3. Wood veneer clad panels
2. **Revise:** Article 2.05 D1 to read:
 1. Colors: Multiple Colors – match Architect's sample, see Schedule in Section 09 90 00.
3. **Add:** Article 2.05 F to read:
 - F. Location: Craft Center corridor near entries.

Section 07 21 00 – THERMAL INSULATION

1. **Add:** Article 2.06 to read:
 - 2.06.FOAMED IN PLACE INSULATION
 - A. Medium-density, rigid closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 1. Regulatory Requirements: Conform to applicable code for flame and smoke limitations.

2. Aged Thermal Resistance (R-value): 5 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
3. Water Vapor Permeance: Vapor retarder; 1 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.5 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
8. Location: Steel stud parapet and locations indicated.

Section 07 25 00 – WEATHER BARRIERS

1. **Revise:** Article 2.02B to read:

B. Self-adhering membrane for window sill pan flashings shall be PE 200 HT manufactured by Henry; an SBS rubberized asphalt compound which is integrally laminated to a blue cross-laminated polyethylene film with slip-resistant coating. Membrane shall have the following physical properties:

1. Membrane Thickness: 0.040 inches (40 mils).
2. Application Temperature: 40 degrees F and above.
3. Elongation: 250% minimum to ASTM D412 (Die C Modified).
4. Tensile Strength Membrane: 600 psi minimum to ASTM D 412.
5. Flexibility at -45 Degrees F: Pass to ASTM D1970.
6. Water Vapor Transmission: 0.05 perms.
7. Air Leakage @ 75 Pa: <0.004 cfm/ft² (ASTM E2178)

2. **Revise:** Article 2.02C to read:

C. Self-adhering membrane for all window jambs, headers, door openings, inside and outside corners, and other transitions shall be pre-cut Blueskin SA manufactured by Henry; an SBS modified bitumen, self-adhering sheet membrane which is integrally laminated to a blue polyethylene film. Membrane shall have the following physical properties:

1. Membrane Thickness: 0.040 inches (40 mils).
2. Low temperature flexibility: -30 degrees F to ASTM D146.
3. Elongation: 200% minimum to ASTM D412-modified.
4. Minimum Puncture Resistance 40lbf to ASTM E154.
5. Lap Peel Strength 25 lbf/in width to ASTM D903 180° bend.
6. Auxiliary tested component of ASTM E2357 for Air Leakage of Air Barrier Assemblies.

Section 07 42 13 – WEATHER BARRIERS

1. **Add:** Article 1.02 Related Requirements to read:

1.02 RELATED REQUIREMENTS

A. Section 07 90 05 – Joint Sealers.

2. **Add:** Article 2.02D to read:

D. Matching Profile Series Louvers:

1. Same material and finish as adjacent panels.
2. Blade Lengths: As indicated and as required to fit withing the metal panel layout.
3. Blade Depth: As required.
4. Free Area: See mechanical requirements.

Section 07 62 00 – SHEET METAL FLASHING AND TRIM

1. **Add:** Article 2.03 G. to read:

G. Fabricate coping joints with flat interlocked seams conforming to SMACNA J-9 configuration.

Section 08 11 13 – HOLLOW METAL DOORS AND FRAMES

1. **Replace:** Section with revised and attached Section 08 11 13

Section 08 33 23 – OVERHEAD COILING DOORS

1. **Replace:** Section with attached Section 08 33 23.

Section 08 44 13 – ALUMINUM-FRAMED CURTAIN WALL

1. **Replace:** Section with attached Section 08 44 13.

Section 08 71 00 – DOOR HARDWARE

1. **Replace:** Section with attached Section 08 71 00 and Hardware Schedule

Section 09 90 00 – PAINTING AND COATING

1. **Revise:** Article 3.06 X. 3. to read:
 3. Manufacturer: Scofield
2. **Revise:** Article 3.06 X. 4. to read:
 4. Color: Lithochrome Color Hardener, color A-21 Deep Charcoal.

Section 10 11 01 – VISUAL DISPLAY BOARDS

1. **Replace:** Section with attached Section 10 11 01 – Visual Display Boards.

Section 10 51 00 – LOCKERS

1. **Replace:** Section with attached Section 10 51 00 – Lockers.

Section 11 24 16 – FALL PROTECTION SYSTEM

1. **Add:** Section 11 24 16 – Fall Protection System attached.

Section 21 20 00 – FIRE PROTECTION

1. Change Entire Section

Section 22 05 00 – BASIC MATERIALS AND METHODS - PLUMBING

1. Change Article 2.5.A to read:
 - A. Provide all access doors and panels to serve equipment under this work, including those which must be installed, in finished architectural surfaces. Frame of 16-gauge steel, door of 20 gauge steel. 1" flange width, continuous piano hinge, key operated, prime coated. Refer to Architectural Specifications for the required product Specification for each surface. Contractor is to submit schedule of access panels for approval. Exact size, number and location of access panels is not shown on Plans. Access doors shall be of a size to permit 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 or concealed valve. Use no panel smaller than 12" x 12" for simple manual access, or smaller than 24" x 30" where personnel must pass through. Provide cylinder lock for access door serving mixing or critical valves in public areas.

Section 22 05 01 - PLUMBING

1. Change Article 2.9.A.1 and 2 to read:
 1. Counter mounted right hand side of sink, mounting bracket and dust covers.
 2. Manufacturer: Haws 7611.

Section 22 11 23 – PLUMBING EQUIPMENT

1. Add Article 2.1.B to read:
 - B. Approved manufacturers: J.R. SMITH, Watts, or equal.

2. Add Article 2.2.B to read:
 - B. Approved manufacturers: J.R. SMITH, Watts, or equal.

Section 26 05 13 - MEDIUM VOLTAGE POWER CONDUCTORS AND CABLES

1. Add new section.

Section 26 09 23 – LIGHTING CONTROL DEVICE

1. Add Article 2.3.A.8:
 8. Cooper
2. Add Article 2.6.A.8:
 8. Cooper

DRAWINGS

Sheet GC001 CRAFT CENTER SHEET INDEX

1. **Clarify:** Revised Project Directory for current project address for Package 1.

Sheet GC003 CRAFT CENTER CODE COMPLIANCE SUMMARY

1. **Clarify:** Added occupancy tag and label to outdoor metals.
2. **Change:** Relocated FEC near front desk to the hallway.
3. **Change:** Revised occupancy total at the north exit gate of the outdoor space.

Sheet DAC150 CRAFT CENTER DEMOLITION

1. **Change:** Moved KEYNOTE 11 to indicate an area for both dust collection penetrations to occur.
2. **Add:** Added KEYNOTE 12 to clarify and coordinate the location of plumbing penetrations through the existing louver area.
3. **Add:** Added KEYNOTE 13 to clarify the location of plumbing penetrations at the tank storage area.
4. **Delete:** 2 demo shaft openings between grids 4 and 5, not required. See DAC 151 for demo. shaft configuration.

Sheet AC101 UPPER LEVEL PLANS

1. **Add:** Roof davits for fall protection.
2. **Clarify:** Structural framing layout plan provided.
3. **Clarify:** Dimensions and callouts added.
4. **Change:** Exterior louvers revised to continuous profile louver system to integrate with exterior cladding.

Sheet AC110

1. **Add:** Additional detail and development provided at ceramics studio.

Sheet AC115 CRAFT CENTER ENLARGED WOODSHOP BENCH COMPOSITE

1. **Change:** Changed the location of W21 Dust Collection Filters.

Sheet AC116 CRAFT CENTER ENLARGED WOODSHOP BENCH COMPOSITE

2. **Add:** "KEYNOTE 40 - NON-SLIP TEXTURE AT RAMP.
3. **Delete:** Delete drywall reveals at existing walls shown on drawings 5&6 on AC116.
4. **Add** "KEYNOTE 41 - PROVIDE AN ALLOWANCE FOR PATCHING/REPAIRING (E) WALLS, PAINT AS SHOWN IN FINISH SCHEDULE.
5. **Clarify:** Added dimension info to clarify location of door 030HB.
6. **Clarify:** Added spot elevation to ceiling shown on 2/AC116.

Sheet AC119 CRAFT CENTER ENLARGED GLASS COMPOSITE

1. **Change:** Changed the location/size of the required trench drain.

Sheet AC150 CRAFT CENTER COMMONS PLAN AND RCP

1. **Change:** Revised 2/AC150 to coordinate lighting with Alternate 6 Base.
2. **Add:** Added spot elevations to ceilings shown on 2/AC150.
3. **Add:** Added KEYNOTE 35 to indicate areas of stained concrete STN-1.
4. **Clarify:** Added additional detail callouts and dimensions.
5. **Add:** Added "KEYNOTE 20 – PAINT EXISTING STRUCTURE AND EXPOSE CEILING AS SHOWN (10/AC001)," to indicate area of painted ceiling.
6. **Add:** Added info for control joints at reception area.

Sheet AC151 CRAFT CENTER COMMONS INTERIOR ELEVATIONS

1. **Clarify:** Added dimensions to clarify elevations of interior glazing and locker sills.
2. **Change:** Deleted "KEYNOTE 4 – ALT. 6 (ADD) WOOD CEILING AS SHOWN."
3. **Change:** Revised location of FEC.
4. **Change:** Revised joint pattern of chalk board walls within craft center.

Sheet AC401 CRAFT CENTER SECTIONS

1. **Clarify:** Callouts to new details, dimensions, and diagrammatic information.

Sheet AC502.1 CRAFT CENTER EXTERIOR COMPOSITE

1. **Change: Changed KEYNOTE 10, indicating embeds are "PROVIDED FOR ALT. 9 (ADD)."**
2. **Add:** Added "KEYNOTE 22 – GAS METER, SEE PLUMBING."
3. **Add:** Added "KEYNOTE 23 – CAST-IN-PLACE CONCRETE WALL ALT. 3 (ADD). TYPICAL FENCE PANELS (BASE).
4. **Change:** modified fence panel above door 030FF shown in 8/AC502.1 to coordinate with mechanical routing above.
5. **Change:** Coordinated exterior doors 030CA, 030BB, 030BA, 030EE, 030AA and 030FF with hardware specification. See specification and AC900.
6. **Add:** Provided detail callouts at outdoor space mechanical exhaust vent penetration.

Sheet AC502.2 CRAFT CENTER EXTERIOR COMPOSITE

- Add:** Provided detail callouts at outdoor space mechanical exhaust vent penetration.
Clarification: Added "KEYNOTE 21 – ALTERNATE 9 (ADD) – ADDITIONAL ROOF AREA/COVER.

Add: Fall protection anchors.

Sheet AC701 EXTERIOR DETAILS

Add: 4/AC701, 5/AC701 and 10/AC701 – Intumescent paint at steel columns shown in details.

Change: 13/AC701 - Adjusted typical fence panel spacing to be 4" O.C.

Add: 11/AC701 - Roof drain.

Add: 12/AC701 - Spray applied fireproofing at steel column and additional info on roof/wall configuration.

Sheet AC702 EXTERIOR DETAILS

Add: Additional details provided for mechanical penthouse.

Sheet AC703 EXTERIOR DETAILS

Add: Additional details provided for mechanical penthouse and craft center outdoor.

Sheet AC800 INTERIOR DETAILS

Clarify: Added dimensional info to 3/AC800.

Add: Added metal surround to interior lockers 16/AC800.

Clarify: Added dimension points to interior details.

Sheet AC804 INTERIOR DETAILS

Add: Additional details provided for shaft conditions, stairs and guardrails.

Sheet AC900 SCHEDULES

Change: Updated door hardware groups.

Sheet MC001 SCHEDULES – MECHANICAL

1. **Clarify:** Updated equipment tags to match Package 2,3,4,5.
2. **Change:** Removed FCU schedule.
3. **Change:** Updated exhaust fan models to reflect intent.

Sheet MC002 SCHEDULES – MECHANICAL

1. **Clarify:** Updated equipment tags to match Package 2,3,4,5.

Sheet MC100 CRAFT CENTER BASMENT FLOOR PLAN - HVAC

1. **Clarify:** Adjusted hood/vent locations shown in 2/MC100.
2. **Change:** Relocated duct collection supply filters.
3. **Clarify:** Added notes to clarify side wall exhaust kiln discharge and duct routing intent.
4. **Charge:** Relocated WE12 west.
5. **Clarify:** Adjust vertical shaft opening location and ductwork at grids G2 1'-6" to the east slightly.

Sheet MC101m CRAFT CENTER MEZZANINE PLAN – MECHANICAL

1. **Clarify:** Deleted chilled water piping to electrical room FCU.

Sheet MC200 CRAFT CENTER BASEMENT FLOOR PLAN - HVAC PIPING

1. **Change:** Removed FCU 1 and associated piping from Package 1.

Sheet MC300 CRAFT CENTER MECHANICAL ZONING PLAN

1. **Change:** Updated control matrix.

Sheet MC501 CRAFT CENTER MECHANICAL SECTIONS

1. **Clarify:** Updated duct routing intent.

Sheet MC601 RISER DIAGRAMS

1. **Clarify:** Added FSDs to riser diagram for clarification only. Scope already shown on MC100

Sheet MC602 CHILLED WATER/HEATING WATER SCHEMATIC DIAGRAMS

1. **Change:** Removed FCU chilled water piping.

Sheet MC802 CRAFT CENTER MECHANICAL CONTROLS DETAILS

1. **Change:** Removed FCU control diagram.

Sheet EC002 SCHEDULES - ELECTRICAL

1. **Change:** In mechanical schedule, removed temporary step-up transformer serving MAU-M1; reconnected to MDP-BN4-1C.
2. **Change:** In mechanical schedule update mechanical tags on electrical drawing to match mechanical tag changes.
3. **Change:** In luminaire schedule change type R6 add type X3 exit sign.
4. **Add:** Add pendant mounting schedule.

Sheet EC100 UNDERGROUND PLAN - ELECTRICAL

1. **Add:** Add switchboard MDP-BN1-4C to be installed in Craft Center scope of work.
2. **Change:** Update feeders serving MDP-BN1-4C and DP-BN1-4A.

Sheet EC101 SECTIONS & ELEVATIONS - ELECTRICAL

1. **Change:** East elevation view of main electrical room 037 to reflect addition of MDP-BN4-1C to Craft Center scope of work and conduit changes shown on EC100.

Sheet EC200 GROUND LEVEL PLAN – LIGHTING

1. **Add:** Add sheet note 12 to photo cell shown near gridline K-9 to clarify lighting control.
2. **Delete:** Delete sheet note reference to photography studio darkroom signage luminaire.
3. **Change:** Updated lighting in selective areas.
4. **Add:** Add sheet note 13 to low voltage switch at the north end of the corridor near gridlines H.6-7.5.

Sheet EC300 GROUND LEVEL PLAN - ELECTRICAL

1. **Delete:** Removed temporary step-up transformers serving MAU-M1 and panel BN1-4C. Remove sheet note reference to temporary step-up transformers.
2. **Add:** Add MDP-BN4-1C to Craft Center scope of work.
3. **Change:** Updated switchboard MDP-BN1-4C and MDP-BN1-2C sizes.
4. **Change:** Updated mechanical tags on electrical drawing to match mechanical tag changes.
5. **Change:** Revise general note E for the fire alarm system.
6. **Clarify:** Connect receptacles shown in Office 030M, Office 030N, Circulation 030 area to panel BN4-2 per general note H.

Sheet EC301M MEZZANINE & ROOF - POWER & SIGNAL

1. **Change:** Update mechanical tags on electrical drawing to match mechanical tag changes.

Sheet EC501 ENLARGED PLANS – ELECTRICAL

1. **Clarify:** Clarified Wood shop equipment item W11, W12 and W18 connections.
2. **Change:** Updated for location change of dust collection system

Sheet EC503 ENLARGED PLANS – ELECTRICAL

1. **Clarify:** Sheet note 5. Add “Connect EPO to unused circuit in power panel serving area.” to sheet note 5.

Sheet EC504 ENLARGED PLANS – ELECTRICAL

1. **Clarify:** Sheet note 5. Add “Connect EPO to unused circuit in power panel serving area.” to sheet note 5.

Sheet EC601 SINGLE LINE DIAGRAMS - ELECTRICAL

1. **Delete:** Modify single line diagrams to reflect removal of temporary step-up transformers.
2. **Add:** Add MDP-BN4-1C to Craft Center scope.
3. **Add:** Add connection to existing panel DD on level 2.
4. **Change:** Upsized switchboard MDP-BN4-1C and feeder from 3000 to 4000 amps.
5. **Clarify:** Add clarification regarding medium voltage wiring to utility transformer primary sizing and conductors.

Sheet EC701 PANEL SCHEDULES – ELECTRICAL

1. **Add:** Add load summary for switchboard MDP-BN4-1C.
2. **Change:** Update panel schedule BN4-1C to reflect switchboard MDP-BN4-1C power source.

Sheet EC702 PANEL SCHEDULES – ELECTRICAL

1. **Delete:** Removed MCB from panelboard BN4-1C.
2. **Change:** Update mechanical tags on electrical drawing to match mechanical tag changes.

Sheet DEC100 GROUND LEVEL FLOOR PLAN – ELECTRICAL - DEMO

1. **Add:** Add power panel CC and XA with sheet note 1 to electrical demo scope.
2. **Add:** Add sheet note to panel AA to indicate panel DD on level 2 will need to be refed.

Sheet PC100 CRAFT CENTER FLOOR PLAN UNDERGROUND PLUMBING

1. **Change:** Location of 6" RD to drop below grade around gridline 8/K.
2. **Change:** Added two 3" floor drains to match architects background.
3. **Change:** 4" RD at gridline 5.5/K for future connection from a future package.

Sheet PC101 CRAFT CENTER FLOOR PLAN PLUMBING

1. **Clarify:** Routing of piping, See enlarged plans

Sheet PC502 CRAFT CENTER FLOOR PLAN PLUMBING

1. **Change:** 4"Rd piping along gridline 4.
2. **Change:** Routing 6"RD to Gridline 8/K.
3. **Change:** Routing of O2 piping.
4. **Change:** Routing of ACET piping.
5. **Change:** Fire Protection Dry Valve assembly along gridline K/6.
6. **Change:** O2 piping at K/6.5.
7. **Change:** 4"Rd piping along gridline 4.

Sheet PC503 ENLARGED PLAN PLUMBING

1. **Change:** 2" Vent routed along the wall above doors and tie into the building.
2. **Change:** Piping to match architect changes of equipment location.
3. **Change:** Location of WH-1 to match architect.
4. **Change:** Piping along gridline K.25 to be routed over double doors.
5. **Change:** Note contractor to provide Dry Fire Protection system.
6. **Change:** 6"RD at gridline 6.5/K.
7. **Change:** (2) 3"FD-1 to match architects backgrounds

Sheet CC001 EROSION CONTROL PLAN

Revise: Revise plan to incorporate City review comments.

Sheet CC002 EROSION CONTROL NOTES

Revise: Update City's CSMP Notes to most current rendition.

Sheet CC100 SITE UTILITIES PLAN

Revise: Revise location of SD Bldg Connection and revise downstream flowline elevations. Add points G, H, and I for video inspection and revise construction note 17 accordingly. Revise SD Treatment Structure and Diversion Manhole locations and configuration.

Sheet LC001 SITE CLEARING AND PROTECTION PLAN

Add: Tree protection fencing
Add: Saw cut for utility improvements

Sheet LC002 SITE PLAN

Add: Concrete paving for at storm utility installation
Add: Segmental retaining wall detail

BIDDER QUESTIONS / CLARIFICATIONS

1. Spec Section 21 10 00 includes section 2.17: "2.15 Pre Action System". I don't believe this spec section is relevant as a requirement of this project. **Glumac: This has been removed and a Dry Valve assembly has been added.**
2. Nowhere in Spec Section 21 10 00 are outdoor fire sprinkler systems addressed. Are dry systems required? Glycol? Please clarify. **Per Glumac - Sidewall dry heads won't work with the throw depth of the outdoor space. Provide Dry Fire Protection system for the outside area.**

END OF ADDENDUM NO. 01

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This Section specifies 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. Suspended slabs.
 - 5. Concrete toppings.
 - 6. Building frame members.
 - 7. Building walls.
 - 8. Acoustical isolation floating slabs.
 - 9. Architectural Concrete Mock-ups for the following
 - a. Retaining walls.
 - b. Slabs.
 - c. Interior ramp.
 - d. Cast concrete against existing walls.
- B. This Section specifies architectural cast-in place concrete for locations indicated, and all materials, procedures, and requirements specified in Section 03 30 00 Cast-in-Place Concrete shall fully apply to cast-in-place architectural concrete, except as otherwise specified.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following, subject to compliance with requirements:
 - 1. Blended hydraulic cement.
 - 2. Fly ash and other pozzolans.
 - 3. Ground granulated blast-furnace slag.
 - 4. Silica fume.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 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.
 - 2. Include substantiating test data to show compliance with ACI 318 Chapter 5.
- 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. The steel reinforcement detailer shall generate all shop drawing bending and installation details from the structural and architectural drawings and specifications. The use of reproductions or photocopies of the contract drawings shall not be permitted.
 - 1. Provide details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include special reinforcement required for openings through concrete structures.
 - 2. Shop drawing re-submittals shall clearly identify all revisions to previous submittals.
 - a. Heavy ink clouded outlines (revision clouds) shall be drawn around revised areas of individual sheets.
 - b. Architect/Engineer will not review information outside of revision clouds on resubmitted drawings.

CAST-IN-PLACE CONCRETE

- D. Formwork Shop Drawings: Prepared by or under the supervision of a structural engineer licensed in the State of Oregon detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
 - 2. Provide form tie layout showing aesthetically appropriate evenly spaced ties horizontally and vertically.
- E. Waterstop Shop Drawings: PDF format showing locations and types per manufacturer's recommendations.
- F. Samples: For waterstops and vapor retarder.
- G. Welding certificates.
- H. Qualification Data: For Installer, manufacturer, and testing agency.
 - 1. 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.
- I. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor barriers.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- J. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- K. Minutes of preinstallation conference.
- L. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval by the Engineer.
- M. Vapor barrier manufacturer's technical representative reports.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301, ACI 117 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.
- D. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and supervisor who is an ACI-certified Concrete Flatwork Technician.
- E. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM 94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities.

CAST-IN-PLACE CONCRETE

- F. For slabs-on-grade required to include an under-slab vapor barrier, provide a vapor barrier from a firm experienced in manufacturing vapor barriers and conforming to the requirements specified herein. Do not proceed with placement unless manufacturer's technical representative is present for vapor barrier installation and for every day of concrete slab placement.
- G. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade 1. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.
- H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant located within a 500 mile radius, obtain aggregate from one source, and obtain approved admixtures through one source.
- I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01 30 00 - Administrative Requirements.
 - 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 cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Steel reinforcement subcontractor when applicable.
 - f. Under-slab vapor barrier
 - g. Under-slab vapor barrier manufacturer's technical representative, for slabs on grade.
 - 2. Review procedures and special conditions and details for field quality control of vapor barrier placement.
 - 3. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
- K. Manufacturer's Technical Representative:
 - 1. Visit site not less than three times, and more if required to review vapor barrier placement and installation procedures and concrete placement over vapor barrier.
 - a. Pre-installation meeting.
 - b. Duration of membrane installation for observation of completed membrane installation.
 - c. After installation of reinforcing, when applicable, and during placement of concrete
 - 2. Document site visits in writing with copy to Architect.

1.05 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

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- B. Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. See Section 01 43 39.
- C. Construct concrete mock-ups for new architectural concrete placements indicated on the drawings, incorporating all components specified.
 - 1. Construct in a coordinated mock-up, concrete retaining wall mock-up where indicated on the drawings, incorporating all components specified for one coordinated assembly in conjunction with associated assemblies.
 - 2. Minimum size of mock-up is indicated on the architectural drawings.
 - 3. Approved mock-up may remain as part of the Work if undisturbed at time of Substantial Completion.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.07 SYSTEM DESCRIPTION

- A. Redesign or Departures from Requirements of the Contract Documents Initiated by Contractor:
 - 1. Obtain written acceptance from the Architect and Architect's consultants.
 - 2. Bear costs for Contractor-initiated or construction error due to changes in type, form, system, or details of construction from those indicated by the contract documents.
 - 3. Costs of review of such changes by Architect and Architect's consultants will be deducted from the Contract Sum by Change Order.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1, or better.
- B. Forms for Rectangular Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 1 by 1 inch.

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- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. 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 units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.03 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed. Refer to General Structural Notes.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.
- C. Regional Content: Provide steel products which are extracted/harvested and manufactured from within 500 miles of the project site.
- D. Low-Alloy-Steel Reinforcing Bars: All reinforcing steel to be welded or bent in field: ASTM A 706, deformed.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.04 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615, Grade 60 plain steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice" of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.05 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II.
 - a. Fly Ash: ASTM C 618, Class C or F. Refer to General Structural Notes.
 - b. Recycled Content: Provide cement and cementitious materials with postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 - c. Regional Content: Provide cement and cementitious materials which are extracted/harvested and manufactured from within 500 miles of the project site.
- B. Normal-Weight Aggregate: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch at foundations, 3/4 inch at slabs and walls
 - a. Regional Content: Provide aggregate materials which are extracted/harvested and manufactured from within 500 miles of the project site.
- C. Water: ASTM C 94 and potable.

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2.06 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
 - 1. Use of admixtures requires Owner approval.
- B. Chemical Admixtures:
 - 1. Use of admixtures requires Owner approval.
 - 2. Provide approved admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - b. Retarding Admixture: ASTM C 494/ C494M, Type B.
 - c. Water-Reducing and Retarding Admixture: ASTM C494/C 494M, Type D.
 - d. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - e. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C 494M, Type G.
 - f. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- ~~C. Waterproofing Admixture: Hydrophobic Waterproofing integral to concrete mix with WRA, hydrophobe and pore blocker for protecting against water ingress and reducing water absorption to 1 percent or less~~
 - ~~1. Use of admixtures requires Owner approval.~~
 - ~~2. Hydrophobic Waterproofing Admixture: Integral to concrete mix with WRA, hydrophobe and pore blocker for protecting against water ingress and reducing water absorption to 1 percent or less.~~
 - ~~a. Manufacturers:~~
 - ~~1) Aquafin, Inc.~~
 - ~~2) Caltite~~
 - ~~3) Grace Building Products, Inc.~~
 - ~~4) Hycrete, Inc.~~
 - ~~5) Master Builders, Ltd.~~
 - ~~6) Substitutions: See Section 01 60 00 - Product Requirements.~~
- DC. Shrinkage Reducing Admixture (SRA):
 - 1. Use of admixtures requires Owner approval.
 - 2. Provide SRA in mixes used at all exposed polished concrete slab applications at the highest dose rate recommended by the manufacturer. Verify compatibility with other admixtures.
 - a. Master Builders, MasterLIFE SRA20
 - b. Grace Construction Products, Eclipse 200
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- ED. Synthetic Fiber Reinforcing: Provide synthetic fiber reinforcing in mixes used at all exposed polished concrete slab applications as recommended by the manufacturer. Follow all manufacturer mixing procedures.
 - 1. Propex Concrete Systems, Novomesh 950
 - 2. Grace Construction Products, STRUX 90/40
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 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, 3/4 inch by 1 inch (19 by 25mm).
 - 1. Products:

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- a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
- b. Concrete Sealants Inc., Conseal CS-231.
- c. Greensteak; Swellstop.
- d. Henry Company, Sealants Division; Hydro-Flex.
- e. JP Specialties, Inc.; Superstop.
- f. TCMiraDRI; Mirsastop.
- g. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ACCESSORY MATERIALS

- A. Underslab Vapor Barrier: Polyolefin multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs.
 1. Single ply polyethylene is prohibited.
 2. Water Vapor Permeance: less than .01 perms when tested in accordance with ASTM F-1249/ASTM E-96.
 3. Minimum thickness: 15 mils.
 4. Manufacturers:
 - a. Fortifiber Corporation, www.fortifiber.com <<http://www.fortifiber.com>>; Product: Moistop Ultra 15 X.
 - b. Raven Industries Inc, www.ravenind.com <<http://www.ravenind.com>>; Vapor Block 15.
 - c. Reef Industries Inc, www.reefindustries.com <<http://www.reefindustries.com>>; Product: Griffolyn Type 105.
 - d. Stego Industries, LLC www.stegoindustries.com <<http://www.stegoindustries.com>>; Product: Stego Wrap, 15 mils.
 5. Details, transitions, terminations and penetrations to be installed per manufacturer's recommendations.
- B. Vapor Emission Control Sealer and pH Suppression: Two-component high solids penetrating epoxy sealer for providing an effective membrane barrier to inhibit moisture migration and provide pH isolation. Details, transitions, terminations and penetrations to be installed per manufacturer's recommendations. See Section 01 45 19 for testing procedures to determine if use of these products is necessary. Use of these products is applicable only when testing indicates need for floor covering application and individual Division 09 floor covering manufacturers do not have a preferred specific product for maintaining floor covering warranties.
 1. Manufacturers:
 - a. Ardex
 - b. Advanced Moisture Control
 - c. Aquafin, Inc
 - d. Bostik
 - e. Dependable Floor Underlayments
 - f. Mapei
 - g. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Slab Isolation System: Roll-out batting with pre-spaced isolators for providing an effective high-performance resilient decoupler creating a floating floor system to minimize floor impact noise and airborne sound transmissions.
 1. Manufacturers:
 - a. Kinetics Noise Control, Inc.
 - 1) Product: Model RIM.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Concrete Topical Sealer: Clear single-component high resin solids, water-based low VOC concrete sealer for providing an effective anti-dusting wear surface for exposed concrete floors

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which are not receiving floor covering, penetrating sealers/hardeners or polished concrete floor surfacing.

2.09 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edoco; BurkeFilm
 - c. ChemMasters; Spray-Film
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (the); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - k. Meadows, W.R., Inc.; Sealtight Evapre.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
 - p. Unitex; Pro-Film.
 - q. US Mix Products Company; US Spec Monofilm ER.
 - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
 - s. Substitutions: See Section 01 60 00 - Product Requirements.
 2. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
 3. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 4. Water: Potable.
 5. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A, 30% solids content minimum. The only place in the project this is applied are the top of exposed concrete slabs that are not receiving other floor finishes that cover the concrete slab visually or concrete polishing.
 - a. Products:
 - 1) Burke By Edoco; Cureseal 1315 WB.
 - 2) ChemMasters; Polyseal WB.
 - 3) Conspec Marketing & Manufacturing Co.; Inc., a Dayton Superior Company; Sealcure 1315 WB.
 - 4) Euclid Chemical Company (The); Super Diamond Clear VOX.
 - 5) Kaufman Products, Inc.; SureCure 25 Emulsion.
 - 6) Lambert Corporation; UV Safe Seal.
 - 7) L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - 8) Meadows, W.R., Inc.; Vocomp-30.
 - 9) Metalcrete Industries; metcure 30.
 - 10) Symons Corporation, a Dayton Superior Company; Cure & Seal 31 Percent E.
 - 11) Tamms Industries, Inc.; LusterSeal WB 300.
 - 12) Unitex; Hydro Seal 25.
 - 13) US Mix Products Company; US Spec Radiance UV-25.
 - 14) Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
 - 15) Substitutions: See Section 01 60 00 - Product Requirements.

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2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class, suitable for application temperature and grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Weep Hole Sleeve:
 - 1. Size: Schedule 40 standard steel pipe, 1 inch inside diameter.
 - 2. Finish: Hot dipped galvanized, G-185 complying with ASTM A 123/A 123 M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and in accordance with the following:
 - 1. Compressive Strength: Refer to General Structural Notes.
 - 2. Maximum Water-Cementitious Materials Ratio: Refer to General Structural Notes.
 - 3. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having the air content specified in the General Structural Notes.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 20 percent.
 - 2. Combined Fly Ash and Pozzolan: 20 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 20 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 30 percent with fly ash or pozzolans not exceeding 20 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent portland cement minimum, with fly ash or pozzolans not exceeding 20 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

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2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 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 concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces at interior or exterior exposed to view concrete surfaces.
 - 2. Class B, 1/4 inch for utility formed finished surfaces.
 - 3. Class D, up to 1 inch for rough-formed finished surfaces hidden from view.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Place form ties in patterns evenly space horizontally and vertically.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- M. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 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.

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1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete if concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318, and ACI 301 for design, installation, and removal of shoring and reshoring.
 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 VAPOR BARRIER

- A. Plastic Vapor Barrier: Place, protect, and repair vapor barrier according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
 2. Install vapor barriers per manufacturer's recommendations.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- 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.
 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

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- E. Install welded wire fabric 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.

3.07 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.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent or roughen interface to 1/4" (6mm) amplitude at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.08 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field-fabricate joints in waterstops according to manufacturer's written instructions. Install per manufacturer's recommendations

3.09 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.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
- C. Adjust mix as required to maintain specified air content at the point of discharge.
- 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 (150 mm) 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.

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5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities to meet preparation requirements for waterproofing and dampproofing.
 1. Apply to concrete surfaces not exposed to public view.
- B. 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 or to be covered with a coating or covering material applied directly to concrete.
- C. 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.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen 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 indicated and to floor and slab 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 and measure surface to tolerances indicated.
- C. Trowel and Fine-Broom Finish: Apply a first trowel finish, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

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1. Comply with flatness and levelness tolerances for trowel finished floor surfaces indicated.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and 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.

3.12 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. An independent testing agency, as specified in Section 01 40 00, will inspect finished slabs for conformance to specified tolerances.
- B. Screed slab on grade floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155 within 48 hours after slab installation; report both composite overall values and local values for each measured section. Verify finish with Architect.
 1. Non-critical areas, thickset tile:
 - a. F(F): Specified Overall Value (SOV) of 20; Minimum Localized Value (MLV) of 15.
 - b. F(L): Specified Overall Value (SOV) of 15; Minimum Localized Value (MLV) of 10.
 2. Carpet areas:
 - a. F(F): Specified Overall Value (SOV) of 25; Minimum Localized Value (MLV) of 17.
 - b. F(L): Specified Overall Value (SOV) of 17; Minimum Localized Value (MLV) of 15
 3. Thinset Flooring:
 - a. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 30.
 - b. F(L): Specified Overall Value (SOV) of 30; Minimum Localized Value (MLV) of 20.
 4. Polished Concrete Flooring:
 - a. F(F): Specified Overall Value (SOV) of 50; Minimum Localized Value (MLV) of 35.
 - b. F(L): Specified Overall Value (SOV) of N/A; Minimum Localized Value (MLV) of N/A.
- C. Screed suspended slab floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155 within 48 hours after slab installation; report both composite overall values and local values for each measured section. Verify finish with Architect.
 1. Non-critical areas, thickset tile and parking structures:
 - a. F(F): Specified Overall Value (SOV) of 20; Minimum Localized Value (MLV) of N/A.
 - b. F(L): Specified Overall Value (SOV) of 15; Minimum Localized Value (MLV) of N/A.
 2. Carpet Areas:
 - a. F(F): Specified Overall Value (SOV) of 25; Minimum Localized Value (MLV) of N/A.
 - b. F(L): Specified Overall Value (SOV) of 15; Minimum Localized Value (MLV) of N/A.
 3. Thinset Flooring:
 - a. F(F): Specified Overall Value (SOV) of 30; Minimum Localized Value (MLV) of N/A.
 - b. F(L): Specified Overall Value (SOV) of 24; Minimum Localized Value (MLV) of N/A.
 4. Polished Concrete Flooring:
 - a. F(F): Specified Overall Value (SOV) of 50; Minimum Localized Value (MLV) of 35.
 - b. F(L): Specified Overall Value (SOV) of N/A; Minimum Localized Value (MLV) of N/A.

3.13 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 the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

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- C. Equipment Bases: Unless shown otherwise in the drawings provide 4" thick concrete pads under mechanical equipment as required. Reinforce with #4 @16" on center each way at center of pad. Dowel to floor structure with #3 hooked dowels with 12" horizontal legs, at 24" on center around perimeter of pad. Drill and epoxy with 3" embedment. Refer to Mechanical drawings for locations. Pad size to extend 6" beyond edge of equipment on all sides. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.14 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.
- 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./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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. 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 (300-mm) 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 (300 mm), 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.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of a floor covering used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial

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application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

- F. General: Where structural slabs will be polished and exposed to view, protect structural concrete slab finished surface from surface damage and staining resulting from construction activities by utilizing appropriate membrane and sheet materials and other such measures as may be necessary to protect the finished slab surface appearance such as, but not limited to, diapering of equipment to eliminate oil leaks, and restricting construction activities that could be potentially detrimental to exposed to view slab finished surfaces. Protect concrete surfaces to receive polished finish:
1. Moist cure for a minimum of 10 days before covering with protection board.
 2. Use Ram Board as protection board, with additional plywood during setting of steel. Do not use Masonite, hardboard.
 3. Do not use staining snap lines. Use blue only.
 4. Wet cure only, concrete slabs.
 5. Slab curing temperature is to remain below 120 degrees F where radiant heating/cooling system plastic piping is integral with slab.
 6. Forming and bracing must remain in place for support of structural slab until slab has come up to full strength.
 7. Allow slabs to adequately cure to eliminate possibility of discoloring slab surface and silhouetting of protect board onto concrete finish surface. Hardboard may not be used as a protection board.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by 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. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. 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. Repair defects on surfaces exposed to view 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. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- 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 (0.25 mm) 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.

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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 (6 mm) 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 (25 mm) 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 (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture 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 (25 mm) 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.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports as specified in Section 01 40 00.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests, and inspections and to submit test reports
- C. Inspections: As indicated in the General Structural Notes.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain at least one composite sample for each 150 cu. yd. or fraction thereof of each concrete mix placed each day and at least one composite sample for each 5000 square feet of surface area of slabs or walls.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

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5. Prior to finish flooring surfaces being installed, the relative humidity of the concrete slab shall meet the requirements of the flooring manufacturer or 80 percent, whichever is less, per ASTM F-2170-02 (Relative Humidity Probe Test).
6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days, two at 28 days, and hold one for later testing.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, Structural Engineer, concrete manufacturer, Building Official, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, type of break for both 7- and 28-day tests, and air content.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Fire-rated steel doors and frames.
- C. Thermally insulated steel doors.
- D. Steel glazing frames.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
 - 1. Schedule: Coordinated with other doors, frames, hardware, glazing, finishes and accessories.
- D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Maintain at the project site a copy of all reference standards dealing with installation.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL 10C..
 - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
- F. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

HOLLOW METAL DOORS AND FRAMES

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Doors and Frames: Member of HMMA or SDI that produces products complying with requirements.

2.02 DOORS AND FRAMES

- A. Requirements for All Doors and Frames:
1. Door Top Closures: Flush with top of faces and edges.
 2. Door Edge Profile: Beveled on both edges.
 3. Door Texture: Smooth faces.
 4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
 5. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
 6. Galvanizing all Units: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
 7. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 STEEL DOORS

- A. Exterior Doors Type ____:
1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
 2. Core: Polyurethane, foamed in place.
 3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
- B. Interior Doors, Non-Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
 2. Core: Polystyrene foam.
 3. Finish: Factory primed, for field finishing.
- C. Interior Doors, Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
 2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
 - a. Provide units listed and labeled by UL.
 - b. Attach fire rating label to each fire rated unit.
 3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch w.g. pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.
 4. Core: Mineral fiberboard.
- D. Energy Efficiency Exterior Hollow Metal Doors:**
1. **General: Provide 1-3/4 inch doors of design specified, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.**
 2. **Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated**

HOLLOW METAL DOORS AND FRAMES

below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

- a. Design: Flush panel.
 - 1) Roof Access Door Frame: 4-sided frame.
- b. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
 - 1) Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - 2) Thermal properties to rate at a fully operable minimum U-Factor 0.29 and R-Value 3.4, including insulated door, thermal-break frame and threshold.
 - (a) Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.8, including insulated door, kerf type frame, and threshold.
- c. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042 inch - 1.1-mm) thick steel, Model 2.
- d. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
- e. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- f. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
- g. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.04 STEEL FRAMES

- A. General:
 - 1. Comply with the requirements of grade specified for corresponding door, except:
 - a. Exterior Frames: Not less than 14 gage.
 - b. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 2.
 - 2. Finish: Same as for door.
 - 3. Frame with Opening Wider than 48 inches: Increase material thickness by 2 gages.
 - 4. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.
- B. Exterior Door Frames: Fully welded.
 - 1. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
- D. Interior Door Frames, Fire-Rated: Fully welded type.
 - 1. Fire Rating: Same as door, labeled.

EE. Energy Efficiency Exterior Hollow Metal Frames:

- 1. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated custom thermally broken frame profiles with integral 2-inch perimeter flange and other configurations as detailed, available for use in both masonry and framed wall construction. Fabricate from minimum 16 gauge galvanized steel, with positive 3/8" vinyl thermal break and integral vinyl weatherstripping. Thermal break frames available as knock down types only.
 - a. Manufacturers Basis of Design:
 - 1) CECO Door Products - Thermal Break SQT and SRT Series.
 - 2) Curries Company - Thermal Break M and C Series.

HOLLOW METAL DOORS AND FRAMES

- 3) Substitutions: See Section 01 60 00 - Product Requirements.
2. Weatherstripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weatherstripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.
- F. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
- FG. Transom Bars: Fixed, of profile same as jamb and head.

2.05 ACCESSORY MATERIALS

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
1. Do not prepare frames for silencers where weatherstripping or gasketing is indicated.
- D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.
- E. Galvanizing Repair Paint: Tnemec Series 135

2.06 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard, except silicone modified resin is not acceptable.
- B. Galvanizing Touch-Up Paint: Zinc rich primer compatible with finish paint system.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
1. Automotive undercoating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
- B. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
1. Coat interior of frame with undercoating.
- E. Coordinate installation of hardware.
- F. Coordinate installation of glazing.
- G. Coordinate installation of electrical connections to electrical hardware items.
- H. Touch up damaged factory finishes.

HOLLOW METAL DOORS AND FRAMES

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Bonded abrasive polishing of exposed new and existing concrete floors to a Class B aggregate exposure and a Gloss Level of 3:
 - 1. Existing floor finish removal from slab.
 - 2. Joint and crack filler.
 - 3. Grinding and polishing hardened concrete floors.
 - 4. Application of penetrating concrete sealer-hardener.
 - 5. Application of floor color stain.
 - 6. Oil repellent sealer.

1.02 DEFINITIONS

- A. Aggregate Exposure: Grinding a concrete floor surface with bonded abrasives to achieve a specified class of exposed aggregate, classified as A, B, C and D with varying levels of exposed aggregate.
- B. Finished Gloss: Processing a concrete floor surface to achieve a specified level of finished gloss prior to application of any protective treatment; Flat (ground), satin (honed), semi polished, and highly polished are measured in reflective clarity (DOI), and reflective sheen (specular gloss). Finished Gloss is classified as levels 1, 2, 3 and 4 with varying degrees of reflective clarity, and sheen.;

1.03 PERFORMANCE REQUIREMENTS

- A. Performance Criteria for final finish:
 - 1. Abrasion Resistance: ASTM C779 - Up to 20-26% increase in abrasion resistance.
 - 2. Impact Strength: ASTM C805 - Up to 21% increase impact strength.
 - 3. Ultra violet Light and water Spray: ASTM G23-81 - No adverse effect to ultra violet and water spray.
 - 4. Reflectivity: Up to 30% increase in light reflectivity.
 - 5. Coefficient of friction: ~~0.6~~ Horizontal surface average of not less than 0.30 and incline of not less than 0.80 per ANSI 101.3.
 - 6. Minimum flatness and level of F(F) of 35 and F(L) of 35 per ASTM E 1155.
 - 7. Gloss at 60 degrees from vertical of 70 to 85 units per ASTM D 523.
 - 8. Slip resistance of diamond polished concrete: Provide minimum 0.8 static coefficient of friction at stairs and ramps and to qualify as a slip resistant surface per Voices of Safety International VOSI V41.21 test method.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Comply with pertinent provisions of Section 01 60 00- Product Requirements.
- C. Certification of Mix Design Review: Submit finish applicator's review and acceptance of the mix design submitted per section 03 30 00 - Cast in Place Concrete for concrete flatwork to receive bonded abrasive polish finish.
- D. Product data:
 - 1. Submit manufacturer's technical data specifications and test data giving descriptive data, curing time, and application requirements.
 - 2. Finished Floor Slip Resistance: Provide performance data for representative sample of similarly finished concrete flatwork demonstrating compliance with slip resistance requirements.
 - 3. Submit manufacturer's special concrete finish describing each product to be provided, giving manufacturer's name and product name for the specified material proposed to be provided under this section.
 - 4. Submit special concrete finishes technical data sheet

CONCRETE FLOOR FINISHING

- E. Test Reports: Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.
- F. Installer's Certification.
- G. Installation Instructions: Manufacturer's recommended installation procedures and instructions for each special concrete finish; which when approved by the Architect, will become the basis for accepting or rejecting actual installation.
- H. Pre-installation meeting minutes.
- I. Manufacturer's technical representative to submit to Architect and Owner's representative field reports for each site visit.

1.05 QUALITY ASSURANCE

- A. Source Quality Control: Provide concrete finishing components and materials from single manufacturer or as approved through the substitution request process.
- B. Installer Qualifications:
 - 1. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section. Applicator must have availability of proper equipment to perform work within scope of this project on a timely basis.
 - 2. Installer to provide manufacturer trained personnel, experienced, and skilled in application of materials and system finish specified in adequate numbers and maintain supervision over personnel.
- C. Manufacturer's Certification: Letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.
- D. Field Quality Control:
 - 1. Notify Architect and Owner's representative a minimum of 7 days prior to any Work.
 - 2. Technical representative of materials manufacturer to observe Work in progress and at a minimum these other times:
 - a. Pre-installation meeting.
 - b. Installation of mock-up.
 - c. Observation of completed installation.
 - 3. Document site visits in writing with copy to Architect.

1.06 MOCK-UPS:

- A. Provide mock-ups of each type finish, new and existing slabs, in a selected area where new and existing are contiguous, to demonstrate typical joints, surface finished gloss, color variation (if any), aggregate exposure and standard of workmanship.
 - 1. Size: 100 square feet for each type (new and existing).
 - 2. Location: As selected by Architect.
 - 3. When accepted, mock-up will demonstrate minimum standard of quality required for this work.
 - 4. Maintain and protect mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
 - 5. Approved mock-up may remain as part of finished work if undisturbed at time of substantial completion.
 - 6. Existing Slab Mock-Up:
 - a. Prepare floor mock-up in advance of adjoining new slab placement so that mock-ups are at matching elevation.
 - b. Slab preparation aesthetics must be approved by owner prior to beginning mock-up.
 - 7. Notify Architect or Owner Representative seven days in advance of dates and times when mock-ups will be constructed.

CONCRETE FLOOR FINISHING

1.07 PRE-INSTALLATION CONFERENCE

- A. Conduct conference at Project Site two weeks before starting Work of this section.
- B. Review preparation and installation procedures and coordinating and scheduling required with related Work.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.
- B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.09 PROJECT CONDITIONS

- A. Protection of concrete floors prior to and after finishing:
 - 1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
 - 2. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
 - 3. No trade shall park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
 - 4. No pipe cutting machine shall be used on the inside floor slab.
 - 5. Steel will not be placed on interior slab to avoid rust staining.
 - 6. Acids and acidic detergents shall not come into contact with slab.
 - 7. All trades shall be informed that the slab must be protected at all times.
- B. Environmental limitations:
 - 1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
 - 2. Concrete must be cured a minimum of 28 days or as directed by the manufacturer before application of hardener/sealer can begin.
 - 3. Application of hardener/sealer shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.
- C. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.
- D. Protect floor access panels from damage in new and existing exposed concrete floors. Intent is to have access panels flush to adjacent polished concrete floors.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Seven year non-dusting warranty covering application and use of chemicals, diamond tooling and polishing equipment for installation of polished concrete floor.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Hardener-Sealer-Densifier Requirements:
 - 1. Densifier: Nano-sized particles of reactive, amorphous colloidal silica in water.
 - 2. VOC Content: Zero volatile organic compounds.
 - 3. pH: 9.5-10.5.
 - 4. Consistency and Color: Non-gel forming with no visible residue or whitening when applied to concrete surfaces.
 - 5. Densifier must not contain acrylic or other additive that will void warranty.

CONCRETE FLOOR FINISHING

- B. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
 - 1. Type recommended by hardener-sealer-densifier manufacturer and compatible with hardener-sealer-densifier.
- C. Latex Based Grout to fill exposed air pockets and aggregate lost due to grinding process
 - 1. Type recommended by hardner-sealer-densifier manufacturer and compatible with hardener-sealer-densifier.
 - 2. Bonding agent allows concrete dust to receive densification process and does not introduce colors outside of concrete matrix, no epoxy based grout product.
- D. Concrete Stain:
 - 1. Acceptable Product: Scofield Lithochrome Chemstain Classic or approved equal.
 - 2. Color: ~~Match architect's sample~~ See section 09 90 00 Color Schedule.
- E. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymer blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.
 - 1. Type recommended by hardener-sealer-densifier manufacturer and compatible with hardener-sealer-densifier.
- F. Metal-bond and resin-bond diamond tooling appropriate for grinding, polishing and refinement of bonded abrasive polished concrete floor in conformance with ST 115 requirements.
 - 1. 13 millimeter metal-bond, industrial diamond impregnated grinding segment for aggregate exposure and latex grout application.
 - 2. Resin bond diamond impregnated tooling for refinement and polishing.
 - 3. Manufacturer/Supplier:
 - a. GMI Engineered Products, LLC; gmiengineeredproducts.com
 - b. HTC Professional Floor Systems; www.htc-floorsystems.com
 - c. Husqvarna Construction Products; www.husqvarna.com
 - d. Jon-Don, Inc.; www.jondon.com
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SURFACE PREPARATION EQUIPMENT

- A. Grinder: Triple-headed planetary type having fully independent speed/directional control of plate and satellite heads, with minimum 700 pounds grinding pressure and phase correction in conjunction with vacuum filtration system.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrate, with installer present, for conditions affecting performance and quality of finish. Correct conditions detrimental to timely and proper work. Do not proceed until such observations have been made, unsatisfactory conditions are corrected, and have been approved in writing to Architect.
- B. Verify that base slab meet finish and surface profile requirements specified in Section 03 30 00 - Cast-In-Place Concrete, and Project Conditions above.
- C. Prior to application, verify that floor surfaces are free of construction latents.
- D. Concrete must be in place a minimum of 28 days or as directed by the manufacturer before application can begin.

3.02 PREPARATION

- A. Protect adjacent finishes and floor that will be exposed.
- B. Verify that protection is adequate daily and with each stage of finishing.

CONCRETE FLOOR FINISHING

3.03 APPLICATION

- A. Floor to be prepared for densifier application with specified diamond grinding steps, followed by final polishing steps:
 - 1. Level One (Flat / Ground) requires 150 grit metal bonded diamonds, 50 grit resin diamonds, and densifier;
 - 2. Level Two (Satin / Honed) requires 150 grit metal bonded diamonds, 50 grit resin diamonds, 120 grit resin diamonds, 220 grit resin diamonds, densifier and 400 grit resin diamonds;
 - 3. Level Three (Semi-Polished) requires same steps as Level Two, with the addition of an 800 grit resin diamond final polish; Start any of the floor finish applications in presence of manufacturer's technical representative.
- B. Sealing, Hardening and Polishing of Concrete Slabs:
 - 1. Application is to take place at 28 days after new slab has been placed. Existing slabs with cementitious cast underlayment or fill back areas using polymer modified cementitious fill should be polished no sooner than 14 days after placement.
 - 2. Densifier shall be applied by a certified applicator, following applicable procedures as recommended by the manufacturer and as required to match approved mock-up.
 - 3. Achieve hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
 - 4. Finish to within 1/2" of vertical surfaces where practical. Finish remainder of slab to vertical surface with hand held grinder/polisher.
 - 5. Polish to pre-determined level based on approved mock-up.
- C. Concrete Stain: Apply concrete stain in strict conformance with stain manufacturer's instructions and best recommendations. Match approved mock-up.
- D. Sealer:
 - 1. Apply sealer on entire floor as final finish of polished concrete. Follow application directions and burnish as recommended to level required to match mock-up final sheen.

3.04 CLEANING

- A. Keep work area clean and free of debris at all times.
- B. Remove spatter or dusting from adjoining surfaces, as necessary, depending on grinding process.
- C. Repair or replace damaged surfaces caused by preparation, polishing, or cleaning operations.
- D. Remove debris from jobsite.
 - 1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.05 PROTECTION

- A. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.
- B. Final Protection of Polished Concrete:
 - 1. Following completion of the final polishing, protect finished work until fully cured in accordance with Manufacturer's recommendations.
 - 2. After finish work is fully cured, and prior to opening area to traffic, protect from other trades by covering with a breathable product, such as "Ramboard" or thin curing blanket. Do not use hardboard or any wood based products in direct contact with concrete as wood tanins will leave stain patterns on concrete surface.

3.06

- A. Manufacturer, Owner representative, polishing sub and responsible party for facility maintenance to review manufacture recommended maintenance program of polished floor.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Overhead coiling doors, operating hardware, non-fire-rated and exterior, electric manual operation.
- ~~B. Wiring from electric circuit disconnect to operator to control station.~~

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Cylinder cores and keys.
- ~~B. Section 09 90 00 - Painting and Coating: Field paint finish.~~
- ~~C. Section 28 31 00 - Fire Detection and Alarm: Fire alarm interconnection.~~
- ~~D. Section 26 27 17 - Equipment Wiring: Power to disconnect.~~
- ~~E. Section 26 05 34 - Conduit: Conduit from electric circuit to operator and from operator to control station.~~
- ~~F. Section 26 05 34 - Conduit: Conduit from fire alarm system.~~

1.03 REFERENCE STANDARDS

- ~~A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2012.~~
- ~~B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.~~
- ~~C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.~~
- DA. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- ~~E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.~~
- ~~F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.~~
- ~~G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.~~
- ~~H. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated 600-2000 Volts; National Electrical Manufacturers Association; 2000 (R2008).~~
- ~~I. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.~~
- ~~J. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.~~

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- E. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 ~~QUALITY ASSURANCE~~

~~A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.~~

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
- ~~C. Provide one year service and maintenance agreement for installed system for one year owner's consideration from Date of Substantial Completion.~~
 - ~~1. Examine system components monthly. Clean, adjust, and lubricate equipment.~~
 - ~~2. Include systematic examination, adjustment, and lubrication of elevator equipment. Maintain hydraulic fluid levels. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original equipment.~~

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Alpine Overhead Doors, Inc: www.alpinedoors.com.
 - 2. Clopay Corporation: www.clopaydoor.com.
 - 3. Cornell Iron Works, Inc: www.cornelliron.com.
 - 4. The Cookson Company: www.cooksondoor.com.
 - 5. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
 - ~~6. McKeon Door Company; www.mckeondoors.com.~~
 - 7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors: Heavy Duty, ~~Insulated, Type 304 perforated~~ Stainless steel slat curtain and components ~~conforming to ASTM A 666, Type 304, rollable temper; Number 4 finish.~~
 - 1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
 - ~~2. Sandwich slat construction with insulated core of mineral wool type insulation; insulation 4.5 R- value: 0.50 BTU/hr-sq-ft-deg-F~~
 - ~~3. Nominal Slat Size: 2 inches wide x required length.~~
 - ~~4. Finish: No. 4.~~
 - ~~5. Guides: Angles; stainless steel.~~
 - ~~6. Hood Enclosure: Stainless steel~~
 - ~~7. 2. Manual hand chain lift operation.~~
 - ~~3. Mounting: Surface mounted.~~
 - ~~8. Exterior lock and latch handle.~~
- ~~B. Non-Fire-Rated Interior Coiling Doors: Perforated steel slat curtain.~~
 - ~~1. Single thickness slats.~~
 - ~~2. Nominal Slat Size: 2 inches wide x required length.~~
 - ~~3. Finish: Factory powder coat.~~
 - ~~4. Guides: Formed track; with factory powder coat steel.~~
 - ~~5. Hood Enclosure: Manufacturer's standard; with factory powder coat steel.~~
 - ~~6. Manual chain operation.~~
 - ~~7. Mounting: Surface mounted.~~
 - ~~8. Exterior lock and latch handle.~~
 - ~~9. Size: 8 feet wide by 7 feet high.~~

2.03 MATERIALS

- ~~A. Curtain Construction: Interlocking slats.~~

OVERHEAD COILING DOORS

- ~~B.~~ Curtain Construction: 2 inch nominal, interlocking stainless steel slats; 1-1/2 inch perforations matching Architect's pattern, minimum 22 gage, conforming to ASTM A 666, Type 304, rollable temper.
1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
 2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
 3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
- ~~B.~~ Steel Slats: Minimum 22 gage ASTM A653/A653M galvanized steel sheet.
1. Galvanizing: Minimum G90 coating.
- ~~C.~~ Stainless Steel Slats: Minimum 22 gage steel conforming to ASTM A 666, Type 304, rollable temper.
- ~~D.~~ Angle Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- ~~E.~~ Steel Guides: ASTM A36/A36M steel angles, size as indicated, hot dip galvanized per ASTM A 123/A 123M.
- ~~F.~~ Steel Guides: Formed from galvanized steel sheet, 4 gage; 2 inch wide; complying with ASTM A653/A653M.
1. Galvanizing: Minimum G90/Z275 coating.
- ~~G.~~ Stainless Steel Guides: ASTM A 666, Type 304, rollable temper.
- ~~HD.~~ Hood Enclosure: Internally reinforced to maintain rigidity and shape.
1. Minimum 22 gage.
 2. Factory paint, custom color.
- ~~IE.~~ Hardware:
1. Lock Cylinders: Specified in Section 08 71 00.
 2. Latching: Inside mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position.
 3. Latch Handle: Interior and locking exterior handlehandles.
- ~~JF.~~ Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

~~2.04~~ **ELECTRIC OPERATION**

- ~~A.~~ Electric Operators:
1. Mounting: Side mounted.
 2. Motor Enclosure:
 - a. Exterior doors: NEMA MG 1 Type 4; open drip proof.
 - b. Interior doors: NEMA MG 1 Type 1; open drip proof.
 3. Motor Rating: 1/3 hp; continuous duty.
 4. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 5. Controller Enclosure: NEMA 250 Type 1.
 6. Opening Speed: 12 inches per second.
 7. Brake: Adjustable friction clutch type, activated by motor controller.
 8. Manual override in case of power failure.
- ~~B.~~ Interior Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
1. 24 volt circuit.
 2. Surface mounted.

OVERHEAD COILING DOORS

- ~~C. Exterior Control Station: Standard key-operated (OPEN-STOP-CLOSE) momentary control for each operator:
 - 1. 24 volt circuit.
 - 2. Recessed.~~
- ~~D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.~~
- ~~E. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.~~

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of ~~electrical service with Section 26 27 17 Division 26.~~
- ~~F. Complete wiring from disconnect to unit components.~~
- ~~G. Coordinate installation of~~ sealants and backing materials at frame perimeter as specified in Section 07 90 05.
- ~~H~~F. Install perimeter trim, closures, and gasketing.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

ALUMINUM FRAMED CURTAIN WALL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.
- B. Aluminum doors and frames.
- C. Transoms vents.
- D. Column covers.
- E. Perimeter sealant.
- F. Field Quality Control Testing.

1.02 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.
- B. AAMA 503-08 (Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Glazing Systems).
- C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 2009.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2011.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2013.
- H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- I. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
- J. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008)

1.03 PERFORMANCE REQUIREMENTS

- A. The delegated design curtain wall system shall be 2 ½ inches inside glazed and utilize the appropriate depth back member to meet project loads. An energy efficient fiberglass pressure plate will be used in lieu of a standard extruded aluminum pressure plate.
- B. Design and size components to withstand the following load requirements without damage or permanent set:
 - 1. Positive Design Wind Load: 40 lbf/sq ft.
 - 2. Negative Design Wind Load: 40 lbf/sq ft.
 - 3. Member Deflection: Limit member deflection to 1/175 in any direction, and maximum of 3/4 inch, with full recovery of glazing materials.
 - 4. Measure performance by testing in accordance with ASTM E 330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
- C. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with building code.

ALUMINUM FRAMED CURTAIN WALL

- D. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - 1. Movement of curtain wall relative to perimeter framing.
 - 2. Deflection of structural support framing, under permanent and dynamic loads.
- E. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf as measured in accordance with ASTM E 283.
- F. Condensation Resistance Factor: CRF of 55 when measured in accordance with AAMA 1503.1.
- G. Water Leakage: None, when measured in accordance with ASTM E 331 at a test pressure difference of 12 lbf/sq ft.
- H. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- I. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
- J. Overall System U-Value: Not to exceed 0.35 including design basis glazing units.
- K. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
- L. Design system to eliminate noises caused by wind and thermal movement, to prevent vibration harmonics, and to prevent "stack effect" in internal spaces.
- M. Integration requirements with building envelope systems: manufacturer must allow weather barrier flashing components to extend into shoulder of curtain wall system to create a continuous 90 degree barrier against water penetration and to complete the air barrier.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glazing and infill, internal drainage details and operable hardware.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples 3 by 5 inches in size illustrating finished aluminum surface, glazing, infill panels, glazing materials.
- E. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.
- F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
 - 1. Comply with Section 01 33 16 - Delegated Design Procedures.
- G. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- H. Report of field testing for water leakage.
- I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

ALUMINUM FRAMED CURTAIN WALL

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State in which the Project is located.
- B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.06 MOCK-UP

- A. See Section 01 40 00 Quality Requirements, for general requirements for mock-ups.
- B. Provide 100 square feet mock-up including all components occurring on project. Assemble to illustrate component assembly including glazing materials, weep drainage system, attachments, anchors, and perimeter sealant.
- C. Locate on-site where directed. Mock-up may remain as part of the Work.

1.07 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 PROJECT CONDITIONS

- A. Coordinate the work with installation of firestopping components or materials.

1.10 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.11 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide 5 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Design Basis: Wausau Window and Wall Systems: www.wausauwindow.com.
~~1.~~
1. Superwall and Superwall SSG.
- B. Acceptable Manufacturers pending conformance to Design Basis requirements and requirements specified herein:
 - 1. EFCO Corporation; www.efcocorp.com
 - 2. Kawneer North America: www.kawneer.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Inside glazed, with pressure plate and mullion cover.
 - a.
 - 2. Vents:

ALUMINUM FRAMED CURTAIN WALL

- a. System Description: Concealed frame (structurally glazed), with operable awning windows integrated within curtain wall system by manufacturer. Performance requirements for whole system also apply to vents.
 3. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - a. At exterior doors, provide compression weather stripping at fixed stops.
 4. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
 5. Finish: ~~Superior performance organic coating~~ Class I color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 - d. Color: Black.
 6. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 7. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 8. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
 10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
1. Design Wind Loads: Comply with the following:
 - a. See structural notes for positive and negative design load requirements.
 - b. Measure performance by testing in accordance with ASTM E330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.
 - c. Member Deflection: For spans less than 13 feet 6 inches, limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch, whichever is less and with full recovery of glazing materials.
 - d. Member Deflection: For spans over 13 feet 6 inches and less than 40 feet, limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch, with full recovery of glazing materials.
 2. Seismic Loads: Design and size components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
 3. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F surface temperature.
 - b. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.

ALUMINUM FRAMED CURTAIN WALL

4. Design system to eliminate noises caused by wind and thermal movement, to prevent vibration harmonics, and to prevent "stack effect" in internal spaces.
- C. Water Penetration Resistance: No uncontrolled water on indoor face when tested as follows:
 1. Test Pressure Differential: 12 lbf/sq ft.
 2. Test Method: AAMA 503 to full factory test pressure.
- D. Air Leakage: Maximum of 0.06 cu ft/min/sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 pounds per square foot pressure differential across assembly.

2.03 COMPONENTS

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
- B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
- C. System Description: concealed frame (structurally glazed), with operable awning and casement windows integrated within curtain wall system by manufacturer
- D. Glazing: As specified in Section 08 80 00.
- E. Column Covers: Aluminum, 0.032 inch thick, full contact pressure bonded to structure for flat surface, finish to match curtain wall framing members.
- F. Frame and Doors: Wausau Glazed Thermal-Block Entrances:
 1. Frame configured for attachment to thermal break curtain wall system.
 2. Doors: Medium stile of size indicated.
 3. Performance Requirements:
 - a. Air Infiltration: Not more than 0.30 cfm (0.00015 m3/s) per lineal foot (305 mm) at 1.60 psf (77 Pa) static air pressure differential, when tested in accordance with ASTM E283.
 - b. Water Leakage: There shall be no uncontrolled water entry at 0 psf (0 Pa) test pressure as defined in ASTM E331.
 - c. Structural Performance: Structural performance per ASTM E330 shall be based on an actual deflection of 0.02 inch (0.051 mm) at test pressure of 30.09 psf (1441 Pa).
 - d. Thermal Transmittance: Thermal transmittance due to conduction (Uc) shall not be greater than 0.651 Btu/hour/ft2/°F Insulbar only per AAMA 1503. Condensation resistance factor (CRF) shall not be less than 56 Insulbar only per AAMA 1503.
 4. Hardware: See Section 07 81 00; balance of hardware by door manufacturer.
 5. Glazing: See Section 08 80 00.
 6. Finish: Same as curtain wall system.

2.04 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Perimeter Sealant: Type exterior building sealant specified in Section 07 90 05.
- D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- E. Glazing Accessories: As specified in Section 08 80 00.

2.05 FINISHES

- A. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.
- B. Color: To be selected by Architect from manufacturer's custom range.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

ALUMINUM FRAMED CURTAIN WALL

2.06 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce framing members for imposed loads.
- G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Install firestopping at each floor slab edge.
- I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- J. Install perimeter sealant in accordance with Section 07 90 05.
- K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. Provide the services of the manufacturer's field representative to observe installation and make report.
- B. See Section 01 40 00 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

ALUMINUM FRAMED CURTAIN WALL

- C. Test installed curtain wall for water leakage in accordance with AAMA 503 to factory full test pressure.
- D. In-Place Testing Installation: Demonstrating all common aspects applicable to Project. Include flashing and accessory products, Coordinated with flexible flashing and sill pans, initial units for in-place mock-ups. Coordinate Work in advance with all trades.
- E. Test one curtain wall of each type, as directed by Architect.
- F. If any curtain wall fails, test additional curtain walls at Contractor's expense.
- G. Repair or remove Work that does not meet specified requirements, or that is damaged by testing.
 - 1. Where repair does not produce system(s) that meet specified performance requirements, replace system(s) components with new components and re-test.
 - 2. Obtain Architect's acceptance of corrective Work prior to executing it.
- H. Cost of corrective Work and re-testing necessary to arrive at performance requirements are Contractor's responsibility.
 - 1. Re-testing includes testing fees, Architect's fees, and Consultant's fees.
 - a. Re-testing costs due to re-design by Architect will be paid by Owner.

3.05 MANUFACTURER'S FIELD SERVICES

- A. See Section 01 40 00 - Quality Requirements, for general requirements for manufacturer observation of installation.
- B. Provide curtain wall manufacturer's field surveillance of the installation. Monitor and report installation procedures, unacceptable conditions and provide copies to the architect and envelope consultant.

3.06 ADJUSTING

- A. Adjust operating sash for smooth operation.

3.07 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION

LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- ~~A. Metal lockers.~~
- ~~BA.~~ Locker units with hinged doors.
- ~~CB.~~ Metal tops and filler panels.

1.02 REFERENCE STANDARDS

- ~~A. ASTM A653/A653M—Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.~~

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
- D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.0403 MOCK-UP

- A. Provide mock-up of one full size locker, 4 tier with sloped top, in selected colors.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.0504 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Design Basis Metal Lockers:
 - 1. Lyon Workspace Products: www.lyonworkspace.com.
- B. Acceptable manufacturers pending conformance to design basis requirements:
 - 1. Art Metal Products: www.artmetalproducts.com.
 - 2. ~~Lyon Workspace Products: www.lyonworkspace.com.~~
 - 3. Penco Products, Inc: www.pencoproducts.com.
 - 4. Republic Storage Systems Co: www.republicstorage.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

- A. Student Lockers: ~~Six~~Single tier ~~metal~~solid plastic (HDPE) lockers, ~~free-standing with matching closed base~~recessed mounted.
 - 1. Width: 15 inches.
 - 2. Depth: 18 inches.
 - 3. Height: 18 inches.
 - 4. Locking: Padlock hasps, for padlocks provided by Owner.
 - 5. Provide sloped top.

2.03 METAL LOCKERS

- ~~A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
 - 1. ~~Color: To be selected by Architect; allow for contrasting colors for locker bodies and doors.~~~~
- ~~B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.~~

LOCKERS

- ~~1. Body and Shelves: 24 gage, 0.024 inch.~~
- ~~C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.~~
 - ~~1. Door Frame: 16 gage, 0.060 inch, minimum.~~
- ~~D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.~~
 - ~~1. Door Outer Face: 18 gage, 0.048 inch, minimum.~~
 - ~~2. Door Inner Face: 20 gage, 0.036 inch, minimum.~~
 - ~~3. Form recess for operating handle and locking device.~~
 - ~~4. Provide louvers in door face, top and bottom, for ventilation.~~
- ~~E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.~~
 - ~~1. Hinge Thickness: 14 gage, 0.075 inch.~~
- ~~F. Sloped Top: 20 gage, 0.036 inch, with closed ends.~~
- ~~G. Trim: 20 gage, 0.036 inch.~~
- ~~H. Number Plates: Provide oval shaped brass plates. Form numbers 1 inch high of block font style with ADA designation, in contrasting color.~~

2.04 MATERIALS

- A. Sheet Steel: ASTM A 653/A 653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; to the following minimum thicknesses:
 - 1. Body and Shelf: 24 gage, 0.024 inch.
 - 2. Door Outer Face: 18 gage, 0.048 inch.
 - 3. Door Inner Face: 20 gage, 0.036 inch.
 - 4. Door Frame: 16 gage, 0.060 inch.
 - 5. Hinges: 14 gage, 0.075 inch.
 - 6. Base: 20 gage, 0.036 inch.
 - 7. Sloping Top: 20 gage, 0.036 inch.
 - 8. Trim: 20 gage, 0.036 inch.
- B. Accessories For Each Locker: Two single prong wall hooks, coat hanger bar.
- C. Finish: C Paint locker units 11 custom colors to be selected.
- D. Metal trim closure surround for recessed lockers

2.0504 FINISHING

- A. Clean, degrease, and neutralize metal; prime and finish with one coat of baked enamel.
- B. Paint locker bodies and doors in same colors.
- C. Paint locker units 1 custom color, as selected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.

LOCKERS

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Work of this Section includes design, supply and installation of roof and wall mounted fall restraint safety anchors,

1.02 REFERENCES

- A. AISC S342L-1993, with Supplement No.1 "Load and Resistance Factor Design Specification for Structural Steel Buildings".
- B. AISI SG-971-1996, with 2000 Supplement "Specification for Design of Cold-Formed Steel Structural Members".
- C. AWS D1.1-2000 Structural Welding Code - Steel.

1.03 REQUIREMENTS

- A. Locate davit bases to suit equipment and personnel which will be used on the building with respect to items such as reach, rigging, spacing, roof edge condition and similar items.
- B. Confirm all anchor components will provide adequate attachment to the building and are suited to current suspended maintenance practices. Confirm compatibility with industry standard equipment.
- C. Ensure all anchor components conform to proper engineering principles and conform to the requirements of window cleaning/suspended maintenance equipment, its application and safety requirements.
- D. Design system fall arrest safety anchors and equipment supports to comply with all governing code requirements.
- E. Design system fall arrest safety anchors and equipment supports to comply with the following structural requirements:
 - 1. Fall Arrest Safety Anchors: designed to a maximum fall arresting force of typically 1800 lbs (8.0 kN) when wearing a body harness with a safety factor of 2 without any permanent deformation and to 5000 lbs (22.24 kN) against fracture or detachment.
 - 2. Ensure design of primary support equipment is capable of sustaining without failure at least four times the maximum static working load applied or transmitted to the components, i.e. a 4 to 1 stability factor.
 - 3. Supports for Suspended Platforms: davits, rigging sleeves and monorails are used for suspending a powered platform from storage and rigging/working locations on the building. These supports and the structure to which they are attached are typically designed to 1000 lbs (4.45 kN) vertical service load plus impact with a factor of safety as per AISC requirements and/or ACI or other applicable construction codes, and to 4 times the rated load against fracture or detachment (i.e. a 4 to 1 stability factor).

1.04 SUBMITTALS

- A. Product Data.
- B. Shop drawings to include installation and rigging instructions and all necessary Restrictive and Non-Restrictive Working Usage Notes and General Safety Notes.
- C. Shop drawings to be reviewed, signed, and stamped by a professional engineer, and upon request, complete with calculations or test reports.
- D. Delegated Design Procedures: Comply with Section 01 33 16.
- E. Manufacturer's Qualifications: Experience and proof of insurance.
- F. Welder's certificates.
- G. Sample Warranty.

1.05 QUALIFICATIONS

- A. Manufacturer's Qualification: Manufacturer specializing in the design, fabrication and installation of window cleaning/suspended maintenance systems having a minimum of 5 years documented experience.
- B. Loading and Safety Assurance: Comply with regulations of Project jurisdiction for engineered loading and safety criteria for the intended use.
- C. Insurance: Manufacturer to carry specific liability insurance (products and completed operations) in the amount of \$2,000,000.00 to protect against product/system failure.
- D. Welding shall be executed by welders certified in accordance with AWS requirements.

1.06 REGULATORY REQUIREMENTS

- A. Comply with the following OSHA regulations:
 - 1. 1910, Subpart D (Walking and Working Surfaces).
 - 2. Appendix C, Subpart F, to 1910 (Personal Fall Arrest Systems).
 - 3. "OSHA Ruling on Window Cleaning by Bosun's Chair" Memorandum to Regional Administrators from P.K. Clark, Director, Directorate of Compliance Programs.
 - 4. 1910.33, Subpart F (Powered Platforms).
- B. Comply with Oregon State regulations.

1.07 MAINTENANCE DATA

- A. Submit 1 copy of system Equipment Manual & Inspection Log Book, with "Initial Inspection Certification for Use" and "Inspection Sign-Off" forms completed.
- B. Submit 2 copies of a reduced plastic laminated as-built shop drawing showing equipment locations and details. This drawing is to be posted near exits onto the roof.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Acceptable Manufacturers:
 - 1. Peek-A-Boo Systems; www.peakaboosystems.com
 - 2. Pro-Bel Enterprises Limited; www.pro-bel.ca.
 - 3. Sky Rider Equipment Co. www.sky-rider.com/ <<http://www.sky-rider.com/>>
 - 4. Thaler Metal Industries www.thalermetal.com/ <<http://www.thalermetal.com/>>
 - 5. Spider Div SafeWorks www.spiderstaging.com/ <<http://www.spiderstaging.com/>>
 - 6. Tractel, Swingstage Div www.tractelwingstage.com/ <<http://www.tractelwingstage.com/>>

2.02 SAFETY AND TIEBACK ANCHORS

- A. Safety U-bars: Mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot dipped galvanized to ASTM A123/A 123M. U-bar to be not less than 3/4" (19 mm) diameter material with 1-1/2" (38 mm) eye opening.
- B. Safety Anchor Eye Plate: Mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M. Plate to be not less than 7/8" (22 mm) thickness material with 2" (50 mm) eye opening having chamfered edges.
- C. Securement Bolts: mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M-2000.
- D. Hollow Steel Section (HSS) Piers: Mild steel, Type 300W with yield strength of 50 Ksi (350 MPa). Wall thickness to suit application, hot dipped galvanized to ASTM A123/A 123M-2000.
- E. Base Plate and All Other Sections: galvanized mild steel as above with yield strength of 44 Ksi (300 MPa). Thickness and securement to suit application.
- F. Seamless Spun Aluminum Flashing (for steel pier anchors): Type 6061-T6 alloy to ASTM B221-2000 with deck flange flashed in to NRCA recommendations. Seal top of aluminum flashing with detachable watertight stainless steel cap.

FALL PROTECTION SYSTEM

- G. Miscellaneous Bolts, Nuts and Washers: mild steel, Type 300W with yield strength of 44 Ksi (300 Mpa), hot-dip galvanized to ASTM A123/A 123M-2000, or Type 304 stainless steel with yield strength of 35 Ksi (240 Mpa).

2.03 SYSTEM COMPONENTS

- A. Davit bases: Round, hollow steel section piers of mild steel, Type 350W with yield strength of 50 Ksi (350 MPa), with Pro-Bel Protex 3/32" (2.4 mm) thickness, hot-dip galvanized to ASTM A123/A 123M-2000 or Type 304 stainless steel with black colored two-component TPU polyurethane/polyurea coating finish system, and 3/4" (19 mm) diameter U-bar safety anchor, and securement to suit applications.
- B. Tethers: All pins and loose pieces to be secured using 1/8" (3 mm) stainless steel cable complete with easily inserted lead connectors to avoid loss.
- C. Plate and all other sections: Galvanized steel as per safety anchor with yield strength of 44 Ksi (300 MPa).
- D. Seamless spun aluminum flashing (for fall restraint safety anchors bases): Type 6061-T6 alloy to ASTM B221-2000 sized with deck flange flashed in to NRCA or CRCA recommendations. Seal top of aluminum flashing with conformable mastic tape and torch applied heat-shrink rubber collar flashing.
- E. Miscellaneous bolts, nuts and washers: mild steel, Type 300W with yield strength of 44 Ksi (300 MPa), hot-dip galvanized to ASTM A123/A 123M-2000 or Type 304 stainless steel with yield strength of 35 Ksi (240 MPa).

2.04 FABRICATION

- A. Fabricate work true to dimension, square, plumb, level and free from distortion or defects detrimental to appearance and performance.
- B. Grind off surplus welding material and ensure exposed internal and external corners have smooth lines.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and areas upon which the work of this Section depends. Report to the Contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions which would cause defective installation of products, or cause latent defects in workmanship and function.
- B. Verify site dimensions.
- C. Commencement of work will imply acceptance of prepared work.

3.02 INSTALLATION

- A. Install equipment in accordance with approved shop drawings and manufacturer's recommendations.
- B. Co-ordinate installation with work of related trades.
- C. Install all work true, level, tightly fitted and flush with adjacent surfaces as required.
- D. Structural steel to receive davit base to have adequate bearing surface as indicated on shop drawings and/or to ensure 100% weld.
- E. Deform threads of tail end of davit cage studs after nuts have been tightened to prevent accidental removal or vandalism.
- F. Manufacturer to assist and/or supervise installation of suspended maintenance equipment installed by others.

3.03 FINAL ADJUSTING AND INSPECTION

- A. Adjust and leave equipment in proper working order.

FALL PROTECTION SYSTEM

- B. Complete "Initial Inspection - Certification for Use" form included in Equipment Manual & Inspection Log Book.

3.04 TESTING

- A. All anchorage systems relying upon chemical adhesive fasteners to be 100% tested on site using load cell test apparatus in accordance with manufacturer's recommendations.

END OF SECTION

VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Chalkboards.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on chalkboard, markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- ~~D. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of chalkboard, markerboard, tackboard, tackboard surfacing, and trim.~~
- ~~E~~. Manufacturer's printed installation instructions.
- ~~F~~. Maintenance Data: Include data on regular cleaning, stain removal.

1.03 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 20 year warranty for chalkboard ~~and markerboard~~ to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Visual Display Boards:
 - 1. MooreCo, Inc: www.moorecoinc.com.
 - 2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
 - 3. Polyvision Corporation (Nelson Adams): www.polyvision.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

- A. Chalkboards: ~~Chalkboard enamel on hardboard~~ Slate, 1/4 machine ground.
 - 1. ~~Color: Black.~~
 - 2. ~~Hardboard Face Sheet Thickness: 1/4 inch.~~
 - 3. ~~Height: 48 inches and Width: As indicated.~~
 - 4. ~~Length: 8 feet, in one piece.~~
 - 5. Frame: ~~Extruded~~ Dark anodized extruded aluminum, with concealed fasteners and segmented chalk tray as indicated.

2.03 MATERIALS

- ~~A. Hardboard for Chalk Surface: AHA A135.4, Tempered type.~~
- ~~B. Adhesives: Type used by manufacturer.~~

2.04 ACCESSORIES

- A. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- B. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

VISUAL DISPLAY BOARDS

3.02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.

3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at date of Substantial Completion.

END OF SECTION

DOOR HARDWARE SCHEDULE

HW SET: 01

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-996-06	626	VON
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	SET	SEALS	5050B (HEAD & JAMBS)	BRN	NGP

HW SET: 02

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 03

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND53TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 04

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH

SERA Architects Inc.

Addendum 1

Package 1 – PERMIT / CONSTRUCTION

NOTICE OF ALTERNATE BILLING CYCLE: The Contract will allow the Owner to require the submission of billings or estimates in billing cycles other than 30-day cycles. Billing or statements shall be submitted monthly ending on the last day of the month.

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DOOR HARDWARE SCHEDULE

1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE LOCK	ND53TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	OH STOP	100S ADJ	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 07

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 08

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	POWER TRANSFER	EPT10	689	VON
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	ELEC CLASSROOM LOCK	CO-200-CY-70-KP-RHO-JD (LESS STRIKE)	626	SCE
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	EU STOREROOM LOCK 7/8" LIP STRIKE	ND80TDEU RHO XQ07-351 N423-0627/8"	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4040XP REG ARM	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
2	EA	FIRE/LIFE WALL STOPMAG	WS407CCV SEM7850	630 689	IVE LCN
1	SET	SEALS	5050B (HEAD, JAMBS, & ASTRAGAL)	BRN	NGP
1	EA	ASTRAGAL	139SP SNB	600	NGP

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Addendum 1

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DOOR HARDWARE SCHEDULE

2 EA ~~DOOR CONTACT~~ 679-05HM BLK SCE
~~ACCESS CONTROL – WORK OF~~
~~DIVISION-28~~
~~POWER SUPPLY BY OTHERS~~

HW SET: 09

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	ELEC CLASSROOM LOCK	ND70TD-RHO-XQ07-351 (LOCKING SIDE ON BENCHROOM SIDER-RHR LEAF) <u>CO-200-CY-70-KP-</u> <u>RHO-JD</u> (<u>LESS STRIKE</u>)	626	SCHS <u>CE</u>
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	<u>7/8" LIP STRIKE</u>	<u>XQ07-351 7/8"</u>	<u>626</u>	<u>SCH</u>
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH (ST2648)	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	ASTRAGAL	139SP SNB (PULL SIDE ACTIVE LEAF)	600	NGP
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 10

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
4	EA	ELEC CLASSROOM LOCK	ND70TD-CO-200-CY-70-KP-RHO-JD	626	SCHS <u>CE</u>
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	OH STOP	100S (LH LEAF)	630	GLY
1	EA	OH STOP	100S ADJ (RH LEAF)	630	GLY
2	EA	SURFACE CLOSER	4040XP REG ARM	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE

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DOOR HARDWARE SCHEDULE

1	EA	ASTRAGAL	139SP SNB (PUSH SIDE INACTIVE LEAF)	600	NGP
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 11

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S RHO	626	SCH
1	EA	WALL STOP	WS407CCV	630	IVE
1	SET	SEALS	107NA (HEAD & JAMBS)	CL	NGP
1	EA	DOOR BOTTOM	420NA	CL	NGP
1	EA	THRESHOLD	411 MS/LA	AL	NGP

HW SET: 12

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
			HARDWARE BY DOOR MANUFACTURER		

HW SET: 13

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
1	EA	PIVOT SET	7226F SET	630	IVE
1	EA	INTERMEDIATE PIVOT	7226F INT	630	IVE
1	EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	BLADE STOP SPACER	4040-61	689	LCN
1	EA	DOOR SWEEP	600A	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP
			WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		

4	EA	AUTO OPERATOR	9553-PUSH SIDE	689	LCN
4	EA	POWER SUPPLY	PS902	689	SCE
2	EA	OPERATOR BUTTONS	623-GID	689	SCE
4	EA	BATTERY BACKUP KIT	900-BBK		SCE
2	EA	SQUARE ACTUATORS	8310-853T		LCN
2	EA	SQUARE FLUSH BOX	8310-867F		LCN
4	EA	ELECTROMAGNETIC LOCK	M492P-ATS/LED-2	626	SCE

**AUTO OPERATOR AND POWER SUPPLY REQUIRE 110VAC. MOUNT OPERATOR BUTTONS
WITHIN 5 FEET OF DOOR**

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Addendum 1

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DOOR HARDWARE SCHEDULE

HW SET: 1420

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HW HINGE	5BB1HW5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC	98-NL-990CO-200-CY-70-KP-RHO-JD	626	VONS
		HARDWAREELEC			CE
		CLASSROOM LOCK			
1	EA	RIM CYLINDERFSIC	20-057-ICG23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	FSIC CORESURFACE	23-030 (PERMANENT CORE BY OWNER)4040XP REG ARM	626	SCH
		CLOSER		689	CN
1	EA	SURFACE CLOSERKICK	4040XP-EDA8400 10" X 2" LDW B4E	689	LCN
		PLATE		630	IVE
1	EA	KICK PLATEWALL STOP	8400 10" X 2" LDW B4EWS407CCV	630	IVE
13	EA	WALL STOP	WS407CCVSR64	630	IVE
		SILENCER		Y	

HW SET: 93

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	FIRE EXIT HARDWARE	98-L-F-996-06	626	VON
1	EA	RIM CYLINDER	20-057-ICC	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	DRIP CAP	16A (OMIT IF OPENING IS PROTECTED)	CL	NGP
1	SET	SEALS	5050B (HEAD & JAMBS)	BRN	NGP
1	EA	DOOR SWEEP	C627A	CL	NGP
1	EA	THRESHOLD	659 MS/LA	AL	NGP

HW SET: 1594

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
4	EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
1	EA	ELECTRIC STRIKE	6211WF FSE 24VDC	630	VON
1	EA	SURFACE CLOSER	4040XP-REG-ARM	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE

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DOOR HARDWARE SCHEDULE

4	EA	WALL STOP	WS407CGV	630	IVE
3	EA	SILENCER	SR65	GRY	IVE
4	EA	DOOR CONTACT	679-05WD	BLK	SCE
4	EA	MOTION SENSOR	SCANII	WHT	SCE
ACCESS CONTROL – WORK OF DIVISION 28					
POWER SUPPLY BY OTHERS					

HW SET: 16

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
43	EA	HW-HINGE	5BB4HW5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-F-996-06	626	VON
1	EA	STOREROOM LOCKRIM CYLINDER	ND80TD-RHQ20-057-ICC	626	SCH
1	EA	FSIC CORE	23-030 (PERMANENT CORE BY OWNER)	626	SCH
4	EA	ELECTRIC STRIKE	6241WF-FSE-24VDC	630	VON
4	EA	OH-STOP	90S	630	GLY
1	EA	SURFACE CLOSER	4040XP REG-ARMS CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR65	GRY	IVE
1	EAS	DOOR CONTACT SEALS	679-05WD5050B (HEAD & JAMBS)	BLKBR	SGEN
	ET			N	GP
4	EA	MOTION SENSOR	SCANII	WHT	SCE
ACCESS CONTROL – WORK OF DIVISION 28					
POWER SUPPLY BY OTHERS					

HW SET: 95

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	BUMPER SHOE	102	Z	CRO
	EA	END STOP	572	Z	CRO
	EA	SIDEWALL MOUNT	6G X 1	Z	CRO
	EA	LOCK JOINT	6G X 189	Z	CRO
	EA	END BLIND	6G X 2	Z	CRO
	EA	HANGER	6Z3B	Z	CRO
	EA	STAY ROLLER	CRS-14		CRO
	EA	CONCEALED CHANNEL	CRSC-14	AL	CRO
	EA	600 LB. TRACK	NO. 6G	Z	CRO
1	SET	DOOR PULL, 1" ROUND	PR 8103 10" J	630	IVE

HW SET: 96

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
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DOOR HARDWARE SCHEDULE

1	EA	<u>PIVOT SET</u>	<u>7226F SET</u>	<u>630</u>	<u>IVE</u>
1	EA	<u>INTERMEDIATE PIVOT</u>	<u>7226F INT</u>	<u>630</u>	<u>IVE</u>
1	EA	<u>ELEC CLASSROOM</u> <u>LOCK</u>	<u>CO-200-CY-70-KP-RHO-JD</u>	<u>626</u>	<u>SCE</u>
1	EA	<u>FSIC CORE</u>	<u>23-030 (PERMANENT CORE BY</u> <u>OWNER)</u>	<u>626</u>	<u>SCH</u>
1	EA	<u>ELECTRIC STRIKE</u>	<u>6211 FSE</u>	<u>630</u>	<u>VON</u>
1	EA	<u>LOCK GUARD</u>	<u>LG14</u>	<u>630</u>	<u>IVE</u>
1	EA	<u>OH STOP</u>	<u>100S ADJ</u>	<u>630</u>	<u>GLY</u>
1	EA	<u>SURF. AUTO</u> <u>OPERATOR</u>	<u>4642</u>	<u>689</u>	<u>LCN</u>
2	EA	<u>ACTUATOR</u>	<u>CE-635-BFM</u>	<u>630</u>	<u>CRR</u>
1	EA	<u>DOOR SWEEP</u>	<u>600A</u>	<u>CL</u>	<u>NGP</u>
1	EA	<u>THRESHOLD</u>	<u>659 MS/LA</u>	<u>AL</u>	<u>NGP</u>
1	EA	<u>DOOR CONTACT</u>	<u>679-05HM</u> <u>WEATHERSTRIP BY DOOR/FRAME</u> <u>MANUFACTURER</u>	<u>BLK</u>	<u>SCE</u>

NOTE: 120VAC TO DOOR OPERATOR.

HW SET: 97

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3	EA	<u>GATE HINGE</u>	<u>2050.200</u> <u>(SEE NOTE BELOW FOR</u> <u>INFORMATION)</u>	<u>Z</u>	
1	EA	<u>PANIC HARDWARE</u>	<u>98-NL-990</u>	<u>626</u>	<u>VON</u>
1	EA	<u>RIM CYLINDER</u>	<u>20-057-ICC</u>	<u>626</u>	<u>SCH</u>
1	EA	<u>FSIC CORE</u>	<u>23-030 (PERMANENT CORE BY</u> <u>OWNER)</u>	<u>626</u>	<u>SCH</u>
1	EA	<u>SURFACE CLOSER</u>	<u>4040XP SCUSH</u>	<u>689</u>	<u>LCN</u>
1	EA	<u>MOUNTING PLATE</u>	<u>4040-18</u>	<u>689</u>	<u>LCN</u>

NOTE: GATE MANUFACTURER TO PROVIDE ALL NECESSARY MOUNTING PLATES AND REINFORCEMENT FOR SPECIFIED HARDWARE. GUARDIAN GATE HINGE INFORMATION - WWW.GUARDIANHARDWARE.COM 1-800-213-9525.

HW SET: 98

EACH TO HAVE:

<u>QTY</u>		<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
8	EA	<u>GATE HINGE</u>	<u>2050.200</u> <u>(SEE NOTE BELOW FOR</u> <u>INFORMATION)</u>	<u>Z</u>	
2	EA	<u>PANIC HARDWARE</u>	<u>9827-L-LBR-ER12-996-06</u>	<u>626</u>	<u>VON</u>
2	EA	<u>RIM CYLINDER</u>	<u>20-057-ICC</u>	<u>626</u>	<u>SCH</u>
2	EA	<u>FSIC CORE</u>	<u>23-030 (PERMANENT CORE BY</u> <u>OWNER)</u>	<u>626</u>	<u>SCH</u>
2	EA	<u>SURFACE CLOSER</u>	<u>4040XP SCUSH</u>	<u>689</u>	<u>LCN</u>

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DOOR HARDWARE SCHEDULE

2 EA MOUNTING PLATE 4040-18 689 LCN

NOTE: GATE MANUFACTURER TO PROVIDE ALL NECESSARY MOUNTING PLATES AND REINFORCEMENT FOR SPECIFIED HARDWARE. GUARDIAN GATE HINGE INFORMATION - WWW.GUARDIANHARDWARE.COM 1-800-213-9525.

HW SET: 99

EACH TO HAVE:

<u>QTY</u>	<u>EA</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
<u>6</u>	<u>EA</u>	<u>HINGE</u>	<u>5BB1 4.5 X 4.5 NRP</u>	<u>630</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>FIRE EXIT HARDWARE</u>	<u>9827-EO-F-LBR-499F</u>	<u>626</u>	<u>VON</u>
<u>1</u>	<u>EA</u>	<u>FIRE EXIT HARDWARE</u>	<u>9827-NL-F-LBR-990-499F</u>	<u>626</u>	<u>VON</u>
<u>1</u>	<u>EA</u>	<u>RIM CYLINDER</u>	<u>20-057-ICC</u>	<u>626</u>	<u>SCH</u>
<u>1</u>	<u>EA</u>	<u>FSIC CORE</u>	<u>23-030 (PERMANENT CORE BY OWNER)</u>	<u>626</u>	<u>SCH</u>
<u>2</u>	<u>EA</u>	<u>SURFACE CLOSER</u>	<u>4040XP SCUSH</u>	<u>689</u>	<u>LCN</u>
<u>2</u>	<u>EA</u>	<u>KICK PLATE</u>	<u>8400 10" X 2" LDW B4E</u>	<u>630</u>	<u>IVE</u>
<u>1</u>	<u>EA</u>	<u>DRIP CAP</u>	<u>16A (OMIT IF OPENING IS PROTECTED)</u>	<u>CL</u>	<u>NGP</u>
<u>1</u>	<u>SET</u>	<u>SEALS</u>	<u>5050B (HEAD & JAMBS)</u>	<u>BRN</u>	<u>NGP</u>
<u>1</u>	<u>SET</u>	<u>MEETING STILE SEAL</u>	<u>9115A</u>	<u>CL</u>	<u>NGP</u>
<u>2</u>	<u>EA</u>	<u>DOOR SWEEP</u>	<u>C627A</u>	<u>CL</u>	<u>NGP</u>
<u>1</u>	<u>EA</u>	<u>THRESHOLD</u>	<u>659 MS/LA</u>	<u>AL</u>	<u>NGP</u>

MEDIUM VOLTAGE ELECTRICAL POWER 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 cables and related splices, terminations, and accessories for medium-voltage electrical distribution systems.
- B. Provide the following termination assemblies:
 - 1. 200A bolted stress-cone cable terminations at medium voltage switchgear.
 - 2. 200A load-break, separable T-splice in underground vault.
 - 3. 200A load-break separable elbows at main service transformers.
 - 4. MOV separable elbows at main service transformers.

1.3 DEFINITIONS

- A. NETA ATS: Acceptance Testing Specification.
- B. Cable splice: Where the joining of two or more cable ends is accomplished by using field installed separable connector assembly that can be attached and unattached to a mating termination fitting on another cable end.
- B. Cable connector: Where a cable end is field joined to a factory made separable connector assembly that can be attached and unattached to a mating termination fitting on a piece of equipment. 600A connectors are dead-break rated and require the system to be shutdown prior to disconnection. 200A elbows shall be load-break rated.
- C. Cable termination: Where a cable end is field joined to a factory made stress cone assembly with compression type lug bolted to a bus bar on the piece of equipment.
- D. Termination assembly(ies): Refers to all components associated with cable splices, cable connectors and cable terminations.
- E. Separable connector: A cable is terminated in a factory made assembly unit that can be attached and unattached to another similar unit without damage to the connection or the cable ends.
- F. Permanent splice: Where the joining of two or more cable ends is by a field made insulated connection that cannot be separated without destroying or damaging the connection or cable ends. Permanent splices are not allowed. All splices shall be made with separable connectors and shall occur only in vaults and pullboxes.
- G. All equipment terminations shall be made via two-hole bolted lugs or separable elbow connectors, as indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of cable indicated. Include splices and terminations for cables and cable accessories.

MEDIUM VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- B. Installer certificates: Submit installer certificates signed by manufacturer of cable termination assembly products that Installers comply with training requirements specified under “Quality Assurance.” Include name of lead termination assembly installer(s) and associate installer(s) that will perform the work on the project.
- C. Installer certificates: Submit installer certificates signed by Contractor that Installers of cable termination assemblies meet the experience qualifications specified under “Quality Assurance.” Material Certificates: For each cable and accessory type, signed by manufacturers.
- D. Installation instructions: Manufacturer's installation and assembly instructions for each type of termination called for.
- E. Source quality-control test reports.
- F. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer of medium voltage electrical cable to perform the installation specified in this section. Cable splices, connectors and terminations shall be made by certified workman with a minimum of 5 years experience in terminating the specific types of cable and cable accessories specified in this Section.
- B. Designation of Installer: The name of the designated termination assembly installer(s) and his experience and training must be submitted to, and approved by, the Owner's representative prior to the installation of any termination assembly.
- C. Installer: Engage a cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.
- D. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- E. Source Limitations: Obtain cables and accessories through one source from a single manufacturer.
- 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.
- G. Comply with IEEE C2 and NFPA 70.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than ten days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Owner's written permission.

MEDIUM VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver medium voltage cable on factory reels conforming to NEMA Standard WC 26 - Wire and Cable Packaging. Reels with unsealed cable ends will be recorded and rejected by the Owner's representative.
- B. Store cables on reels on elevated platforms in a clean, dry location.

1.8 EXTRA MATERIALS

- A. Provide 3 snap-on, hot-stick operable capacitive test point caps.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cables:
 - a. Okonite Company (The).
 - 2. Cable Splicing and Terminating Products and Accessories: All assemblies used shall be furnished by a single approved manufacturer.
 - a. Engineered Products Company.
 - b. G&W Electric Company.
 - c. MPHusky.
 - d. Raychem Corp.; Telephone Energy and Industrial Division; Tyco International Ltd.
 - e. RTE Components; Cooper Power Systems, Inc.
 - f. Thomas & Betts Corporation/Elastimold.
 - g. 3M; Electrical Products Division.

2.2 CABLES

- A. Cable Type: MV105.
- B. Comply with UL 1072, AEIC CS 8, ICEA S-93-639, and ICEA S-97-682.
- C. Conductor: Copper.
- D. Each reel of cable furnished shall not be more than 12 months old.
- E. Conductor Stranding: Compact round, concentric lay, Class B).
- F. Strand Filling: Conductor interstices are filled with impermeable compound.
- G. Conductor Insulation: Ethylene-propylene rubber.
 - 1. Voltage Rating: 15 kV.
 - 2. Insulation Thickness: 133 percent insulation level.
- H. Shielding: Concentric neutral solid copper tape helically applied over semiconducting insulation shield.
- I. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.
- J. Cable Jacket: Sunlight-resistant PVC.

2.3 SPLICE KITS

- A. Connectors and Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.

SERA Architects, Inc.

Addendum 1 Package 1 – PERMIT / CONSTRUCTION

NOTICE OF ALTERNATE BILLING CYCLE: The Contract will allow the Owner to require the submission of billings or estimates in billing cycles other than 30-day cycles. Billing or statements shall be submitted monthly ending on the last day of the month.

NOTICE OF EXTENDED CERTIFICATION PROVISION: The Contract will allow the Owner to certify billings and estimate within 20 days after the billings and estimates are received from the original contractor.

NOTICE OF EXTENDED PAYMENT PROVISION: The Contract will allow the Owner to make payment within 30 days after the date a billing or estimate is received.

MEDIUM VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- B. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.
1. Combination tape and cold-shrink-rubber sleeve kit with re-jacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
 2. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
 3. Premolded, cold-shrink-rubber, in-line splicing kit.
 4. Premolded EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.

2.4 SOLID TERMINATIONS

- A. Termination Assembly Kits: General:
1. Shall be assembled by the manufacturer or supplier of the materials and shall be packaged for individual cable installations.
 2. Shall consist of materials designed for the cables being terminated and shall be suitable for the prevailing environmental conditions.
 3. Shall include detail Drawings and printed instruction for each type of termination being installed, as prepared by the manufacturers of the materials in the kits. Printed instructions shall indicate the cable type, voltage rating, manufacturer's name and catalog numbers for the materials indicated.
 4. Voltage ratings for the termination shall be not less than the voltage ratings for the cables on which they are being installed.
 5. Shall include grounding shield adapter accessory on all terminations.
- B. Cable End Termination Fittings:
1. Shall be heavy duty, 2-hole, circumferential pressure type fittings which shall assure satisfactory performance of the connections under conditions of temperature cycling and magnetic forces from available short circuit currents.
 2. The fittings shall be suitably designed and the proper size for the cables and being terminated.
 3. Grounding of metallic shields shall be accomplished by a solderless connector enclosed in a watertight rubber housing covering the entire assembly. The grounding device and terminator shall be of same manufacturer to insure electrical integrity of the shielded parts.
 4. Where the Owner/Engineer determines that unsatisfactory fittings have been installed, remove the unsatisfactory installations and install approved fittings at no additional cost to the Owner.
 5. Provide stress cones at all bolted terminations.
- C. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class is equivalent to that of cable. Include shield ground strap for shielded cable terminations.
1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone rubber, insulator modules; shield ground strap; and compression-type connector.
 2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
 3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.

MEDIUM VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

4. Class 1 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.
5. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape, cold-shrink-rubber sleeve, or heat-shrink plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
6. Class 3 Terminations: Kit with stress cone and compression-type connector.

2.5 SEPARABLE INSULATED CONNECTORS

- A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.
- B. The premolded parts shall be suitable for indoor, outdoor, and submersible applications.
- C. All separable connectors shall include capacitive test points with specified fault indicator.
- D. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.
- E. Load-Break Cable Terminators: Elbow-type units with 200-A load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.
- F. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless-steel mounting brackets, and attaching hardware.
 1. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.
 2. Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.
 3. Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders, and carrying case.
 4. Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.

2.6 SEPARABLE INSULATED MOV SURGE ARRESTERS

- A. Description: Modular system, complying with IEEE 386, with single-pole, plug-in, dead-front surge arrester designed for system voltage and for sealing against moisture.
- B. The premolded parts shall be suitable for indoor, outdoor, and submersible applications.
- C. The arrester shall be designed with a 60 Hz sparkover of 1.5 times its duty cycle rating. The operation of the MOV arrester shall have the line voltage shared by both resistance graded gap structure and metal oxide varistors (MOV). When overvoltages occur, the gaps sparkover, leaving only the metal oxide varistors in the circuit. This shall result in lower discharge voltages than are possible with gapless metal oxide arresters.
- D. Performance Test Characteristics: The VariGAP MOV surge arrester shall withstand the following design tests as described by IEEE Standard C62.11
 1. Duty Cycle: 22 current surges of 5 kA crest, 8/20 μ s waveshape.

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2. High-Current, Short-Duration Discharge: 2 current surges of 40 kA crest, 4/10 μ s waveshape.
3. Low-Current, Long-Duration Discharge: 20 current surges of 75 A crest, 2000 μ s rectangular wave duration

2.7 ARC-PROOFING MATERIALS

- A. General: Provide fire taping of all medium voltage cables and termination assemblies inside vaults, including existing cables if present.
- B. Tape for First Course on Metal Objects: 10-mil- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.
- C. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, compatible with cable jacket.
- D. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1/2 inch wide.

2.8 FAULT INDICATORS

- A. Indicators: Automatically reset fault indicator with inrush restraint feature, arranged to clamp to cable sheath and provide a display after a fault has occurred in cable. Instrument shall not be affected by heat, moisture, and corrosive conditions and shall be recommended by manufacturer for installation conditions.
- B. Resetting Tool: Designed for use with fault indicators, with moisture-resistant storage and carrying case.
- C. Provide automatic reset, in-rush restraint type fault indicators at all splices and at all terminations. Provide all mounting kits and adapters as required. Manufacturer to recommend correct trip ratings at each location to be used. Manual reset types are prohibited.
- D. Provide cooper power systems, or equal, TPR (capacitive test point) fault indicator with three-phase remote display on all separable connectors.
- E. Provide corrosion resistant, current type reset units on terminations without capacitive test points. Cooper Power Systems, or equal, CRR3PD fault indicator with three-phase remote display.
- F. Provide one test point testing tool suitable for each type of indicator.

2.9 SOURCE QUALITY CONTROL

- A. Test and inspect cables according to ICEA S-97-682 before shipping.
- B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cables according to IEEE 576. Direct burial is not allowed. All medium voltage cables to be installed in rigid steel conduit if exposed or PVC Schedule 40 if buried.
- B. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
 1. Where necessary, use manufacturer-approved pulling compound or lubricant that will not deteriorate conductor or insulation.

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2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.
- D. Support cables according to Division 26 Section "Common Work Results for Electrical."
- E. Install "buried-cable" warning tape 12 inches above cables and per details in construction drawings.
- F. Provide nylon pulling rope in all empty conduits. Tie each ends of rope to structure, pulling iron, etc.
- G. Provide support for all cables using galvanized steel channels and porcelain insulators. Use racks within manholes. See drawings for additional details.
- H. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit and support cables at intervals adequate to prevent sag.
- I. Install cable splices at pull points and elsewhere as indicated; use standard kits. Splices shall not be used wherever it is possible to install the conductor in one continuous run.
- J. Install terminations at ends of conductors and seal multiconductor cable ends with standard kits.
- K. Install separable insulated-connector components as follows:
 1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
 2. Portable Feed-Through Accessory: Three for power phases and three for MOV surge arrester elbows.
 3. Standoff Insulator: Three.
- L. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:
 1. Clean cable sheath.
 2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
 3. Smooth surface contours with electrical insulation putty.
 4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
 5. Band arc-proofing tape with 1-inch- wide bands of half-lapped, adhesive, glass-cloth tape 2 inches o.c.
- M. Seal around cables passing through fire-rated elements according to Division 07 Section "Penetration Firestopping."
- N. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.
- O. Contractor shall be responsible for the correct phasing out of the conductors of each circuit at terminations and/or splices.
- P. Causes of Termination Failures: Terminations fail in test or in service for one or more of the following reasons:
 1. Improper crimping. Use proper tool for fitting and proper fitting for cable. Check that correct crimping pressure is applied.

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2. Failure to completely cover mating surfaces with silicone lubricant.
 3. Dirt or moisture in the termination assembly. Usually introduced by dirty hands, dirty cleaning cloths, or laying termination material on the ground.
 4. Over tightening or under tightening threaded connections. Torque values specified by the termination manufacturer must be strictly adhered to.
 5. Failure to properly assemble the termination. Contractor shall follow the termination manufacturers specified procedures, strictly, in detail.
- Q. Retain Factory Packaging: Component watertight packaging shall be unopened until immediately before materials are to be installed on the cable. Opened packing observed by the Owner's representatives, except as noted above, shall be immediately removed from the site of the work, and may not be used in the work of this project.
- R. Cable ends shall be sealed until immediately before connectors are installed. All cut ends shall immediately be either sealed or connected to approved terminating devices. Cut ends of cable shall not be left open.
- S. Site and Work Conditions: The site of the work and working conditions and procedures shall comply with the following:
1. Clean dry work site a clean dry site shall be provided for constructing all terminations. Termination work shall be done only in sunny dry weather, unless a heated and lighted enclosure for the work is provided by the Contractor.
 2. Clean drop cloths shall be provided for laying of parts and tools.
 3. Hand cleaning supplies packaged cleaning tissues impregnated with an evaporating cleaning compound and clean dry cotton cloths shall be provided for the termination workmen to clean and dry their hands.
 4. Adequate lighting natural or artificial lighting provided by the Contractor, shall be used to provide not less than 200 footcandles on the work to be assembled.
 5. Manufacturer's instructions work will be permitted at such time as the termination manufacturers installation and assembly instructions are at work site and easily available to the termination workmen.
 6. Required tool set all tools required for assembly shall be at the work site prior to beginning termination. The set shall include:
 - a. Cable shears and hacksaw (or rotating blade cable cutter). Roughing cut may be made with shears. Final cable cut shall be made with hacksaw or rotating blade cable cutter.
 - b. Crimping tool with proper dies for conductors terminated, including grounding cable and ground leads from ground adapters.
 - c. Torque wrench (and spanner wrench for 600 amp).
 - d. Rotary blade insulation cutter and sharp knife.
 - e. Sand paper and insulation file.
- T. Avoiding Cable Strain: Cable shall be trained to final location and secured with temporary ties prior to any cutting. Terminations installed on the cable shall be oriented to permit completion of the termination without twisting, or stressing the cable insulation.
- U. Bending and Training Cable: The bend radius of any cable shall not be less than fifteen times the outside diameter of the cable jacket. Cable shall not be twisted.
- V. Identify cables according to Division 26 Section "Identification for Electrical Systems."

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3.2 CABLE GROUNDING:

- A. Ground shields of all shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated connector fittings, and hardware in accordance with manufacturer's written instructions. Use cable shield adaptor kits, unless noted otherwise.
- B. Connect the primary cable grounding conductors to the ground lug at the transformers and in turn to the ground rod.
- C. The shields of all primary cable terminations shall be bonded to the local ground in each piece of equipment.
- D. Bare #4/0 AWG, copper 600 volt, equipment ground conductor shall be provided in all medium voltage cable runs.
- E. Ground all cable shields to new #4/0 AWG bare copper ring around interior of each vault. Bond ring to new ground rods and to new #4/0 bare copper conductors in medium voltage conduit runs.

3.3 INSTALLATION OF CABLE ACCESSORIES

- A. Tape for first course on metal objects in contact with cable, such as racks, shall be 10 mil thick, corrosion protective, moisture resistant PVC pipe wrapping tape.
- B. Arc Proofing: After all tests have been performed and accepted, arc-proof medium voltage cables and termination assemblies within the manhole and at locations not protected by conduit or termination materials except where indicated. Do not fire tape termination assemblies in medium voltage switchgear or transformers. Fire tape each individual phase conductor. Apply as recommended by the manufacturer of the arc-proofing tape and the following:
- C. Clean cable sheath.
- D. Smooth surface contours with electrical insulation putty.
- E. Apply arc-proofing tape in one-half lapped layer with the coated side toward the cable.
- F. Band the arc-proofing tape with 1" wide bands of half lapped adhesive glass cloth tape 2" on center to prevent unraveling.
- G. Fault Indicators: Mount remote 3-phase display unit in location noted:
 - 1. Vaults: Point 3-phase display face toward ladder.
 - 2. Switchgear: Flush mounted through housing with 3-phase display on the outside. Provide label to indicate with circuit is represented.

3.4 IDENTIFICATION

- A. Cables shall be identified in two locations:
 - 1. Identify each cable bundle (related A, B and C phase cables) as to manufacturer's product number (MV-105), year installed, voltage (15 kV), conductor size, and Owner's circuit numbering scheme.
 - 2. Identify each phase cable as to Phase, conductor size, and Owner's circuit numbering scheme.
- B. Identification shall be carried in plastic embossed letter holder permanently secured with black nylon ty-wraps where the cable emerges into each and all manholes or switchgear. Identification shall be applied over the fire tapping where present.

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- C. The cables shall be identified with a 2" wide band of Scotch 35 colored insulation tape adjacent to all splices and terminations. The colors shall correspond to the following code.
 - 1. Phase A Two red bands
 - 2. Phase B Two yellow bands
 - 3. Phase C Two blue bands
- D. Equipment grounding conductor Green
- E. Provide above mentioned identification on all new cables and all existing cables in the underground vault.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified testing and inspection agency to perform the following field tests and prepare test reports.
- B. Testing: Engage a qualified testing and inspection agency to perform the following field tests and inspections and prepare test reports.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
 - 2. After installing medium voltage cables and before electrical circuitry has been energized. Test for compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

FIRE PROTECTION

PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 210500 - Basic Materials and Methods, and other Sections in Division 21 specified herein.

1.2 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches.
- B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.
- C. NICET - National Institute for Certification In Engineering Technologies
- D. Other definitions for fire protection systems are included in referenced NFPA standards.

1.3 DESCRIPTION OF WORK

- A. The work includes designing new, providing and installing a complete and fully operable automatic sprinkler system as described in this Section of the Specification and as shown on the contract construction drawings and shall be in accordance with rules, regulations and standards as required by the following authorities having jurisdiction.
 - 1. State of Oregon
 - 2. City of Eugene
 - 3. Building Department
 - 4. Fire Prevention Division, Fire Marshal's Office
 - 5. University of Oregon
- B. Work to be in accordance with criteria of the following design and installation standards:
 - 1. State of Oregon Structural Specialty Code
 - 2. National Fire Protection Association
 - a. No. 13 - Sprinkler Systems
 - b. No. 14 - Standpipes & Hose Systems
 - c. No. 24 - Private Fire Service Mains
 - d. No. 70 - National Electrical Code
 - e. No. 101-Life Safety Code
 - 3. International Fire Code (IFC) with state amendments.
 - 4. International Building Code (IBC) with state amendments.
 - 5. Factory Mutual Approval Guide (Product listing, only). Factory Mutual Approval Guide and FM Pamphlet #20 "Rules for Installing Sprinklers" (Product listing and project review).
 - 6. Underwriters Laboratories, Inc.
 - 7. Industrial Risk Insurance Underwriters
 - 8. Owner's insurance agency
- C. Work includes but is not limited to the following:
 - 1. Automatic Wet Type Sprinkler System
 - 2. Standpipes: Wet type.
 - 3. Dry Type Sprinkler System.
 - 4. All cutting and patching.
 - 5. Provide all pipe, fittings, sprinklers, valves, signs, flow switches, tamper switches, protective painting, test connections, drains and tests necessary to make the entire system complete and operative.

FIRE PROTECTION

6. Coordinate with plumbing contractor for capacity of all sprinkler main, test, and auxiliary drain connections.
7. Valve tags and instruction plates shall be mounted and/or hung per local fire department requirements.
8. All sleeves and inserts.

1.4 SUBMITTALS

- A. Product Data: Submit six copies of manufacturer's technical data and installation instructions for fire protection materials and products.
 1. Thirty days after the awarding of contract, contractor shall submit list of manufacturer's names and model numbers for approval to architect. This list shall identify any prior approved substituted items contractor wishes to use. Do not submit technical data until list has been approved. This is mandatory.
 2. Prior to construction submit for approval items including but not be limited to the following:
 - a. Coordinated layout drawings. Lettering shall be minimum 1/8" high
 - b. Sprinklers and escutcheons - designating area of use
 - c. Valves, valve boxes, flow switches, and tamper switches
 - d. Pipe, fittings, sway bracing, inserts, anchors and hangers
 - e. Inspector's test and drain station
 - f. Hose valves, pressure relief valves, and pressure reducing valves
- B. Working Plans: Prepare scaled working plans for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, and elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface between and spatial relationship to piping and adjacent equipment. Lettering shall be minimum 1/8" high. All design work shall be done under supervision of licensed engineer.
 1. Spacing of fire sprinklers shall be coordinated with lights, air conditioning outlets, sound speakers, architectural reflected ceiling plan; obstruction from light fixtures and other architectural features; and sprinkler piping shall be coordinated with HVAC ductwork & piping, plumbing, electrical conduit, cable trays and structure prior to the installation. Drawings shall be composite type including mechanical, plumbing and lighting equipment with sprinkler and sprinkler drain piping.
- C. Submittal Drawings: Submit shop drawings to Agency having jurisdiction for approval bearing engineer of record stamp. Submit six approved copies, bearing stamp and/or signature of authority having jurisdiction to the Engineer for approval.
 1. Contractor shall submit sprinkler head locations to architect for approval.
 2. Each calculation shall include legible schematic of system showing all hydraulic reference points.
- D. Hydraulic Calculations: Prepare hydraulic calculations of fire protection systems. Submit to authority having jurisdiction for approval. Submit six approved copies, bearing stamp, and/or signature of Agency having jurisdiction to Owner's representative for approval.
 1. Contractor shall submit published piping friction loss data from manufacturer with hydraulic calculations.
- E. Certificate of Installation: Submit certificate upon completion of fire protection piping work, which indicates that work has been tested in accordance with NFPA 13, and also that system is operational, complete, and has no defects.
- F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculation, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of the General Conditions and of Division 01.

FIRE PROTECTION

- G. Operating and Maintenance Instructions: Provide the Owner with three sets of operating and maintenance instructions covering completely the operation and maintenance of sprinkler equipment and controls. Manual shall be assembled in a 3-ring binder and arranged in following sections:
1. Site Utilities: Drawings showing location, size, depth of all connections, valve boxes, manholes, etc., as installed.
 2. Section No. 1: A chart tabulating all types of pipefittings, valves, and piping specialties installed in each system.
 3. Section No. 2: A chart tabulating all pressures, valve settings for fire department and sprinkler pressure reducing valves as required by S.F.F.D. Provide pressure reducing valve flow test documentation.
 4. Section No. 3: Manufacturer's brochures of all sprinkler heads.
 5. Section No. 4: Tamper switches and flow switches.
 6. Section No. 5: Fire Department connections.
 7. Section No. 6: Reproducible copies of approved working drawings prepared to facilitate the actual installation of ductwork and piping. Drawings shall indicate location of all concealed valves, and other apparatus.
 8. Section No. 7: 2 copies of NFPA 25 "Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems."
 9. Section No. 8: Approval Calculations.
 10. Section No. 9: Certificate of Installation.
 11. Section No. 10: Guarantees.
 12. The Contractor is responsible for proper instruction of Owner's personnel for operation and maintenance of all material, equipment and apparatus provided.

1.5 DESIGN DESCRIPTION

- A. This section of the specification combined with any of the contract drawings are intended as a guide to establish a basis of design for the systems required.
- B. Contractor shall examine the existing building, the Architectural, Plumbing, Interior Design, Structural, Mechanical and Electrical drawings, layout and install a completely hydraulically sized sprinkler system for all existing and new areas. Space shall be provided for any valving and equipment to be used.
1. System shall start at five feet from the building exterior and extend throughout the new and existing portions of the building.
 2. Contractor shall contact Owner's insurance agency to incorporate insurer's design requirements in this layout document. Factory Mutual shall review layout drawings and calculations. Incorporate all of their design criteria into documents.
- C. The building shall be served with a wet type sprinkler system.
- D. All areas shall be sprinklered as the construction progresses, including accessible pipe chases, elevator pits, etc.
- E. Pressure restricting devices shall be installed on any branch outlet exceeding 100 PSI.
- F. All electrical devices used for this system shall be compatible with the fire alarm system, refer to Division 26.
- G. Seismic Requirement: All automatic sprinkler and standpipe system to be seismically braced and anchored for IBC Seismic Zone D, FM and NFPA 13. Submit shop drawings on methods and materials.
1. Do not use NFPA Earthquake Zone Chart.

FIRE PROTECTION

1.6 HYDRAULIC DESIGN

- A. System shall be a straight line or gridded system per NFPA No. 13 with the following exceptions:
 - 1. For all systems the design area shall be the hydraulically most demanding rectangular area.
 - 2. Minimum pressure for any sprinkler head shall not be less than 7 psi.
- B. Fire Standpipes: Pipe schedule per IBC Chapter 9 or hydraulically calculated at 500 GPM for first standpipe and 250 GPM for each additional standpipe. Wet standpipes shall maintain 100 Psi at top of each riser.
- C. Total Combined Inside & Outside Hose Allowances: Hydraulic calculations shall include an allowance for hose streams, added at the point of connection to the water supply.
- D. Safety Factor: 10 Psi, or 10 percent of static and residual pressure, whichever is greater.
- E. Light Hazard Areas: Water density of 0.10 GPM per square foot calculated for an area of 1500 square feet in the most remote location.
- F. Ordinary Group I Hazard Areas: Water density of 0.15 GPM per square foot calculated for an area of 1500 square feet in the most remote locations.
- G. Ordinary Group II Hazard Areas: Water density of 0.20 GPM per square foot calculated for an area of 1500 square feet in the most remote locations.
- H. Head spacing shall not exceed the limits described in NFPA Pamphlet No. 13.
 - 1. Light Hazard: 225 sq.ft. (for smooth ceiling)
 - 2. Ordinary Hazard: 130 sq. ft.
 - 3. Extra Hazard: 100 sq. ft.
- I. Maximum floor areas protected by any one sprinkler system riser:
 - 1. Light Hazard: 52,000 sq.ft.
 - 2. Ordinary Hazard: 52,000 sq.ft.
- J. Flow Data: Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.

1.7 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 210500: Basic Materials and Methods
- B. Division 26: Electrical. Coordinate for electrical wiring of detectors, flow alarm switches, tamper switches, fire alarm bell connection by life safety section for remote monitoring. All electrical devices used for this system shall be compatible with the fire alarm system.
- C. Division 09: Finishes.
- D. Division 02: Existing Conditions. Coordinate with General Contractor for excavation for the underground water supply system.
- E. Coordination with Plumbing for drain

1.8 QUALITY ASSURANCE

- A. The Contractor for the fire protection installation shall be duly qualified Fire Protection Contractor, experienced and regularly engaged in the installation of fire protection systems with a license classification of C-16. Where local authorities require additional licensing of the Fire Protection Contractor, and/or workmen, such a license shall be mandatory for a prospective Contractor.
 - 1. Contractor is to verify flow data (static pressure, residual pressure and GPM flowing) available at site and provide design for available pressure and flow.
 - 2. The Fire Protection contractor shall be the Engineer of Record for the automatic sprinkler and standpipe system.

FIRE PROTECTION

3. Permits - The Fire Protection Contractor shall obtain permits for the installation or construction as required for approval and installation of the fire protection system. The Fire Protection Contractor shall submit working plans to the authorities having jurisdiction to obtain approval.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01. Handle components carefully to prevent damage, denting, and scoring. Do not install damaged components. Damaged components shall be replaced with new components.
- B. Store/protect products under provisions of Division 01. Store components in clean, dry place. Protect from weather, dirt, water, construction debris, and physical damage.

1.10 GUARANTEE

- A. Provide a one-year (12 months) guarantee under provisions of Division 01. The guarantee shall include parts, shipping, labor, travel costs, living expenses, required fees, and any other associated cost or expense to repair or replace products or systems. The guarantee period is to begin on the date of acceptance of the fire protection installation by the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All products to be commercial grade, new and of the manufacturer's latest design model. Products manufacturers outside of North America will not be accepted without written approval from engineer prior to submission of bid.
- B. All products to be UL listed and/or FM approved, except for items, which are not required to be listed by code.
- C. All products shall be delivered and stored in original containers. Containers shall be clearly marked or stamped with manufacturer's name and rating.
- D. The following items to be included but specified under Section 210500: Basic Materials and Methods.
 1. Hangers and supports
 2. Escutcheons plates, flashings and sleeves
 3. Access panel and doors
 4. Identification markers and signs
 5. Expansion compensators and flexible connectors
 6. Anchors and seismic restraints
 7. Excavation and backfill
- E. Coordination: All piping and pre-action system in basement data center area will be required to be fully coordinated with data center design team prior to installation.

2.2 UNDERGROUND PIPE COATING:

- A. All underground ferrous piping shall be covered with:
 1. Either two coats of 10 Mill Scotch Wrap No. 51, or with;
 2. "XTRU-COAT" prefabricated extruded cover with joints sealed with two coats of 10 Mill Scotch Wrap #51.
 3. Or approved equal

2.3 THRUST BLOCKS

- A. Provide thrust blocks at changes in pipe direction, changes in pipe sizes, dead-end stops and at valves.

FIRE PROTECTION

- B. Calculate area of undisturbed earth of thrust block based on actual soil conditions and water test pressure of 200 Psi.
- C. Concrete and reinforcing steel shall be as specified in Division 03 and 05. All concrete shall be Class A, unless specified otherwise.
- D. Miscellaneous nuts and bolts shall be stainless steel.

2.4 RODS AND CLAMPS

- A. Socket clamps shall be stainless steel; four bolt type, equipped with stainless steel socket clamp washers and nuts Grinnell Fig. 595 and 594, Elcen Fig. 37 and 37X, or equal.
- B. Rods shall be stainless steel, 3/4" diameter.

2.5 PIPE AND FITTINGS - ABOVE GROUND

- A. General: The piping products listed below by manufacturer's name and model numbers are the only acceptable materials listed for this project. Substitutions of pipe must be submitted and approved in writing by the architect prior to bid. No copper pipe shall be allowed in the wet fire sprinkler system.
- B. Piping or fittings that show substantial rust or breaks in coating will be removed and replaced.
- C. Allied Tube & Conduit: Schedule 40 black steel, ASTM A-135 stamped on pipe, UV cured acrylic finish; Stockham, Grinnell or Warwick Class 150 threaded malleable, ASTM A197, ASTM A126, or Victaulic roll-grooved fittings and couplings, only.
- D. Allied Tube: Scheduled 10 black steel pipe, ASTM A-135 stamped on pipe, UV cured acrylic finish; Victaulic roll-grooved fittings and couplings.
- E. Shop-weld thread-o-lets may be used in lieu of tee fittings, but field (site) welding will not be permitted.
- F. Mechanical Couplings: Victaulic grooved couplings style 07, 75 or 77, or equal by Gruvlok.
- G. Mechanical Tees: Victaulic style 920, Gruvlok. U-bolt mechanical tees are not acceptable.
- H. Flexible sprinkler connector for suspended ceiling sprinkler application: Flexhead or equal Factory Mutual approved system.
- I. Use rigid couplings where flexibility is not required or provide necessary sway bracing.
- J. Prohibited Piping and Fittings: Copper pipe, CPVC pipe, pipe less than schedule 40 for threaded or less than schedule 10 for roll grooving; Super 40 "Dyna-Flow", "Dyna-Thread", "Fireflow", XL, Thinwall, "Eddylite" by Bullmoose and Threadable Lightwall pipe are not allowed. POZ-LOK, U-bolt Victaulic style 921 mechanical tees, Victaulic style 99 Roust-A-Bout, Victaulic style 90 Plainlock, Hooker style fitting, quick disconnect, boltless, snap-joint, field drilling or welding of any main or branch lines, and any device specifically prohibited by the local authority having jurisdiction is not allowed. No unions shall be permitted for any size pipe. Plain end fittings are not allowed.

2.6 SPRINKLER HEADS - GENERAL

- A. Sprinkler heads shall be regular automatic closed-type heads of ordinary degree temperature rating except that sprinkler heads installed in the vicinity of heating equipment or in special occupancy areas shall be of the temperature rating as described in NFPA No. 13.
- B. Provide quick response heads in all new light hazard occupancies.
- C. Provide corrosion-resistant sprinkler heads where they are exposed to weather, moisture or corrosive vapors.

FIRE PROTECTION

- D. The Contractor shall furnish spare heads. The heads shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating head installed. In addition to the spare heads, the contractor shall furnish not less than two special sprinkler head wrenches. Refer to NFPA 13 section; "Stock of Spare Heads".

2.7 SPRINKLER HEADS AND ESCUTCHEONS

- A. Sprinkler heads installed shall be upright or pendent, as conditions require, and shall be of the following type and finish for the areas designated. Unless otherwise specified, sprinklers shall be small frame type, center bulb capsule for finished areas, fusible link for unfinished areas, and ½" orifice. Extended coverage sprinkler heads are not allowed.

<u>Building Area</u>	<u>Sprinkler Head</u>	<u>Sprinkler Finish</u>	<u>Escutcheon Finish</u>	<u>Temp. Deg.</u>
Unfinished Retail, & Office, Garage & Mechanical Rooms	Upright/Pendant	Brass	None	165°F
Electrical, Telephone & Switchgear Rooms, above all gas fired equipment	Upright	Brass	None	286° F
Finished Ceilings	Semi-recessed Pendant	White	White	165° F
	Concealed Pendant	Brass	White Coverplate	165° F
Soffit	Flush Sidewall	White	White	165°F
Sidewall	Horizontal Sidewall	Brass	None	165°F

- B. Manufacturer: TYCO, Viking & Reliable

2.8 VALVING

- A. 2" or Smaller:
1. Control Valve: OS&Y rising stem type gate valve bronze body, bonnet and disc, copper alloy stem, threaded ends, 175 PSI WOG min. Provide with tamper switch.
 2. Check Valve: Swing check type with bronze body, cap and disc, threaded ends, 175 PSI WOG min.
 3. Drip Valve: 3/4", cast brass automatic ball drip type, threaded ends, 175 PSI WOG min.
 4. Testing Valve: 1-1/4", test and drain, sight glass, ½" test orifice, lever operated, 300 psi WOG. Drain to mop sink or drain riser.
 5. Main Drain Valve: 2", angle gate valve, bronze body, copper alloy stem, threaded ends, 175 psi WOG. Drain to mop sink or drain riser.
- B. 2-1/2" or Larger:
1. Control Valve: Lug type wafer valve with tamper switch, ductile iron body, nickel plated ductile iron disc, stainless steel stem and Buna-N seat, 175 PSI WOG min.
 2. Control Valve: OS&Y rising stem type gate valve, cast iron body and bonnet, bronze stem, seat and disc, flanged ends, 175 PSI WOG min. Provide with tamper switch.
 3. Check Valve: Swing check type with cast iron body, bolted cap and disc, flanged ends, 175 PSI WOG min.
 4. Manufacturer: Grinnell, Stockham, Milwaukee, Mueller, Kennedy, Elkart or AGF.

FIRE PROTECTION

2.9 BACKFLOW PREVENTER

- A. Provide listed backflow prevention device as required by local codes and ordinances. Backflow prevention devices installed in the vertical position shall be approved for that orientation.
- B. Double check detector check valve assembly: Epoxy coated, ductile iron construction, 175 Psig working pressure, complete with two spring loaded "Y" type check valves, "Y" strainer with hose bibb on suction side of assembly, two OS&Y gate valves, test cocks, bypass water meter and bypass double-check. Febco #856-DCDA, Conbraco or approved equal

2.10 WET and dry SPRINKLER ALARM CHECK VALVES

- A. Contractor shall provide completely engineered wet alarm check valve, retarding chamber, and trim assembly for each floor. Viking #H-2, Tyco or Reliable.
- B. Contractor shall provide completely engineered dry alarm check valve, air supply, and trim assembly for each stair standpipe. Tyco DPV-1, Viking, or Reliable.

2.11 VALVE BOXES

- A. Cast iron valve boxes for shutoff valves buried in ground shall be complete with bellbottoms, extension piece, top and cover. Boxes shall be suitable for the types of valves with which they are used. All valve boxes shall have a concrete collar flush with grade.
- B. Lids shall have the applicable letters embossed upon the top surface. Tagging shall match existing lids.
- C. Manufacturer: Tyler, ITT Grinnell, or equal.

2.12 INTEGRAL INSPECTORS ALARM TEST AND SYSTEM DRAIN

- A. Combination system drain and visible orifice insert/sight glass for testing system alarm; with screwed or grooved inlet and outlet connections, Malleable iron hand wheel, EPDM valve seats, maximum working pressure 300 Psi, 1/2" orifice insert, Bronze housing, UL listed and FM Approved. Victaulic TestMaster II style 720, or approved equal.
- B. Water pressure gauge, range 0-300 Psi, in 5 Psi increments, brass case - 3-1/2" diameter, 1/4" NPT male pipe connection, UL listed. Locate pressure gage on riser per code. Star Sprinkler, Ashcroft or approved equal.
- C. Pressure gauge test valve, brass 1/4" screwed ends, 300 Psi WOG. United or approved equal.
- D. All relief, main, auxiliary and equipment drains shall be routed separately to floor drain or air gap fitting (by plumbing).

2.13 TAMPER SWITCHES

- A. Switch shall be mounted so as not to interfere with normal operation of the valve and be adjusted to operate when handle of valve has traveled more than one-fifth the distance of its normal operating position. Electrical Contractor shall provide conduit from switch to fire alarm panel.
- B. Housing shall be of aluminum, acid-treated, primed and finished in baked red enamel. Removal of housing shall cause switch to operate. Inside shall be single pole, double throw micro switch with connection for electrical conduit.
- C. Install on all control valves.
- D. Manufacturer: Potter-Electric, Notifier, Ellenco, or Simplex.

FIRE PROTECTION

2.14 EXTERIOR ALARM

- A. Electric bell, 10" diameter, U.L. listed, 120 VAC, 99 dB at 10 FT; Potter model PBA12010 or equal.
- B. Provide signage stating "IF RINGING CALL 911"
- C. Electric Horn: Potter-Electric, Ellenco, Notifier, or Simplex weatherproof, 120 VAC.

2.15 FIRE DEPARTMENT HOSE VALVES

- A. Fire Department Valves: 2-1/2" brass construction female to male angle valve with cap and chain, rough chrome finish and mounted 48" above finished floor.
- B. Manufacturer: Croker, Elkhart, Powhattan Brass, Potter-Roemer or Zurn.

2.16 DRY-PIPE VALVE SYSTEM

- A. Contractor shall provide where indicated on drawings a completely engineered dry-pipe valve assembly in accordance with NFPA Pamphlet No. 13.
- B. Space shall be provided for all valving required. Dry-pipe alarm valve(s) shall be of the differential type with all accessories including, but not limited to, the following:
 - 1. Alarm Valve, Trim, Pressure Switch with auxiliary contacts for fire alarm connection, Water gong, Air maintenance device, listed air compressor unit designed to fill system in a minimum of thirty minutes, Dry type valves supplying more than 300 sprinkler heads shall be provided with quick opening device (accelerator).
- C. Manufacturer: Viking #E, Star or Reliable.

PART 3 - EXECUTION

3.1 GENERAL

- A. This system to be installed by an experienced firm regularly engaged in the installation of automatic sprinkler system as specified by the requirements of the Specifications.

3.2 PERFORMANCE OF WORK

- A. Examine areas and conditions under which materials are to be installed. Layout the system to suit the different types of construction and equipment as indicated on the drawings and in accordance with NFPA Pamphlet No. 13 and 14.
- B. Work to start immediately after authorization has been given to proceed so that the overall progress of the construction is not delayed.
- C. Coordinate with other trades as necessary to properly interface components of the sprinkler system.
- D. Follow manufacturer's directions and recommendations in all cases.
- E. The omission from the drawings or Specifications of any details of construction, installation, materials, or essential specialties shall not relieve the Contractor from furnishing the same in place for a complete system.

3.3 TEMPORARY FIRE PROTECTION

- A. Provide all temporary valving, piping, Siamese connections and other components as directed by the fire agency office during all phases of construction.

FIRE PROTECTION

3.4 INSTALLATION - GENERAL

- A. Fire protection system shall be installed in accordance with the approved Drawings. The finished ceiling is not to be erected until all fire protection piping has been installed, tested, and inspected. Sprinkler heads located in the electrical equipment, elevator, or similar rooms shall be furnished with deflectors to prevent water spray on equipment.
- B. The arrangement of all pipes shall conform to all architectural requirements and field conditions, shall be as straight and direct as possible, forming right angles or parallel lines with building walls and other pipes, and shall be neatly spaced. Offsets will be permitted only where required to permit the pipes to follow the walls. Standard fittings shall be used for offsets. All risers shall be erected plumb and true, shall be parallel with the walls and other pipes, and shall be neatly spaced. All work shall be coordinated with HVAC, Plumbing, Electrical and Structural work in order to avoid interference and unnecessary cutting of floors or walls.
- C. All sprinkler heads to be installed in ceilings throughout the scope of work building as listed in Section 2.6. All areas without ceilings shall have rough brass upright or pendent heads as shown on drawings.
- D. Sprinkler heads in all finished areas are to be installed on a true axis line in both directions, with maximum deviation from the axis line of 1 inch plus or minus and shall be plus or minus 1" within center of tile. At the completion of the installation, if any heads are found to exceed the above-mentioned tolerance, they shall be removed and reinstalled.
- E. No pipes or other apparatus shall be installed so as to interfere in any way with full swing of doors.
- F. The arrangement, positions, and connections of pipes, drains, valves, etc., shall be as required by NFPA Pamphlet #13 for all areas to be sprinklered. However, the right is reserved by the Architect to change the location of any item to accommodate conditions, which may arise during progress of the work, without additional compensation for such changes provided that no additional heads are required prior to the installation of the work.
- G. Where required, piping shall be installed concealed in building construction, or through steel beams, to obtain adequate head room.
- H. All pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened, or otherwise injured either before or during installation.
- I. Provide protective pans under pipes passing over high voltage electrical bus duct or switchgear equipment. The pan shall be constructed of 12 gauge black iron with a 6 inch lip, the corners being welded to make the pans watertight. Each pan shall be given three coats of Rust-Oleum paint and shall be supported by pipe hangers. The pan shall drain clear of the bus duct or switchgear.
- J. All pipe interiors shall be thoroughly cleaned of foreign matter before installation, and shall be kept clean during installation by plugging or other approved means. Piping shall be covered with Visqueen during storage. Piping that shows signs of rusting will be removed from job site and replaced.
- K. Field Connections: Any modifications to system required by field conditions, physical equipment changes or compliance with code regulations shall be made promptly without cost to Owner.
- L. Interference: No piping or sprinkler devices shall interfere with the operations of any door, window or mechanical and electrical systems. No part of this system shall visibly be installed in the physical parameter of any window. Sprinkler mains and branch piping shall not interfere with existing or future ceiling, light fixtures and HVAC diffusers.
- M. Threaded Pipe: Threads shall be clean cut, standard and tapered. Threads shall be made up using flaked graphite and lubricating oil, piping compound or Teflon tape applied to the male threads only.

FIRE PROTECTION

- N. Grooved Pipe: Installation shall be as prescribed in the Victaulic Piping Manual only. Holes in the piping are to be made in the fabrication shop, not at the job site. Contractor shall provide at the project site a sample of each type of coupling (threaded, standard grooved coupling and mechanical type), showing complete assembly with pipe connections.
- O. Keep all pipe and other openings closed to prevent entry of foreign matter. Cover all equipment and apparatus to protect against dirt, water, chemical or mechanical damage, before and during construction period. Restore to original condition all apparatus and equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint.
- P. Location of sprinkler piping is critical.
 - 1. Where ceiling space is at a minimum under beams location of ductwork takes precedence, coordinate accordingly.
 - 2. Include in base bid (3) two-hour coordination meetings with Owner, Architect, and Engineer for coordination of sprinkler pipe routing.
 - 3. Coordinate beam and shear wall penetrations with Structural Engineer. Obtain written approval for all beam penetrations from Structural Engineer.
- Q. Elevator Pits: For hydraulic elevators provide sprinkler heads in elevator pits per elevator code. Provide control valve with tamper switch to each pit area. Coordinate with Division 26 Fire Alarm System.
- R. Tracer wire shall be wrapped and taped to non-metallic underground piping at maximum 20 foot intervals.

3.5 SLEEVES AND FLASHINGS

- A. Wherever pipes are exposed and pass through walls, floors, partitions or ceilings, they shall be fitted with chromium plated steel escutcheons held in place with setscrews. Care shall be taken to protect the escutcheons during the course of construction.
- B. Penetrations through fire rated walls and floors shall be sealed with listed mastic of similar fire rating.

3.6 HANGERS, INSERTS, SUPPORTS, AND SWAY BRACING

- A. Hangers and supports shall be installed per NFPA #13 sections on Hangers and Protection of Piping Against Damage Where Subject to Earthquake. Provide restraint from movement at end sprinkler on branch line per NFPA 13.
- B. Bending of threaded hanger rod is not allowed. All powder driven anchor pins in concrete are not allowed.

3.7 SAFETY TESTING & VERIFICATION

- A. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."
- B. Provide NFPA 13 Contractor's Material & Test Certificate Form 85A for above ground piping and Form 85B for underground piping.
- C. Provide manpower to test the function and performance of all Life Safety System components and devices per floor and per zone basis in accordance with the local requirements.

3.8 IDENTIFICATION

- A. In addition to the requirements of Section 210500, provide pipe markers every 20 feet, once in every room, and at each building level traversed, minimum.
- B. Provide hydraulic design data nameplates on the riser of each sprinkler system in accordance with NFPA 13

FIRE PROTECTION

- C. Equipment such as valves, drains, etc., shall be provided with signs that identify type of equipment and service. The tag shall be securely fastened to the handle or spindle of the valve by a brass chain. Furnish four schedules of valves so tagged. There shall also be furnished four diagrammatic charts showing schematically the complete sprinkler system with major control valves and numbers thereof. One set of Schedules and charts shall be mounted in glazed frames located where directed.

3.9 AS-BUILT RECORD DRAWINGS AND CERTIFICATION

- A. As-built Record Drawings are to be kept up-to-date and the Master Copy kept at the job site. Prior to final acceptance of work being approved, these drawings are to be turned over to the Owner's Representative for approval.
- B. Written certification from the insuring agents, and authorities having jurisdiction that the tests were satisfactory.
- C. After installation is complete and tests satisfactorily approved, deliver test certificates and approval by the local Fire Authorities and the FMA to the architect. Final acceptance of sprinkler/standpipe system by Owner's Representative shall be contingent upon receipt of certificate and approval from authorities having jurisdiction and for the delivery of final As-Built Drawings.

END OF SECTION

BASIC MATERIALS AND METHODS - PLUMBING

PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work under this Section shall comply with the requirements of General Conditions, Supplemental Conditions, Special Conditions and Division 01 - General Requirements, and shall include all Plumbing Sections specified herein.

1.2 SCOPE OF THIS SECTION

- 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. Compliance with all codes and standards applicable to this jurisdiction
 - 2. Shop Drawings for Equipment
 - 3. Coordination Documents
 - 4. Record Drawings
 - 5. Start-up Service and Building Commissioning
 - 6. Instruction, Maintenance, and O & M Manuals
 - 7. Work associated with Delivery, Storage, and Handling of products
 - 8. Work associated with provision of Temporary Facilities
 - 9. Preparation of Posted Operating Instructions
 - 10. Meeting Project Safety and Indemnity requirements
 - 11. Proper Cleaning and Closing
 - 12. Supplying proper Warranty information
 - 13. Supply specified Guarantee documentation
 - 14. Design and provision of Supports and Anchors
 - 15. Pipe Portals
 - 16. Equipment Rails
 - 17. Access Panels and Doors
 - 18. Identification Markers
 - 19. Coordination of Electrical requirements for equipment provided

1.3 DESCRIPTION OF WORK

- A. The Contract Documents, including Specifications and Construction Drawings, are intended to provide all material and labor to install complete plumbing systems for the building and shall interface with all existing building systems affected by new construction.
- B. The Contractor shall refer to the architectural interior details, existing installation, floor plans, elevations, and the structural and other Contract Drawings and he shall coordinate his work with that of the other trades to avoid interference. The plans are diagrammatic and show generally the locations of the fixtures, equipment, and pipe lines and are not to be scaled; all dimensions and existing conditions shall be checked at the building.
- C. The Contractor shall comply with the project closeout requirements as detailed in General Requirements of Division 01.
- D. Project involves interface with existing building and site systems, effort has been made to note existing utilities and services. However, the Contractor should thoroughly familiarize themselves with existing conditions and be aware that in some cases information is not available as to concealed conditions, which exist in portions of the existing building affected by this work.

1.4 DESCRIPTION OF BID DOCUMENTS

- A. Specifications:
 - 1. Specifications, in general, describe quality and character of materials and equipment.
 - 2. Specifications are of simplified form and include incomplete sentences.

BASIC MATERIALS AND METHODS - PLUMBING

- B. Drawings:
1. Drawings in general are diagrammatic and indicate sizes, locations, connections to equipment and methods 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, in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 5. Where existing pipes, conduits and/or ducts prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits and/or ducts. Verify exact location and elevation of existing piping prior to any construction.
 6. If any part of Specifications or Drawings appears unclear or contradictory, apply to Architect or Engineer for his interpretation and decision as early as possible, including during bidding period.

1.5 DEFINITIONS

- A. "Above Grade": Not buried in the ground and not embedded in concrete slab on ground.
- B. "Actuating" or "Control" Devices: Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.
- C. "Below Grade": Buried in the ground or embedded in concrete slab on ground.
- D. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces, or in enclosures. In general, any item not visible or directly accessible.
- E. "Connect": Complete hook-up of item with required service.
- F. "Exposed": Not installed underground or "concealed."
- G. "Furnish": To supply equipment and products as specified.
- H. "Indicated," "Shown" or "Noted": As indicated, shown or noted on Drawings or Specifications.
- I. "Install": To erect, mount and connect complete with related accessories.
- J. "Motor Controllers": Manual or magnetic starters (with or without switches), individual push buttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- K. "Piping": Pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.
- L. "Provide": To supply, install and connect as specified for a complete, safe and operationally ready system.
- M. "Reviewed," "Satisfactory" or "Directed": As reviewed, satisfactory, or directed by or to Architect/Engineer/Owner.
- N. "Rough-In": Provide all indicated services in the necessary arrangement suitable for making final connections to fixture or equipment.
- O. "Shall": An exhortation or command to complete the specified task.
- P. "Similar" or "Equal": Of base bid manufacture, equal in materials, weight, size, design, and efficiency of specified products.
- Q. "Supply": To purchase, procure, acquire and deliver complete with related accessories.

BASIC MATERIALS AND METHODS - PLUMBING

- R. "Typical" or "Typ": Exhibiting the qualities, traits, or characteristics that identify a kind, class, number, group or category. Of or relating to a representative specimen. Application shall apply to all other similarly identified on plan or detail.
- S. "Will": A desire to complete the specified task. Allows some flexibility in application as opposed to "Shall."
- T. "Wiring": Raceway, fittings, wire, boxes and related items.
- U. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. All Division 22 Plumbing sections included herein.
- B. Division 02: Existing Conditions. Coordinate with Civil Engineer.
 - 1. Coordination of excavation of trenches and the installation of mechanical systems and piping on site.
- C. Division 03: Concrete.
 - 1. All concrete work for Plumbing Division shall be included in Division 22 under the appropriate Sections and shall include:
 - a. Concrete curbs and housekeeping pads for the mechanical equipment.
 - b. Thrust blocks, pads, and boxes for mechanical equipment.
 - c. Coordination of floor drain and floor sink installations in sloped floors.
- D. Division 05:
- E. Division 07: Thermal and Moisture Protection.
 - 1. Flashing and sheet metal
 - 2. Sealants and caulking
 - 3. Firestopping
- F. Division 09: Finishes:
 - 1. Division 22 installers shall perform all painting, except where specifically stated otherwise in Division 09.
 - 2. Painting of all exposed steel, piping, insulation, equipment and materials.
 - 3. Paint all exposed gas piping, interior and exterior to the building, yellow.
- G. Division 26: Electrical is related to work of:
 - 1. Power connections to all plumbing equipment
 - 2. Life safety provisions

1.7 CODES AND STANDARDS

- A. The Contractor is cautioned that code 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.
- B. Perform all tests required by governing authorities and required under all Division 22 Sections. Provide written reports on all tests.
- C. Electrical devices and wiring shall conform to the latest standards of NEC; all devices shall be UL listed and labeled.
- D. All plumbing work shall comply with the Americans with Disabilities Act (ADA).
- E. 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.

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- F. Provide in accordance with rules and regulations of the following:
1. Building Codes enforced by the Authority Having Jurisdiction in Oregon:
 - a. 2010 Oregon Structural Specialty Code (OSSC) based on 2009 International Building Code (IBC)
 - b. 2010 Oregon Mechanical Specialty Code (OMSC) based on 2009 International Mechanical Code (IMC) and International Fuel Gas Code (IFGC) with State Amendments
 - c. 2011 Oregon Plumbing Code (OPC) based on 2009 Uniform Plumbing Code (UPC) with State Amendments
 - d. Oregon Fire Code (Based on the International Fire Code)
 - e. National Electric Code (NEC) with State Amendments
 2. Local, city, county and state codes and ordinances
 3. Local Bureau of Buildings
 4. Local Health Department
 5. Local and State Fire Prevention Districts
 6. State Administrative Codes
- G. Provide in accordance with appropriate referenced standards of the following:
1. NFPA - National Fire Protection Association
 2. CSA - Canadian Standards Association
 3. ANSI - American National Standards Institute
 4. ASHRAE - American Society of Heating, Refrigerating & Air Conditioning Engineers
 5. ASME - American Society of Mechanical Engineers
 6. ASTM - American Society for Testing Materials
 7. AWS - American Welding Society
 8. AWWA - American Water Works Association
 9. FM - Factory Mutual
 10. MSS - Manufacturer's Standardization Society
 11. NEMA - National Electrical Manufacturer's Association
 12. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
 13. UL - Underwriter's Laboratories
 14. ADA - Americans with Disabilities Act
 15. ETL - Electrical Testing Laboratories
 16. ASSE - American Society of Sanitary Engineers
 17. PDI - Plumbing and Drainage Institute
 18. IAPMO - International Association of Plumbing and Mechanical Officials
 19. CISPI - Cast Iron Soil Pipe Institute

1.8 QUALITY ASSURANCE

- A. Manufacturer's Nameplates: Nameplates on manufactured items shall be aluminum or Type 304 stainless steel sheet, not less than 20 USG (0.0375"), riveted or bolted to the manufactured item, with nameplate data engraved or punched to form a non-erasable record of equipment data.
- B. Current Models. All work shall be as follows:
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.
- C. Experience: Unless more stringent requirements are specified in other sections of Division 22, manufactured items shall have been installed and used, without modification, renovation or repair, on other projects for not less than one year prior to the date of bidding for this project.

1.9 GENERAL REQUIREMENTS

- A. Examine all existing conditions at building site.
- B. Review contract documents and technical specifications for extent of new work to be provided.
- C. Provide and pay for all permits, licenses, fees and inspections.

SERA Architects, Inc. Addendum 1 Package 1 – PERMIT / CONSTRUCTION

NOTICE OF ALTERNATE BILLING CYCLE: The Contract will allow the Owner to require the submission of billings or estimates in billing cycles other than 30-day cycles. Billing or statements shall be submitted monthly ending on the last day of the month.

NOTICE OF EXTENDED CERTIFICATION PROVISION: The Contract will allow the Owner to certify billings and estimate within 20 days after the billings and estimates are received from the original contractor.

NOTICE OF EXTENDED PAYMENT PROVISION: The Contract will allow the Owner to make payment within 30 days after the date a billing or estimate is received.

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- D. 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. This work shall include furnishing and installing all access doors required for mechanical access.
- E. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to Equipment Specifications in Divisions 02 through 48 for rough-in requirements.
- F. Coordinate mechanical equipment and materials installation with other building components.
- G. Verify all dimensions by field measurements.
- H. Arrange for chases, slots, and openings in other building components to allow for plumbing installations.
- I. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
- J. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- K. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials. Contractor to provide for all cutting and patching required for installation of his work unless otherwise noted.
- L. Where mounting heights are not detailed or dimensioned, install plumbing services and overhead equipment to provide the maximum headroom possible.
- M. Install plumbing equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, without interference with other installations.
- N. Coordinate the installation of plumbing materials and equipment above ceilings with ductwork, piping, conduits, suspension system, light fixtures, cable trays, sprinkler piping and heads, and other installations.
- O. Coordinate connection of plumbing systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- P. Coordinate with Owner in advance to schedule shutdown of existing systems to make new connections. Provide valves in new piping to allow existing system to be put back in service with minimum down time.
- Q. All materials (such as insulation, piping, 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 (NFPA 255) Method. 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.
- R. Coordinate installation of floor drains and floor sinks with work of other trades, such that finished floor slopes to drains and floor sinks are flush with surrounding floor.
- S. Products made of or containing lead, asbestos, mercury or other known toxic or hazardous materials are not acceptable for installation under this Division. Any such products installed as part of the work of the Division shall be removed and replaced and all costs for removal and replacement shall be borne solely by the installing Contractor.

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1.10 MINOR DEVIATIONS

- A. The Drawings are diagrammatic and show the general arrangements of all plumbing work and requirements to be performed. It is not intended to show or indicate all offsets, fittings, and accessories which will be required as a part of the work of this Section.
- B. The Contractor shall review the structural and architectural conditions affecting his work. It is the specific intention of this section that the contractor's scope of work shall include
 - 1. Proper code complying support systems for all equipment whether or not scheduled or detailed on drawings or in these specifications
 - 2. Minor deviations from the mechanical plans required by architectural and structural coordination.
- C. The Contractor shall study the operational requirements of each system, and shall arrange his work accordingly, and shall furnish such fittings, offsets, supports, accessories, as are required for the proper and efficient installation of all systems from the physical space available for use by this section. This requirement extends to the Contractor's coordination of this section's work with the "Electrical Work." Should conflicts occur due to lack of coordination, the time delay, cost of rectification, demolition, labor and materials, shall be borne by the Contractor and shall not be at a cost to the Owner.
- D. Minor deviations in order to avoid conflict shall be permitted where the design intent is not altered.
- E. Advise the Architect, in writing, in the event a conflict occurs in the location or connection of equipment. Bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Architect of conflict.

1.11 PRODUCT SUBSTITUTIONS

- A. The Contractor shall certify the following items are correct when using substituted products other than those scheduled or shown on the drawings as a basis of design:
 - 1. The proposed substitution does not affect dimensions shown on drawings.
 - 2. The Contractor shall pay for changes to building design, including engineering design, detailing, structural supports, and construction costs caused by proposed substitution.
 - 3. The proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
 - 4. Maintenance and service parts available locally are readily obtainable for the proposed substitute.
- B. The Contractor further certifies function, appearance, and quality of proposed substitution are equivalent or superior to specified item.
- C. The Contractor agrees that the terms and conditions for the substituted product that are found in the contract documents apply to this proposed substitution.

1.12 SHOP DRAWINGS AND EQUIPMENT SUBMITTALS

- A. Prior to construction submit for review all materials and equipment in accordance with Division 01 requirements.
- B. After approval of preliminary list of materials, the Contractor shall submit Shop Drawings and manufacturer's Certified Drawings to the Architect for approval.
- C. The Contractor shall submit approved Shop Drawings and manufacturer's equipment cuts, of all equipment requiring connection by Division 26, to the Electrical Contractor for final coordination of electrical requirements. Contractor shall bear all additional costs for failure to coordinate with Division 26.

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- D. Submittals and Shop Drawings shall be submitted as a complete package bound in a 3-ring binder with tabs for each specification section. The approved submittals shall be converted into Operations & Maintenance Manuals at the completion of the project. Submit six (6) typed copies of submittals. Refer to Division 01 for additional requirements.

1.13 UNIT PRICING SUBMITTALS

- A. Prior to construction submit for review all materials and equipment in accordance with Division 01 requirements.
- B. Preliminary List of Materials and Unit Price Items: Within thirty (30) days after awarding of the Contract, submit to architect for preliminary approval a complete list of manufacturer's names and model numbers of proposed materials and equipment. Also include proposed list of unit price items for review.
 - 1. Indicate substituted items.
 - 2. Identify test and balancing agency.
 - 3. Identify independent testing laboratory for water analysis.
- C. The Contractor shall submit with preliminary list of materials a unit price list for each item furnished on this project. Included with price shall be labor cost index.
- D. Submittals and Shop Drawings shall be submitted as a complete package bound in a 3-ring binder with tabs for each specification section. Submit six (6) typed copies of submittals. Refer to Division 01 for additional requirements.

1.14 COORDINATION DOCUMENTS

- A. The Contractors shall prepare coordinated Shop Drawings to coordinate the installation and location of all piping and all system appurtenances with other trades. The Drawings shall include all mechanical rooms and floor plans. The Drawings shall be Overlay Drawings showing each discipline on a single sheet. The Drawings shall be keyed to the structural column identification system, and shall be progressively numbered. Prior to completion of the Drawings, the Contractor shall coordinate the proposed installation with the Architect and the structural requirements, and all other trades (including HVAC, Fire Protection, Electrical, Ceiling Suspension, and Tile Systems), and provide reasonable maintenance access requirements. When conflicts are identified, modify system layout as necessary to resolve. Do not fabricate, order or install any equipment or materials until coordination documents are approved by the General Contractor, Architect, and Owner. Within thirty (30) days after award of Contract, submit proposed coordination document Shop Drawing schedule, allowing adequate time for review and approval by parties mentioned above. Drawings should be prepared and submitted for approval on a floor-by-floor basis to phase with building construction.
- B. The Drawings shall be prepared as follows:
 - 1. The Sheet Metal (Mechanical) Contractor shall prepare Drawings to an accurate scale of 1/4" = 1'-0" or larger, on reproducible media sheets (vellum) or AutoCAD disks. Obtain reproducibles or AutoCAD files of the HVAC design from the Architect, or Engineer, at cost plus. Drawings are to be same size as Contract Drawings and shall indicate location, size and elevation above finished floor, of all HVAC equipment, ductwork, and piping.
 - 2. The Plumbing Contractor shall obtain reproducible plans or AutoCAD disks from the Mechanical Contractor, and indicate all plumbing lines including fittings, hangers, access panels, valves, and bottom of pipe elevations above finished floor.
 - 3. The Fire Protection Contractor shall obtain reproducible plans or AutoCAD disks with the detailed mechanical and plumbing work shown. The Sprinkler Contractor shall indicate location of all sprinkler heads and piping, including valves and fittings, dimensions from column lines, and bottom of pipe elevations above finished floor.
 - 4. Plans are to incorporate all addenda items and change orders.
 - 5. Distribute plans to all trades and provide additional coordination as needed.

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- C. Advise the Architect in the event a conflict occurs in the location or connection of equipment. Bear all costs for relocation of equipment, resulting from failure to properly coordinate the installation or failure to advise the Architect of conflict.
- D. Provide means of access to all valves, controllers, operable devices, and other apparatus that may require adjustment or servicing.
- E. Verify in field exact size, location, invert, and clearances regarding all existing material, equipment and apparatus, and advise the Architect of any discrepancies between those indicated on the Drawings and those existing in the field prior to any installation related thereto.
- F. Final Coordination Drawings with all appropriate information added are to be submitted as Record Drawings at completion of project.
- G. Provide copy of Record Drawings to Testing and Balancing Contractor for their use when doing their work.

1.15 RECORD DRAWINGS

- A. Before commencing installation, obtain an extra set of prints from Architect, marked "Record." Keep this set of Drawings at the job site at all times, and use it for no other purpose but to mark on it all the changes and revisions to the Contract Drawings resulting from coordination with other trades. At the completion of the project,
 - 1. Obtain a clean set of reproducibles from the Architect or Engineer, at cost plus, and transfer the revisions to these reproducibles in a neat and orderly fashion.
 - OR
 - 2. Edit project AutoCAD files to incorporate all site markups, changes, and revisions to the Contract Drawings. Submit plots of Record Drawings and six copies CD Roms labeled with all record AutoCAD drawing files.
- B. Provide copy of Record Drawings to Testing and Balancing Contractor for use when doing his work.
- C. Mark Drawings to indicate revisions to piping, size, and location both exterior and interior; including locations of other control devices, valves, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e. – valves, traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- D. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.
- E. Refer also to Special Conditions in Division 01 for full scope of requirements.

1.16 START-UP SERVICE AND BUILDING COMMISSIONING

- A. Prior to start-up, be assured that systems are ready, including checking the following: Proper equipment rotation, proper wiring, auxiliary connections, lubrication, venting, controls, and installed and properly set relief and safety valves.
- B. Provide services of factory-trained technicians for start-up of temperature controls, boilers, pumps, and other major pieces of equipment. Certify in writing compliance with this Paragraph, stating names of personnel involved and the date work was performed.
- C. Refer to other Division 22 Sections for additional requirements.

BASIC MATERIALS AND METHODS - PLUMBING

1.17 INSTRUCTION, MAINTENANCE, AND O&M MANUALS

- A. O&M Manuals: Upon completion of the work, the Contractor shall submit to the Architect complete set of operating instructions, maintenance instructions, part lists, and all other bulletins and brochures pertinent to the operation and maintenance for equipment furnished and installed as specified in this section, bound in a durable binder. Refer to Division 01.
- B. The Contractor shall be responsible for proper instruction of Owner's personnel for operation and maintenance of equipment, and apparatus installed as specified in Division 22 to be no less than 2 hours for each piece of equipment.

1.18 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials in an environmentally controlled area at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage. Piping shall be stored in bundles covered with visqueen. Piping showing signs of rust shall be removed from site and replaced.
- C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.19 TEMPORARY FACILITIES

- A. Refer to Division 01 for the requirements of temporary water and sewer for construction and safety. Provide temporary water, and sewer, etc. services as necessary during the construction period and as required to maintain operation of existing systems.

1.20 POSTED OPERATING INSTRUCTIONS

- A. Furnish approved operating instructions for systems and equipment indicated in the technical sections for use by operation personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. Attach or post operating instructions adjacent to each principal system and equipment including start-up, operating, shutdown, safety precautions and procedure in the event of equipment failure. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal.

1.21 SAFETY AND INDEMNITY

- A. The Contractor shall be solely and completely responsible for conditions of the job site including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal hours of work.
- B. No act, service, Drawing, review, or Construction Review by the Owner, Architect, the Engineers or their consultants, is intended to include the review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- C. The Contractor performing work under this Division of the Specifications shall hold harmless, indemnify and defend the Owner, the Architect, the Engineers and their consultants, and each of their officers, employees and agents from any and all liability claim, losses or damage arising, or alleged to arise from bodily injury, sickness, or death of a person or persons, and for all damages arising out of injury to or destruction of property arising directly or indirectly out of, or in connection with, the performance of the work under the Division of the Specifications, and from the Contractor's negligence in the performance of the work described in the Construction Contract Documents; but

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not including the sole negligence of the Owner, the Architect, the Engineers, and their consultants or their officers, employees and agents.

1.22 CLEANING AND CLOSING

- A. All work shall be inspected, tested, and approved before being concealed or placed in operation.
- B. Upon completion of the work, all equipment installed as specified in this section, and all areas where work was performed, shall be cleaned to provide operating conditions satisfactory to the Architect.

1.23 WARRANTIES

- A. All equipment shall be provided with a minimum one-year warranty to include parts and labor. Refer to individual Equipment Specifications for extended or longer-term warranty requirements.
- B. 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.
- C. 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 after the Date of Final Acceptance, ordinary wear and tear excepted.
- B. Contractor shall be responsible for and pay for any damages caused by or resulting from defects in his work.

PART 2 - PRODUCTS

2.1 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.
- B. 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 manufacturers' names used herein, unless specifically noted that substitutes are not allowed.

2.2 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 7-05: "American Society of Civil Engineers."
 - 3. 2006 International Building Code (IBC)
 - 4. MSS Standard Compliance: Manufacturer's Standardization Society (MSS).
 - 5. SMACNA: "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 6. Provide copper plated or plastic coated supports and attachment for copper piping systems. Field applied coatings or tape is unacceptable.
 - 7. Manufacturer: B-Line, Grinnell, Michigan, Tolco, Kin-Line, Simpson, or Superstrut.
- B. Horizontal Piping Hangers and Supports: Except as otherwise indicated, provide factory-fabricated hangers and supports of one of the following MSS 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.

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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. Single Pipe Roller with Malleable Sockets: MSS Type 41.
 9. Adjustable Roller Hangers: MSS Type 43.
 10. Pipe Roll Stands: MSS Type 44.
 11. 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 or equal.
- D. Vertical Piping Clamps: Provide factory-fabricated two-bolt vertical piping riser clamps, MSS Type 8.
- 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, provide factory-fabricated building attachments of one of the following types listed.
1. Concrete Inserts: MSS Type 18 or Blue Banger Hanger by Simpson
 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. Internally Threaded Expansion Shell Anchors: By Simpson or approved equal.
 5. Concrete Screw Anchors: Titen HD by Simpson or approved equal.
- G. Saddles and Shields: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with 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. Shield length shall match or exceed length of calcium silicate insert.

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4. Thermal Hanger Couplings: Constructed of high strength plastic coupling to retain tubing and join insulation at clevis hangers and strut-mounted clamps. Klo-Shure Insulation Coupling or equal.
- 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 1.0 part cement to 3.0 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: "HoldRite" copper plated brackets. Insulate brackets attached to metal studs with felt.

2.3 PIPE PORTALS

- A. Where pipe portals are not provided by other sections of Specification, provide prefabricated insulated pipe portals as required for piping penetrating through the roof where shown on plans. Field built pipe portals are acceptable alternatives - provide detail of construction for review.
- B. Standard pipe portals, unless otherwise noted, shall be constructed as follows:
 1. Curb shall be constructed of heavy gauge galvanized steel with continuous welds on shell seams.
 2. Insulation to be 1-1/2" thick, 3 lb density rigid fiberglass.
 3. Curb to have a raised 3" (minimum), 45° cant.
 4. Curb to have 1-1/2" x 1-1/2" wood nailer (minimum).
 5. Curb height to be 8" (minimum) above roof deck.
 6. Cant shall be raised to match roof insulation thickness.
 7. Cover or flashing to be constructed of galvanized steel or other suitable material to provide sturdy weather tight closure. Provide collars and rubber nipples with draw bands of sizes required by piping. Size curb, cover and nipples per manufacturer's recommendations.
 8. Manufacturer: Roof Products Systems or Pate.

2.4 EQUIPMENT/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.
- D. Manufacturer: Pate, Vent Products, Thy Curb or Roof Products Systems.

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2.5 ACCESS PANELS AND ACCESS DOORS

- A. Provide all access doors and panels to serve equipment under this work, including those which must be installed, in finished architectural surfaces. Frame of 16-gauge steel, door of 20 gauge steel. 1" flange width, continuous piano hinge, key operated, prime coated. Refer to Architectural Specifications for the required product Specification for each surface. Contractor is to submit schedule of access panels for approval. Exact size, number and location of access panels is not shown on Plans. Access doors shall be of a size to permit 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 or concealed valve. Use no panel smaller than 12" x 12" for simple manual access, or smaller than 24" x 30" where personnel must pass through. Provide cylinder lock for access door serving mixing or critical valves in public areas.
- B. Included under this work is the responsibility for verifying the exact location and type of each access panel or door required to serve equipment under this work and in the proper sequence to keep in tune with construction and with prior approval of the Architect. Access doors in fire rated partitions and ceilings shall carry all label ratings as required to maintain the rating of the rated assembly.
- C. Acceptable Manufacturers: Milcor, Karp, Nystrom, or Elmdor/Stoneman.
- D. Submit markup of architectural plans showing size and location of access panels required for equipment access for approval by Architect.

2.6 IDENTIFICATION MARKERS

- A. Mechanical 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 are not acceptable.
- B. Plastic Pipe Markers:
 - 1. Snap-On Type: Provide pre-printed, semi-rigid snap-on, color coded pipe markers, complying with ANSI A13.1.
 - 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.
- C. 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.
- 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: 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.

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4. Access Panel Markers: Provide 1/16" thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.
 5. Non-potable Water Tags: 1/16" thick, engraved, plastic tags as indicated on Drawings.
- E. Plastic Equipment Signs:
1. Provide 4-1/2" x 6" plastic laminate sign, ANSI A.13 color coded with engraved white core lettering.
 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. Name and plan number
 - b. Equipment service
 - c. Design capacity
 - d. Other design parameters, such as pressure drop, entering and leaving conditions, rpm, etc.
- F. Acceptable Manufacturers: Craftmark, Seton, Brady, Marking Services, Inc., or Brimar.

2.7 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. VFD by Electrical if required.
 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 plumbing 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 - no exceptions.
- 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 1/2 HP or larger shall be rated for 208 or 460 volt, 3-phase, operation. Unless otherwise noted on plans, all motors less than 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.

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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 rated for inverter duty (NEMA Standard MG-1, Part 31) and equipped with a shaft grounding device or as an insulated bearing motor.
 - 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 produce 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 motors for indoor use where satisfactorily housed or remotely located during operation.
 - b) Guarded drip-proof motors where exposed to contact by employees or building occupants.
 - c) 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.
 - 2) Motors shall meet the NEMA premium efficiency standard
 - 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 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.

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- E. Low Voltage Control Wiring:
 - 1. General: 14 gauge, Type THHN, color coded, installed in conduit.
 - 2. Manufacturer: General Cable Corp., Alcan Cable, American Insulated Wire Corp., Senator Wire and Cable Co., or Southwire Co.

- 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 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 work 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.

3.2 MANUFACTURER'S DIRECTIONS

- 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.

3.3 INSTALLATION

- A. Coordinate the work between the various Plumbing Sections and with the work specified under other Divisions. If any cooperative work must be altered due to lack of proper supervision or failure to make proper and timely provisions, the alternations shall be made to the satisfaction of the Engineer and at the Contractor's cost.
- B. Inspect all material, equipment, and apparatus upon delivery and do not install any damaged or defected materials.

3.4 SUPPORTS AND HANGERS

- A. Prior to installation of hangers, supports, anchors, and associated work, installer shall meet at project site with 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 concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through opening at top of inserts.
- 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.

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- D. Install hangers, supports, 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 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 hangers within 12 inches of every change in piping direction, end of pipe run or concentrated load, and within 36 inches of every major piece of equipment. Hangers shall be installed on both sides of flexible connections. Where flexible connection connects directly to a piece of equipment only one hanger is required.
- F. Install hangers 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 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 in accordance with following minimum schedules (other spacings and rod sizes may be used in accordance with the SMACNA Seismic Restraint Manual using a safety factor of five):
- | | | |
|---------------------------------|----------------------------|-----------------|
| 1. Steel Pipe (Gas/Air Filled): | | |
| <u>Pipe Size</u> | <u>Max. Hanger Spacing</u> | <u>Rod Size</u> |
| 1/2" to 1 1/4" | 6 feet | 3/8" |
| 1 1/2" and larger | 10 feet | 1/2" |
| 2. Copper Pipe: | | |
| <u>Pipe Size</u> | <u>Max. Hanger Spacing</u> | <u>Rod Size</u> |
| 1/2" to 2" | 6 feet | 3/8" |
| 2 1/2" and larger | 8 feet | 1/2" |
- J. Sloping, Air Venting, and Draining:
- | | | |
|---|----------------|-------------------------------|
| 1. Slope all piping as specified and as indicated, true to line and grade, and free of traps and air pockets. Unless indicated otherwise, slope piping in the direction of flow as follows: | | |
| | <u>Service</u> | <u>Inclination</u> |
| | Domestic Water | Down |
| | Heating Water | Up |
| | Soil and Waste | Down |
| | Storm Water | Down |
| | Sanitary Vent | Up (towards roof terminal) |
| | | <u>Slope</u> |
| | | 1" per 100' |
| | | 1" per 40' |
| | | 1/4" per foot (1/8" per foot) |
| | | 1/4" per foot (1/8" per foot) |
| | | 1/4" per foot (1/8" per foot) |
2. Provide eccentric reducers in horizontal piping for all sizing changes:
3. Provide drain valves and hose adapters at all low points in piping.
4. Provide vents at all high points in water piping.
- K. 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 water piping, install shields or inserts.

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- c. Saddles: Where insulation without vapor barrier is indicated install protection saddles.

- L. 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 Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs, at intermediate points in pipe runs between expansion loops and bends.

- M. Adjusting:
 - 1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
 - 2. Support Adjustment: Provide grout under supports so as to bring 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.

3.5 ELECTRICAL REQUIREMENTS

- A. Plumbing Contractor 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 plumbing, motors and controls in accordance with the following schedule 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. Carefully coordinate with work performed under the Mechanical Division of these Specifications.

- C. Division 22 has responsibilities for electrically powered or controlled plumbing equipment, which is specified in Division 22 Specifications or scheduled on Division 22 Drawings. The specific division of responsibilities between Division 22 and 26 for furnishing or wiring this equipment is as follows:
 - 1. Division 22 Mechanical Responsibilities:
 - a. MOTORS: Furnish and install all motors necessary for plumbing equipment.
 - b. 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 plumbing controls. If the starter is factory installed on a piece of Division 22 equipment, also furnish and install the power wiring between starter and motor.
 - c. DISCONNECTS: Provide the disconnects which are part of factory wired Division 22 plumbing equipment. Factory wiring to include wiring between motor and disconnect or combination starter/disconnect.
 - d. CONTROLS: Division 22 Contractor is responsible for the following equipment in its entirety. This equipment includes but is not limited to the following:
 - 1) Control relays necessary for controlling Division 22 equipment.
 - 2) Control transformers necessary for providing power to controls for Division 22 equipment.
 - 3) Low or non-load voltage control components
 - 4) Non-life safety related valve
 - 5) Solenoid valves, EP and PE switches

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- D. Division 26 has responsibilities for electrically powered or controlled equipment which is specified in Division 22 Specifications or scheduled on Division 22 Drawings. The specific division of responsibilities between Division 22 and 26 for furnishing or wiring this equipment is as follows:
1. Division 26 Electrical Responsibilities:
 - a. MOTORS: Provide the power wiring for the motors.
 - b. MAGNETIC STARTERS: Except where magnetic starters are factory installed on Division 22 factory assembled equipment, Division 26 is to install magnetic starters furnished by Division 22 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 to the starter.
 - c. DISCONNECTS: Provide all disconnects necessary for Division 22 mechanical equipment which are not provided as part of factory wired Division 22 equipment. Provide power wiring to all disconnects. In addition provide power wiring between motor and disconnect when the disconnect is not factory installed. See also Variable Frequency Drive above for special wiring requirements.
 - d. CONTROLS: Division 26 Contractor is responsible for providing power to control panels and control circuit outlets.
 2. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
 3. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
 4. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.
 5. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
 6. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- 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.

3.6 PAINTING

- A. All painting shall be provided under this Division work, unless otherwise specified under Section 099100: Painting. Painting schemes shall comply with ANSI A13.1. Paint all exposed materials such as piping, equipment, insulation, steel, etc. Exposed gas piping inside and outside the building shall be painted with two coats of "Rust-O-Leum" Yellow. Exposed copper indirect waste piping serving food service equipment shall be painted metallic chrome.
- B. All exposed work under Division 22 shall receive either a factory finish or a field prime coat finish, except:
1. Exposed copper piping
 2. Aluminum jacketed outdoor insulated piping

BASIC MATERIALS AND METHODS - PLUMBING

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 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. Vertically spaced at each story transversed.
- C. Plumbing Equipment Identification: Locate engraved plastic laminate signs on or near each major item of plumbing 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. Pumps and similar motor-driven units
 - 4. Hot water system mixing valves and similar equipment
 - 5. Strainers, filters, treatment systems and similar equipment
- D. 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 VIBRATION AND DYNAMIC BALANCING

- A. Vibration tolerances shall be as specified by the "International Research and Development Corporation", Worthington, Ohio, measured by the displacement, peak to peak, as follows:
 - 1. Pump and Electric Motors: Below severity chart labeled "SLIGHTLY ROUGH", maximum vibration velocity of 0.157 in/sec, peak.
 - 2. Compressors: Same as pumps.
- B. Correction shall be made to all equipment which exceeds vibration tolerances specified above. Final vibration levels shall be reported as described above.

3.9 TESTING

- A. Provide all tests specified hereinafter and as otherwise required. Provide all test equipment, including test pumps, gauges, instruments, and other equipment required. Test all rotational equipment for proper direction of rotation. 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.

END OF SECTION

PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 220500 - Basic Materials and Methods, and other Sections in Division 22 specified herein.

1.2 SCOPE

- A. All work to be furnished and installed under this section shall include but not necessarily be limited to the following:
 - 1. Solids Interceptor

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 220500: Basic Materials and Methods
- B. Section 220501: Plumbing
- C. Section 224000: Plumbing Fixtures
- D. Section 222123: Plumbing Pumps

1.4 SUBMITTALS

- A. Prior to construction submit for approval all materials and equipment in accordance with Division 01. Submit manufacturer's data, colors, installation instructions, and maintenance and operating instructions for all components of this section including, but not limited to, the following:
 - 1. Solids Interceptor
- B. Electrical Work: Refer to Division 22, Section 220500 for requirements.
- C. Shop Drawings: Submit rough-in drawings. Detail dimensions, rough-in requirements, required clearances, and methods of assembly of components and anchorages.
- D. Wiring Diagrams: Submit manufacturer's electrical requirements for electrical power supply wiring. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation. Differentiate between portions of wiring that are factory installed and portions that are to be field installed.
- E. 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.
- F. Certificates: Submit appropriate Certificates of Shop Inspection and Data Report as required by provisions of ASME Boiler and Pressure Vessel Code.
- G. Start-up: Provide written report on start-up in accordance with Section 220500.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver units to the site in containers with manufacturer's stamp or label affixed.
- B. Store and protect products against dirt, water, chemical, and mechanical damage. Do not install damaged products - remove from project site.

1.6 WARRANTY

- A. Provide one year (12 months) warranty. The warranty shall include parts, labor, travel costs, and living expenses to repair or replace products or systems.

PLUMBING EQUIPMENT

PART 2 - PRODUCTS

2.1 SOLIDS INTERCEPTOR, SI-1:

- A. Interceptor: J.R.Smith, 8878, 75gpm, 4" outlet, 30.5" 10 " x 37" deep, steel with non-skid bolted top. Provide extension as needed
- B. Approved manufacturers: J.R. SMITH, Watts, or equal.

2.2 SOLIDS INTERCEPTOR, SI-2:

- A. Interceptor: J.R.Smith, 8878, 75gpm, 4" outlet, 30.5" 10 " x 37" deep, steel with non-skid bolted top. Provide extension as needed
- B. Approved manufacturers: J.R. SMITH, Watts, 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.
- 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 so controls and devices needing service and maintenance have adequate access.
- D. Connect water piping to units with shutoff valves and unions as indicated.
- E. 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 OPERATION MANUALS, START-UP SERVICE, WARRANTIES, ACCEPTANCE AND GUARANTEES

- A. General: Refer to Section 220500 for details.

END OF SECTION

PLUMBING

PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

- A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, and Section 220500 - Basic Materials and Methods, and other Sections in Division 22 specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 220500: Basic Materials and Methods
- B. Section 230700: Mechanical Insulation
- C. Section 222113: Plumbing Piping, Valves and Specialties
- D. Section 224000: Plumbing Fixtures
- E. Section 221123: Plumbing Equipment
- F. Section 222123: Pumps and specialties

1.3 SCOPE

- A. All work includes removing and modifying existing and providing new plumbing. Systems as specified under this section shall include but not necessarily be limited to the following:
 - 1. Connection to existing building services and civil work.
 - 2. Removal of fixtures and piping as indicated on drawings. No pipe to be abandoned in place except piping below grade.
 - 3. Connection of all waste, vent, and water piping to all plumbing fixtures, drinking fountains, sinks, drains and mechanical equipment.
 - 4. Provide for future expansion as indicated.
 - 5. Connect to new mechanical equipment including chiller, cooling tower expansion tanks, domestic hot water heaters, and boilers, etc.
 - 6. Connect hot and/or cold water to hose bibbs and wall hydrants. Provide individual shut-off valves at each location.
 - 7. Provide traps on all floor drains with trap primer where specified. Pipe to trap shall be ½" minimum.
 - 8. Provide domestic hot water recirculation system. Each branch line to be set at one (1) gpm. Provide individual shut-off valve, check valve and ball valve with memory stop at each location.
 - 9. Provide floor drainage in core toilets, mechanical rooms and equipment rooms.
 - 10. Provide connections for all area drains, catch basins, downspouts, roof drains to storm sewer system.
 - 11. Gas service and meter assembly for Craft Center equipment shall be by local gas purveyor.
 - 12. Temporary Water Service: As directed by the General Contractor, the plumber shall provide a temporary metered water service and temporary water risers with four (2) hose bibbs installed at each level as the building proceeds upwards to the roof.

1.4 SUBMITTALS

- A. Prior to construction submit for approval all materials and equipment in accordance with Division 01. Submit manufacturer's data, installation instructions, and maintenance and operating instructions for all components of this section including, but not limited to, the following:
 - 1. Plumbing specialties
 - 2. Trap primers
 - 3. Cleanouts
 - 4. Drains

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5. Roof flashing
6. Wall hydrants and hose bibbs
7. Mixing valves

- B. Contractor shall submit a letter that all products used in the plumbing installed are certified for use in the State of Oregon.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the site in containers with manufacturer's stamp or label affixed.
- B. Store and protect products against dirt, water, chemical, and mechanical damage. Do not install damaged products - remove from project site.

1.6 WARRANTY

- A. Provide one-year (12 months) warranty. The warranty shall include parts, labor, travel costs, and living expenses incurred by the manufacturer to provide factory authorized service.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment under this Division of the Specifications shall be new, of best grade and as listed in printed catalogs of the manufacturer.
- B. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.
- C. All items shall be furnished Vandal Proofed. One type of vandal proof screw is to be used throughout this facility. Coordinate with general contractor for type.
- D. The following products to be included as part of this work but specified under Section 220500 Basic Materials and Methods and Section 222113 Plumbing Piping, Valves and Specialties:
1. Piping
 2. Valves
 3. Hangers and supports
 4. Escutcheon plates, flashings, and sleeves
 5. Identification markers and signs
 6. Anchors, alignment guides and Seismic Zone 3 requirements
 7. Excavation and backfill
 8. Pressure and temperature gauges
 9. Access Panels
- E. Plumbing Fixtures: Refer to Section 224000.

2.2 VALVES: DOMESTIC WATER AND NATURAL GAS (See Section 222113)

2.3 CLEANOUTS

- A. Cleanout Plugs: Bronze, taper thread countersunk head.
- B. Floor Cleanouts: Service weight cast-iron body and frame, flange with flashing clamp, adjustable cast-iron collar, caulk inside, Ty-seal or No-hub joints, neoprene plug gasket seal.
1. Carpeted Areas: Zurn ZN-1400-KC-VP-BP-CM or J. R. Smith 4028 C - F - C - Y - U
 2. Tiled Areas: Zurn ZN-1400-X-KC-VP-BP or J.R. Smith 4148 - F - C - U
 3. Unfinished Areas: Zurn ZN-1400-HD-KC-VP-BP or J.R. Smith 4108 C - F - C - U
 4. Yard Areas: Zurn Z 1474-IN-VP or J.R. Smith 4258 - C - U
- C. Cleanout Tee: Cast iron cleanout tee with countersunk brass plug, neoprene plug gasket seal and smooth stainless steel cover.
1. Manufacturer: Zurn Z-1446-BP or J. R. Smith 4532 S (Y)

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2.4 ROOF FLASHING

- A. Flashing: Unless indicated otherwise on the drawings flashings for pipes through the roof shall be galvanized sheet metal, 24 gauge minimum with seams and joints lapped and soldered watertight. Coordinate with Architectural Sections for flashings and roofing.
- B. Vent Pipes: Provide caulk type, vandalproof hood with Allen head vandal proof screws for all vent pipes through roof or preformed vinyl/galvanized steel assembly.

2.5 ANTI-CONTAMINATION WALL HYDRANTS AND HOSE BIBBS

- A. Anti-Contamination Wall Hydrant, WH-1: Exterior, box-type, freezeproof, cast-bronze construction, chrome plated finish, loose key, bronze casing, length to suit wall thickness, vacuum breaker/backflow preventor, 3/4" inlet, 3/4" threaded hose end, solder joint.
 - 1. Manufacturer: Smith 5509QT, Zurn or Watts
- B. Anti-contamination Hose Bibbs, HB-1: Bronze body construction, polished chrome plated finish, renewable composition disc, wheel handle, 1/2" NPT inlet, 3/4" threaded hose end, vacuum breaker/backflow preventer, solder joint, ANSI 1011.
 - 1. Manufacturer: Woodford series 24P or Zurn Z1341.

2.6 DRAINS

- A. General: Provide drains of type and size as indicated on drawings, including features, as specified herein.
 - 1. Acceptable Manufacturers: J.R. Smith, Zurn, Wade, Sioux Chief, Josam and Watts.
- B. Floor Drain, FD-1 - Finished Areas: Enamel coated cast iron body with flange, integral reversible clamping collar, seepage openings, adjustable round satin nickel bronze strainer, sediment bucket, bottom outlet, caulk inside or Ty-Seal or no-hub joint. Provide trap primer.
 - 1. Manufacturer: Zurn ZN-415-5B-Y-P or J.R. Smith 2010 - A - C(Y).
- C. Floor Drain, FD-2 - Mechanical Rooms: Enamel coated cast iron body with flange, clamping collar, seepage openings, 8-1/2" diameter adjustable cast iron bar strainer, sediment bucket, bottom outlet, caulk inside or Ty-Seal or no-hub joint. Provide trap primer.
 - 1. Manufacturer: Zurn Z-520-Y-P or J.R. Smith 2350 C(Y).
- D. Floor Sink, FS-1: Enamel coated cast iron body with seepage flange, acid resistant interior surfaces, aluminum dome strainer, 12" x 12" x 6", half grate, bottom outlet, caulk inside, Ty-Seal or no-hub joint. Provide trap primer.
 - 1. Manufacturer: Commercial Enameling series 906-1 or Zurn-ZFD-2375-K-H-Y.
- E. Downspout Fitting, DSN-1: Fabricated stainless steel downspout cover with hinged perforated cover.
 - 1. Manufacturer: J.R. Smith 1775.
- F. Downspout connector, DSC-1: Cast iron construction, plain end outlet.
 - 1. Manufacturer: Neenah Series, R4927 or Zurn Z-192.

2.7 TRAP PRIMER

- A. Cast bronze construction, vacuum breaker, 1/2" sweat solder connection. Install in accessible location or provide access panel.
 - 1. Manufacturer: PPP Oregon #1 or E&S, for use for up to 8 drains using PPP trap primer distribution units.
 - 2. Option: Sloan F-72-A1 used in conjunction with water closet flush valve.
- B. For Multiple Units or Kitchen Areas: PPP Prime Time electronic trap primer Series PT. Coordinate 120 V, electrical service with Division 26.

PLUMBING

2.8 MIXING VALVES ASSEMBLY

- A. Mixing Valve: 300 psi, Brass construction, thermostatic controller with check stops. Refer to drawings for schedule of each valve. Use high/low type for uses over 20 gpm.
- B. Manufacturer: Holby, Lawler, Symmons or Leonard.

2.9 EMERGENCY SHOWERS AND EYEWASHES:

- A. Emergency Eye Wash, EW-1:
 - 1. Counter mounted right hand side of sink, mounting bracket and dust covers.
 - 2. Manufacturer: Haws 7611.
 - 3. Mixing valve: Lawler 911 EF or Guardian.

2.10 BUILDING DOMESTIC WATER METERING, HOT & COLD; REQUIRED:

- A. All measurements are to be remote monitored via the DDC system.
- B. Usage/flow is to be measured in K-gallons, calculated at the remote readout, and then pulsed to the DDC system.
- C. Flow meters:
 - 1. Pulse output ONLY via the DDC system.
 - 2. Approved manufacturers: Foxboro; Bailey; Cadillac.

PART 3 - EXECUTION

3.1 GENERAL

- A. This system to be installed by an experienced firm regularly engaged in the installation of plumbing systems as specified by the requirements of the Specifications.
- B. Install all items specified in this section of the Specification under the full purview of local and state governing agencies.
- C. Refer to Section 220500: General Plumbing Requirements for installation of piping, valves and other requirements.

3.2 PERFORMANCE OF WORK

- A. Examine areas, physical conditions and phasing requirements under which materials are to be installed. Layout the system to suit the different types of construction and equipment as indicated on the drawings.
- B. Work shall start immediately after authorization has been given to proceed so that the overall progress of the construction is not delayed. No foundry items to be installed until submittals have been approved.
- C. Coordinate with other trades as necessary to properly interface components of the plumbing system.
- D. Follow manufacturer's 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. The omission from the drawings or Specifications of any details of construction, installation, materials, or essential specialties shall not relieve the Contractor from furnishing the same in place for a complete system.

PLUMBING

3.3 PIPING INSTALLATION

- A. The word “piping” shall mean all pipes, fittings, nipples, valves and all accessories connected thereto.
- B. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts flues, conduits and work of other trades and close to ceiling or other construction as practical, free of unnecessary traps or bends.
- C. Run horizontal sanitary drainage at uniform pitch of not less than 1/8" per foot, unless otherwise indicated. Pitch horizontal vent piping downward from stack to fixtures.
- D. Run drainage piping as straight as possible with long radius turns. Offsets shall be made at an angle of 45° or less.
- E. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.
- F. Piping connections to all equipment shall be made up with unions.
- G. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.
- H. Use reducers or increasers. Use no bushings.
- I. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageway.
- J. Vent pipes to terminate at least 6" above the roof. Provide vandal proof hood assembly.
- K. Cover, cap or otherwise protect open ends of all piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect water supply piping as specified.
- L. Exposed connections to equipment shall be installed with special care, showing no tool marks or threads at fittings and piping. No bowed or bend piping to be permitted.
- M. All ferrous to non-ferrous connections shall be made by means of dielectric fittings. Submit shop drawings for approval.
- N. Use extra heavy pipe for nipples, where unthreaded portion is less than 1½". Use no close nipples. Use only shoulder nipples.
- O. All piping shall be inspected for defects and flaws prior to installation. Remove any damaged piping from job site. Piping shall be thoroughly cleaned of dirt, debris or rust.
- P. Cleanouts to be provided at each change in direction greater than 135° or 100' maximum intervals on underground piping.
- Q. Revise existing cleanout elevations to be flush with new floor elevation.
- R. Cleanouts to be same size as pipe except cleanout plugs larger than 4" shall not be required.
- S. Cleanouts on concealed piping to be extended through and terminate flush with the finished wall or floor. Cover plates to be provided on all cleanout plugs in finished areas.
- T. The bodies of cleanout ferrules to conform in thickness to that required for pipe and fittings of the same metal.
- U. Route piping on roof on manufactured polyethylene pipe pier supports “Pipe Pier” by Erico.

PLUMBING

3.4 TESTING AND DISINFECTING - PLUMBING SYSTEMS

- A. General: The Contractor to perform all field tests and provide all labor, equipment, and incidentals required for the tests. Owner to witness all field tests and conduct all field inspections. The Contractor to give the Owner ample notice of the dates and times scheduled for tests. Any deficiencies to be completely retested at no additional cost.
1. Inspection: Inspection to continue during installation and testing. Perform a final inspection of the equipment prior to installation to determine conformity to the type, class, grade, size, capacity, and other characteristics specified herein or indicated. Correct or replace all rejected equipment prior to installation.
 2. Water Distribution Piping Test: Before fixtures are set, subject the entire hot and cold piping system to a hydrostatic pressure test of 150 pounds per square inch with water for not less than 8 hours in order to permit inspection of all joints with no evidence of leakage. Where a portion of the water distribution piping is to be concealed before completion, test this portion separately as specified for the entire system.
 3. Sanitary, Waste, Storm, Rainwater, and Vent Piping Test: Before the installation of any fixtures or drains, cap the ends of the system and fill all lines with water to the roof level and allow to stand for at least 30 minutes without leakage. Make tests within building with piping exposed. If the system is tested in sections, tightly lug each opening, except the highest opening of the section under test, and fill each section with water and test with at least a 10' head of water.
 4. Sanitary Drainage Vent, Storm, Rainwater and Fixture System Final Test: Give sanitary, drainage vent, and fixture systems an in-service test after complete installation. After all fixtures are installed, test the entire vent and sewer system and prove gas and water tight. Final test shall be with air. Before proceeding with test, fill all traps with water. Close all stacks and line openings during test, for a minimum period of 24 hours. If test reveals leakage of air at any point, repair and retest the system.
 5. Disinfection of Water Distribution System: After pressure tests have been made thoroughly flush the entire domestic water distribution system with water until all entrained dirt and mud have been removed, and sterilize by chlorinating material. The chlorinating material shall be liquid chlorine. The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the system or part thereof in an approved manner. Retain the treated water in the pipe for 24 hours, or, fill the system or part thereof with a water-chlorine solution containing at least 200 parts per million of chlorine and allow to stand for three hours. Open and close all valves in the system being disinfected three times during the contact period. Then flush the system with clean potable water until the residual chlorine is reduced to less than 1.0 ppm. During the flushing period open and close all valves and faucets three times. From at least three divergent points in the system, take samples of water in properly sterilized containers for bacterial examination. Repeat the disinfecting until tests indicate that satisfactory bacteriological results have been obtained.
 - a. Taking of samples shall be witnessed by Architect or Owner's representative. Samples are to be taken and tested by an independent analytical testing laboratory. Written reports shall be supplied to Architect for approval.

3.5 OPERATING TESTING AND CERTIFICATION - PLUMBING SYSTEMS

- A. Upon completion and disinfection, and prior to acceptance of the installation, the Contractor to subject the plumbing system to operating tests to demonstrate satisfactory, functional, and operating efficiency. Such operating tests to include the following information in a report with conclusions as to the adequacy of the system.
1. Time, date, and duration of tests
 2. Water pressures at most remote location
 3. Operation of all valves and hydrants
 4. Operation of all floor drains by flooding with water
 5. Quality of domestic water

PLUMBING

6. Read all indicating instruments at half-hour intervals unless otherwise directed. Supply four copies of the test report to the Owner

3.6 CLEANING EQUIPMENT AND MATERIALS

- A. In addition to the requirements of Section 220500, provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care to be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors, and similar equipment.
- B. All piping, finished surfaces, and equipment to have all grease, adhesive labels, and foreign materials removed.
- C. All piping to be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves, and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation for ten days.
- D. When connections are to be made to existing systems, the Contractor is to do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.

3.7 OPERATION MANUALS, START-UP SERVICE, WARRANTIES, ACCEPTANCE AND GUARANTEES

- A. General: Refer to Section 220500 for details.

END OF SECTION



SUBSTITUTION REQUEST (After the Bidding/Negotiating Stage)

Project: University of Oregon EMU Craft Center
Substitution Request Number:
From: LDC, Inc
Date: 1/2/2014
A/E Project Number:
Contract For:

Specification Title: Fluid Applied Waterproofing Description: Tremco 250GC modified polyurethane
Section: 071400 Page: 1 Article/Paragraph: 2.01 A

Proposed Substitution: Bentonite sheet waterproofing
Manufacturer: Tremco Address: Beechwood OH 44122 Phone: 866-209-2404
Trade Name: Paraseal Model No.:
Installer: LDC, Inc Address: Springfield, OR 97477 Phone: 541-868-1983

History: [] New product [] 1-4 years old [] 5-10 years old [x] More than 10 years old
Differences between proposed substitution and specified product: Mechanically attached bentonite sheet waterproofing versus cold fluid applied

[] Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: Compatibility with existing waterproofing is a concern with fluid applied systems.

Similar Installation: East Tunnel Steam & Chilled Water Upgrades

Project: Architect:
Address: Owner: U of O
Date Installed: 2010

Proposed substitution affects other parts of Work: [x] No [] Yes; explain

Savings to Owner for accepting substitution: (\$).

Proposed substitution changes Contract Time: [] No [] Yes [Add] [Deduct] days.

Supporting Data Attached: [] Drawings [] Product Data [] Samples [] Tests [] Reports []

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Stage - Continued)

The 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 have no adverse effect on other trades and will not affect or delay 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 A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: Curtis Rochambeau

Signed by: 

Firm: LDC, Inc.

Address: 1863 Pioneer Parkway E #305
Springfield, OR 97477

Telephone: 541-868-1983

Attachments: _____

A/E's REVIEW AND ACTION

- Substitution approved – Make submittals in accordance with Specifications Section 01 60 00 Product Requirements.
- Substitution approved as noted – Make submittals in accordance with Specification Section 01 60 00 Product Requirements.
- Substitution rejected – Use specified materials.
- Substitution Request received too late – Use specified materials.

Signed by: Jon DeLeonardo

Date: 1/10/14

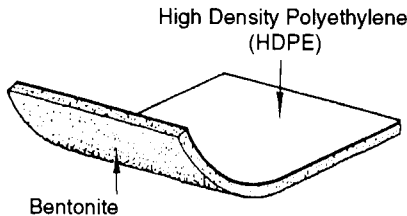
Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

Paraseal

HDPE/Bentonite Sheet Membrane Dual Waterproofing System

Product Description

Paraseal is a self-sealing sheet waterproofing membrane manufactured to controlled thicknesses of 150 mils to 200 mils of tough, high density polyethylene (HDPE) and expandable granular Bentonite.



The Bentonite, capable of expanding up to 8 times its thickness, is laminated at a rate of up to one pound per square foot to the impermeable HDPE sheet forming a superior Dual Waterproofing System for application to vertical and horizontal surfaces.

Basic Uses

Paraseal is a waterproofing membrane designed for use on structures below grade or between slab. It is excellent for use on poured and block foundation walls, split slab parking and plaza decks. It has outstanding performance when used under conditions of high water head and installed prior to the concrete pour such as retaining walls, elevator pits, etc.

Packaging

4' x 24' (1.2 m x 7.3 m) standard rolls.

Also available by SPECIAL ORDER:

- Larger size rolls may be customized for a nominal cutting charge.

INSTALLATION

For complete details, refer to Tremco's published Architectural Guidelines or the Tremco website www.tremcosealants.com.

Preparatory Work

Examine all surfaces prior to starting application. Dust may be present; however all debris must be removed. Standing water and sharp protrusions over 1/4" (6.4 mm) must be removed. Installation may proceed on uncured, damp or frozen surfaces. Paraseal is compatible with all currently used release agents.

Vertical Walls

Paraseal rolls are installed vertically or horizontally with the HDPE side facing the installer, by nailing across the top, lapping edges 1-1/2" (3.8 cm) and nailing vertical seam every 2' (0.6 m) with masonry nails.

Permanent Seam Tape or box staple all seams. Pour 1-1/2" (3.8 cm) cove of TREMproof 201/60T, 250GC-T, Paragranular or Paramastic at intersection of wall and footing prior to Paraseal installation. Compact fill to minimum 85% modified proctor.

Under Floor Slab (minimum thickness 3") (7.6 cm):

Refer to Paraseal LG. Contact your local Tremco representative.

Between Slab Paraseal can be used or refer to Deckseal data sheet and installation details.

Lagging Refer to Paraseal LG data sheet and Lagging Installation details.

Protection

The Paraseal dual waterproofing system has a PUNCTURE RESISTANCE of 169 lbs. (76.6 kg) and does not require an additional protection course for most applications. For special applications, contact your Tremco Representative for details.

Storage

Protect from moisture. Store on skid or pallet, cover with polyethylene or tarp.

Availability

Immediately available from distributors worldwide.

Limitations

If groundwater is brackish, SALTWATER Grade Paraseal may be required. Paraseal products require compaction/confinement to be effective. A minimum 24 psf confinement is required. In lagging situations, Paraseal LG (Lagging-Grade) is required. In situations where methane or continual submersion may occur, Paraseal W/GM (Waterproofing/Gas-Membrane) is required. Contact your local representative or technical services for more information.

Warranty

Tremco warrants its Paraseal Membranes to be free of defects in materials, but makes no warranty as to appearance or color. Since methods of application and on-site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Paraseal Membranes, sole obligation shall be, at its option, to replace, or to refund the purchase price of the quantity of Paraseal Membrane proved to be defective and Tremco shall not be liable for any loss or damage including incidental or consequential damages arising from the use of Paraseal Membranes.

TYPICAL PHYSICAL PROPERTIES

Physical Property	Test Method	Value
Color: Gray/Black		
Tensile Strength: Membrane (psi)	ASTM D412	4,000 psi (27.6 MPa)
Resistance to micro organisms (bacteria, fungi, mold, yeast)		Unaffected
% Elongation-ultimate failure of membrane:	D412 Type 4 Dumbell	700%
Puncture Resistance	ASTM E154-88	169 lbs. (76.6 kg)
Resistance to hydrostatic head [FT. (m) of water]:	ASTM D751 Method Footnote #2	150 ft. (45.6 m)
Resistance to water migration under membrane:	Footnote #1	150 ft. (45.6 m)/Head zero leakage
Permeance	ASTM E96	0.031 Grains/hr*ft*in.Hg. or 2.7×10^{-13} cm/sec or 1.7 ng/Pa.s.m ²
Installation Temperatures		-25°F to 130°F (-31.7°C to 54.4°C)

Non-toxic: Do not ingest

Freeze/thaw cycles: No effect before or after installation.

Non-staining: No known incompatibilities

Resistance to chemicals & gases: Extremely high resistance - contact manufacturer for specific information.

Life Expectancy: both high density polyethylene and bentonite have life expectancy measurable in thousands-of-years.

FOOTNOTES FOR TECHNICAL DATA:

1. A 1" (2.5 cm) diameter hole was cut in the middle of a 3-1/2" (8.9 cm) diameter sample of Paraseal. Sample clamped in 3" (7.6 cm) diameter permeameter, 150' (45.6 m) water head applied.
2. Membrane applied to porous stone and placed in permeameter. Pressure increased to equivalent of 150' (45.6 m) water head.

*Above based on 20 mil HDPE/Bentonite System



Paraseal® Membranes

Backfilled Wall

1. Purpose

1.1 The purpose of this document is to establish uniform procedures for installing Paraseal Membranes on backfilled walls.

1.2 The techniques involved may require modifications to adjust to job site conditions. Tremco recognizes that site specific conditions, weather patterns, contractor preferences and membrane detailing may require deviation or alteration from these prescribed installation procedures. When such circumstances exist on a project, Tremco recommends that the local Tremco Sales Representative or Technical Services be contacted for assistance and approval as required.

2. Scope

2.1 This document will provide the necessary instructions for the application of Paraseal membranes to qualify for the manufacturer's warranty.

3. Conditions

3.1 Remove all sharp protrusions as well as all dirt, mud, debris, ice or any other materials which would interfere with Paraseal's performance.

3.2 In the case of masonry walls, strike flush all joints scheduled to receive Paraseal.

3.3 Joint surface where Superstop is to be installed should be troweled smooth. Remove all debris and sweep the surface prior to installation.

3.4 Parge coating is not required unless the substrate is extremely rough and irregular. Contact Tremco for recommendations on specific projects.

3.5 Paraseal may be installed over uncured or damp surfaces.

3.6 All honeycombs or voids and irregularities which exceed 1/4" (6.4 mm) in depth shall be repaired with TREMproof 250GC-T, Paramastic or concrete mortar.

3.7 Contact Tremco whenever conditions of acid, alkali, salt brine or gas vapor exist. If ground water is brackish, please contact your local Tremco Sales Representative four weeks prior to a pending application, and provide a water or soil sample for testing purposes in order to determine the correct bentonite formula for your project's application.

3.8 If submerged conditions exist, refer to Paraseal Membranes Application Instructions for Backfilled Walls in Submerged Conditions and contact Tremco.

4. Materials

4.1 Recommended materials and their use are as follows.

Paraseal

Paraseal is a sheet waterproofing membrane consisting of 15 mils of HDPE and expandable, granular bentonite. The bentonite is laminated to the HDPE, creating a dual waterproofing system.

Paraseal LG

Paraseal LG is a sheet waterproofing membrane consisting of 20 mils of HDPE, expandable, granular bentonite and a protective layer of spun polypropylene. The bentonite is laminated to the HDPE, creating a dual waterproofing system.

Paraseal GM

Paraseal GM is a sheet waterproofing and gas-mitigating membrane consisting of 20 mils of HDPE and expandable, granular bentonite. The HDPE extends beyond the bentonite on the perimeter edges to create a clean surface for Para JT Tape and Parastick N Dry Tape installation.

Paraseal GM/LG-20 mil

Paraseal GM/LG-20 mil is a sheet waterproofing membrane consisting of 20 mils of HDPE, expandable, chemically-modified, granular bentonite and a protective layer of spun polypropylene. The bentonite is laminated to the HDPE, creating a dual waterproofing system. The HDPE extends beyond the bentonite on the perimeter edges to create a clean surface for Para JT Tape installation.

Superstop

Superstop is a composite waterstop containing expandable, granular bentonite. One side contains a pressure sensitive adhesive. Superstop also is available in saltwater grade.

Paramastic

Paramastic is a mastic containing expandable bentonite that will react in the presence of water when properly applied.

Paraterm Bar

Paraterm Bar is an aluminum alloy termination bar specially profiled to exhibit excellent holding power. When fastened through pre-drilled holes, Paraterm Bar provides tight, straight and extremely long lived terminations, caulk troughs and drip edges.

Para JT Tape

Para JT Tape is an adhesive joint tape compound formulated with cross-linked polymeric elastomers. It is used for sealing seams and around penetrations.

Permanent Seam Tape

Permanent Seam Tape is a rubberized asphalt membrane laminated to a polyethylene reinforcing film.

Paraprimer

Paraprimer is an adhesive primer for preparing surfaces to receive Paraseal accessories.

Paragranular

Paragranular is granular bentonite used to form a cove at transitions as well as to fill voids and irregularities.

Parastick N Dry

Parastick N Dry is a laminate of bentonite applied to mesh with a pressure sensitive adhesive on one side.

TREMproof 250GC-T

TREMproof 250GC-T is an aliphatic, rapid curing, high-solids, VOC-compliant modified polyurethane waterproofing membrane. It can be applied to damp and green concrete.

TREMDrain Series

The TREMDrain Series is a family of drainage mats with a variety of compression strengths, core sizes and fabric options available.

5. Detail Work

5.1 Install a continuous 2" (5 cm) cant of Paragranular where wall meets footing and at all other vertical to horizontal junctures.

5.2 Install a continuous 1" (2.5 cm) vertical cant of TREMproof 250GC-T or Paramastic at all vertical inside corners.

5.3 For single pipe penetrations, refer to Tremco standard details. For multiple pipe penetrations or link seal penetrations, contact Tremco for details.

5.4 Expansion joints shall be treated with closed cell backer rod and sealed with an approved Tremco sealant. Install a strip of Paraseal lapping 12" (30 cm) on either side of the joint and fasten on one side only using nails and 1" (2.5 cm) washers every 24" (60 cm) o.c. Field sheet will be installed over the detail strip. Do not fasten field sheet through detail strip.

5.5 Following good concrete industry practices, a waterstop should be used at all Construction Cold Joints. Install Superstop 2" (5 cm) from outer face of wall. It is recommended to apply Paraprimer to clean surface prior to adhering Superstop on vertical surfaces. Primer is not required for horizontal surfaces. Remove release paper to expose adhesive. Butt ends together and fasten with nails and 1" (2.5 cm) washer every 12" (30 cm) o.c.

6. Membrane Application

6.1 Paraseal shall be installed against backfilled walls with the granular bentonite side against the substrate and the black HDPE side facing the installer.

6.2 Paraseal may be installed with 4" (10.2 cm) minimum overlapped seams running either vertically or horizontally or a combination with equal performance. Seams shall be shingle lapped so that upper sheet is over lower sheet when seams run horizontally.

6.3 Install Paraseal with bentonite side against substrate and fasten with nails and 1" (2.5 cm) washers every 36" – 48" (90 – 120 cm) o.c. Taping all vertical seams with Permanent Seam Tape is required. Install Paraterm Termination bar and nail every 8" (20 cm) o.c. Termination of Paraseal membrane occurs at or immediately below the finished grade. Complete installation at penetrations as required per Tremco's published details referenced in section 5.3 above. Refer to Tremco standard details for treatment of seams.

6.4 CLOSE CLEARANCE AT MASONRY WALL. Place first row of block on footing. Install a continuous 12" (30 cm) strip of Paraseal with bentonite side against wall. Adhere to block with Permanent Tape and Paraprimer. Construct remainder of wall striking all exterior joints flush. Do not exceed 8' (2.5 m) lifts. Lower Paraseal membrane down to overlap 12" (30 cm) strip by 4" (10 cm) and temporarily tack top edges in place. Overlap vertical seams a minimum of 6" (15 cm). Tape vertical seams from top of Paraseal down to at least 18" (46 cm) below finish-grade with Permanent Tape. Install Paraterm Termination Bar and nail every 8" (20 cm) O.C. Finish grade should occur either at or below Paraseal Waterproofing. Lower 6 mil polyethylene sheeting over Paraseal prior to backfilling. Shingle lap polyethylene seams so that backfilling direction keeps seam closed. Please contact Tremco prior to installation.

7. Backfilling

7.1 Paraseal membranes seldom require additional protection unless the backfill contains substantial amounts of either lava rock, basalt or any other coarse or highly abrasive materials. Contact Tremco Sales Representative or Technical Services for recommendations.

7.2 Following good industry practices, a TREMDrain Series drainage mat should be installed prior to backfilling.

7.3 Even though the HDPE side of Paraseal protects it from weather and subsequent trades, it is advisable to place and compact as soon as possible after installation.

7.4 Compact backfill to at least 85% Modified Proctor Density.

7.5 Paraseal, Paraseal LG and Paraseal GM/LG-20 mil require 24 psf of compression/compaction.



Sealant/Weatherproofing Division
Tremco® Mameco/VULKEM® Paramount™
Technical Services

February 22, 2008

We certify that **PARASEAL** waterproofing sheet membrane system as manufactured by Tremco Inc. Beachwood, OH, meets the following physical properties.

HDPE Composite Membrane with Bentonite Clay

- A. Properties for the composite membrane – 15-20 mil thick high density polyethylene laminated to one pound per square foot layer of fine mesh grade bentonite, (sodium montmorillonite).

<u>PHYSICAL PROPERTIES:</u>	<u>VALUE</u>	<u>TEST METHOD</u>
Color: Gray/Black		
Tensile Strength	4000 psi	ASTM D412
Elongation	700%	ASTM D638 Type4
Pliability: 180° bend over 1" mandrel @ -25°F (-31.7°C)	10,000	ASTM D146
Resistance to micro organisms (bacteria, fungi, mold, yeast)	Unaffected	
Puncture Resistance	169 lbs.	ASTM E154-88
Resistance to hydrostatic head [FT. (m) of water]	150 Ft.	ASTM D751
Resistance to water migration under membrane	150 Ft./head	zero leakage

Water Migration at or through joint Permeance	0.031 Grains/hr*ft*ft*in.Hg.	Instant Seal/no penetration ASTM E96-92
Dimension Stability, percentage in each direction @248°F	+/- 1.0%, 1 hour	ASTM D1204
Maximum Specific Optical Density flaming mode	105 DM	ASTM E662
Maximum Specific Optical Density non-flaming mode	400 DM	ASTM E662
B. Properties of High Swelling Bentonite		
1. Percent Montmorillonite		80 - 90 percent
Silicon Dioxide (SiO ₂)		55 - 64 percent
Aluminum Oxide (Al ₂ O ₂)		16 - 22 percent
Ferric Oxide (Fe ₂ O ₂)		3- 6 percent
Sodium Oxide (Na ₂ O)		1- 3 percent
Magnesia (MgO)		2- 4 percent
Lime (CaO)		1- 3 percent
2. Water Content		5 - 10 percent
3. Bulk Density		77 percent
4. Dry Particle Size		20 - 50 mesh
5. Free Swell		20 - 28 ml/2gm

Sincerely,

Alexander Murph
Technical Services Representative

cc: File/Circ.



SUBSTITUTION REQUEST FORM

TO: SERA Architects

FROM: SCAFCO Steel Stud Mfg. Co.

338 NW Fifth Ave

6200 E. Main Ave.

Portland, OR, 97209

Spokane, WA, 99211

Ph: 503-445-7372

Fx: 503-445-7395

PROJECT NAME: U of O -ERB Memorial Union Craft Center

BID DATE: 1-14-14

<u>Section</u>	<u>Paragraph</u>	<u>Specified Item(s)</u>
<u>05400</u>	<u>Part 2, 2.01</u>	<u>Manufacturer of Cold-Formed Metal</u>

Proposed Substitution

SCAFCO meets or exceeds the specifications listed in the above section. Please add SCAFCO Steel Stud MFG CO.

ATTACH COMPLETE TECHNICAL DATA, INCLUDING LABORATORY TESTS, IF APPLICABLE.

Include complete information for changes to drawings and/or specifications which proposed substitution will require for its proper installation.

FILL IN BLANKS BELOW:

- A. Does the substitution affect dimensions shown on drawings? No
- B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes
- C. What affect does the substitution have on other trades? None
- D. Differences between proposed substitution and specified item? None
- E. Manufacturer's guarantees of the proposed and specified items are?
 Same Different (Explain) _____

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item

SUBMITTED BY:

Signature

1/2/14

Date

David Schmitz

DavidSchmitz@SCAFCO.com

Name (please print)

FOR USE BY ARCHITECT:

- Accepted Accepted as Noted
- Not Accepted Received Too Late

Jon DeLeonardo

1/10/2014

By

Date

Remarks

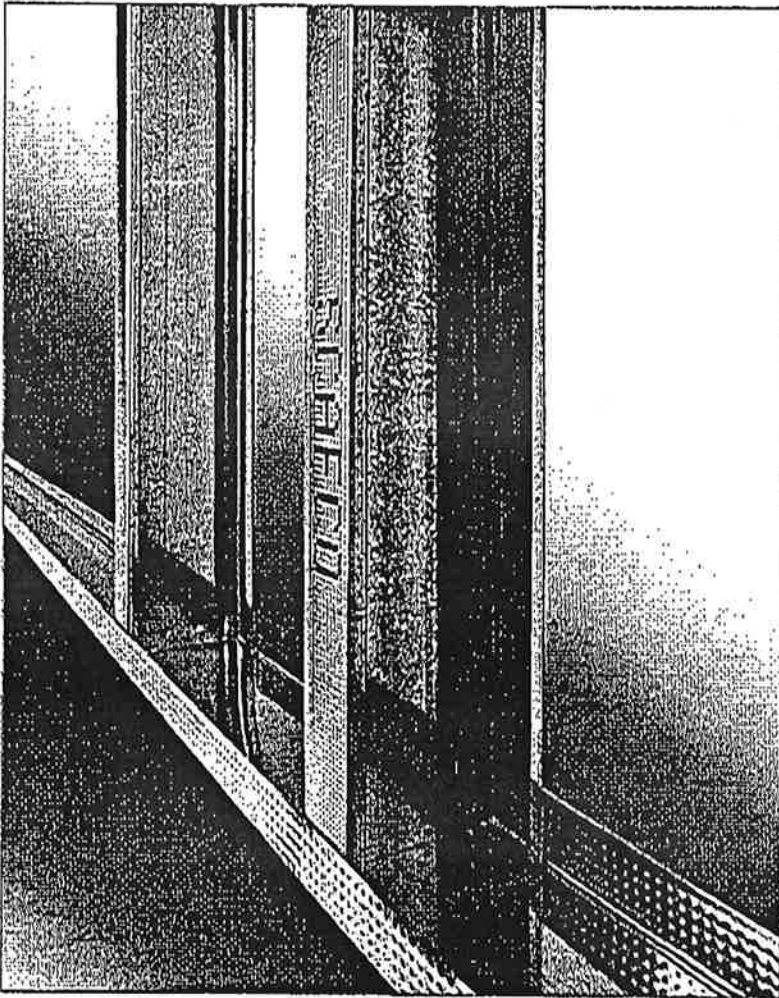


P.O. Box 11215
 Spokane, WA 99211-1215
 ☎: 503-371-8033
 📠: 503-363-6671
www.SCAFCO.com
www.PricellessSteel.com

Request a Product Manual: Yes, I would like a Product Manual Sent to the Above Address

Supreme Framing System

The Benefits of Supreme Framing System™ Speak for Themselves



SUPREME FRAMING SYSTEM®

What is the Supreme Framing System™?

Supreme Framing System™ stud and track is a design that uses thinner steel and superior 57 ksi yield strength when compared to traditional material. Supreme Framing System™ is available nationally through multiple independent steel stud manufacturers.

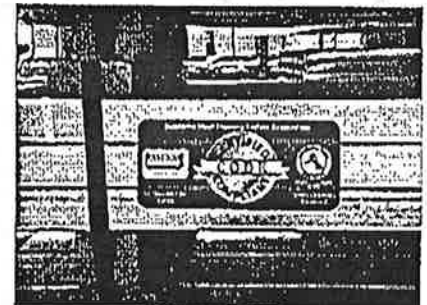
- Complies with 2009 and 2012 IBC
- Multiple UL approved fire-rated assemblies
- Excellent acoustical performance
- 57 ksi steel reduces screw stripping
- Fastens with sharp point screws (30EQD and D20)
- Wider flanges for screw placement
- Full line of Supreme Framing accessories
 - Hat Channel and Z-Furring
 - Slotted Track
 - Custom Brake Shapes

Supreme is Certified!

All inspections and testing for the Supreme Steel Framing System Association (SSFSA) are provided by Architectural Testing, Inc. SSFSA sponsors a third-party certification program that requires products to be continually audited to ensure consistent quality and compliance to ASTM C645, C955, and IBC Codes.

Stud and track products must be tested twice per year on unannounced visits. Steel is chemically stripped and tested for coating weight and bare metal thickness. The dimensional properties of the stud are also measured. All requirements must be satisfied in order to be certified code compliant. All members of the SSFSA must satisfy the requirements each time they are audited.

All certified Supreme Steel products has a label showing that it is third-party certified. Labels may be located on bundles or each framing member. The third-party certification label guarantees to the contractor and owner that materials are high quality and code compliant.



Look for the sticker!

Third-party certified code compliant by nationally recognized Architectural Testing, Inc.

Code Approvals and Performance Standards

AISI "North American Specification for the Design of Cold-Formed Steel Structural Members"

ASTM American Society for Testing and Materials

- A653 Standard Specification for Steel Sheet, Zinc - Coated (Galvanized) or Zinc - Iron Alloy - Coated by the Hot - Dip Process
- A1003 Standard Specification for Steel Sheet, Carbon, Metallic - and Nonmetallic-Coated for Cold-Formed Framing Members
- C645 Standard Specification for Non-structural Steel Framing Members
- C754 Standard Specification for Installation of Steel Framing Members to Receive Screw - Attached Gypsum Panel Products
- C955 Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
- E119 Standard Test Methods for Fire Tests of Building Construction and Materials
- E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
- E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

UL Underwriters Laboratories Supreme Framing Classification

UL 263 Fire Tests of Building Construction and Materials

Steel Framing Members Fire Resistance Classification

U411 U412 U419 U435 U465 U493 V486 V496 V498

ICC-ES Code Approvals

ICC-ES ESR2507 30EQD & 33EQD

ICC-ES ESR3054 43EQS

Independent Product Certification

- Code Compliance - ICC Evaluation Services, LLC
- Fire Testing - Underwriters Laboratories, Inc.
- Sound Ratings - Riverbank Acoustical Laboratories
- 3rd Party Testing - Architectural Testing, Inc.
- Structural Testing - O.S.U. (Oregon State University)
- Structural Engineer - Devco Engineering

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Effective 01/01/2011 and supersedes all previous information.

APPROVED FOR DISTRIBUTION
NEWS RELEASE
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FOR MORE INFORMATION:
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(312) 224-2570
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Steel Stud Manufacturers Association Announces Adoption of Proprietary Brands as SSMA Products

CHICAGO, IL – (April 6, 2011) – The Steel Stud Manufacturers Association (SSMA) is the largest group of manufacturers and is also the leading voice in the metal framing industry. The SSMA just announced big news in its product offering. ViperStud® and Supreme Framing System®, two of the industry's most recognized proprietary brands, have been adopted by the SSMA as association products. These high-quality additions help establish a new standard for metal framing components for the industry. Members will benefit from a lower manufactured cost and better performing products. Distributors and contractors will benefit from value-engineered cost savings and a better installation experience.

"It is exciting to see that SSMA has once again stepped to the forefront to improve the framing industry," said SSMA Treasurer, Marty Klehm. "The certification programs implemented by SSMA for both structural and light gauge continue to build on quality standards and continuity. These additional product offerings will add value for the industry. Our members are now united in offering three certified products to customers in light gauge framing. This is a great day for the framing industry!"

"We believe this move will help promote competition among manufacturers while building solidarity behind the brand of SSMA. The organization is founded on this very principle," SSMA Director, Dan Dry, said.

Membership to SSMA has rich rewards, which now include deep discount rates for licensing these products.





SSMA[®]

Allsteel & Gypsum Products, Inc.

California Expanded Metal Products, Co.

Consolidated Fabricators, Corp.

Craco Manufacturing, Inc.

Custom Stud, Inc.

Design Shapes In Steel

Frametek Steel Products

Mar/Ino\Ware

MBA Building Supplies, Inc.

Olmar Supply, Inc.

Quail Run Building Materials, Inc.

SCAFCO Steel Stud Manufacturing

Southeastern Stud & Components, Inc.

Steel Construction Systems

Steeler, Inc.

Telling Industries, LLC.

The Formetal Co., Inc.

The Steel Network

United Metal Products, Inc.

SSMA

230 East Ohio Street, Suite 400

Chicago, IL 60611

Ph: 312-224-2570 Fax: 312-644-8557

Info@SSMA.com

The Steel Stud Manufacturers Association is the Chicago-based national trade association representing leading manufacturers of steel studs, track and joists. Its twenty-one roll forming member companies support the development and maintenance of quality product standards and specifications for the cold formed steel manufacturing industry. The organization creates market growth opportunities for cold-formed steel through research, marketing and education. For more information on SSMA please visit www.ssma.com.

Technical Information

Nomenclature Example

All SCAFCO products have a four-part identification code that identifies the web depth, flange width, style, and mil thickness.

Member Web Depth

(Example: 6" = 600 × 1/100 inch)

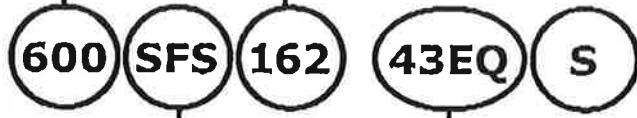
All member depths are given in 1/100 inch.

For all "T" sections, member depth is the inside to inside dimension.

Flange Width

(Example: 1 3/4" = 1.625" ≈ 162 × 1/100 inch)

All flange widths are given in 1/100 inch.



Style

(Example:

Supreme Framing Stud section = SFS)

Nomenclature uses the following characters to designate the profile:

- SFS = Supreme Framing Stud or Joist Sections
- SFT = Supreme Framing Track Sections
- F = Furring Channel Sections

Thickness Designation

See Thickness Tables on page 5.

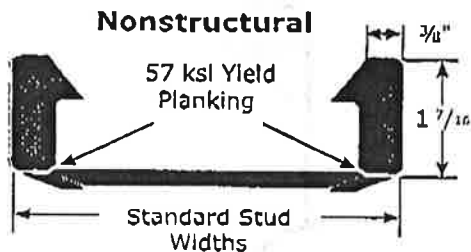
Design Type

(Example: Structural section = S)

Nomenclature uses the following two characters:

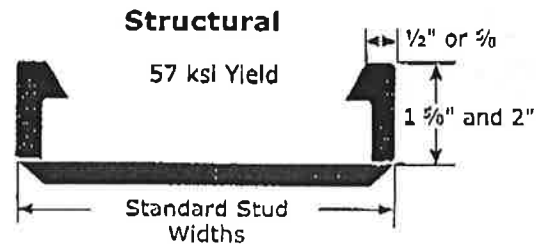
- S = Structural studs and track
- D = Drywall (Non-Structural) studs and track

Supreme Stud Profiles



Available Sizes

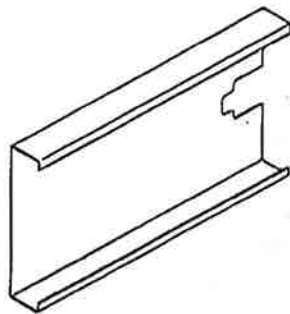
1 3/8", 2 1/2", 3 1/2", 3 3/8", 4", 5 1/2" and 6"



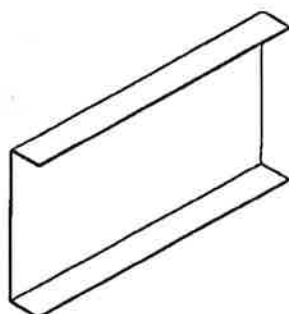
Available Sizes

2 1/2", 3 1/2", 3 3/8", 4", 5 1/2", 6", and "8"

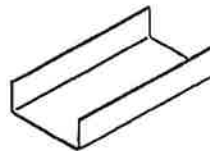
*available in 43EQS only



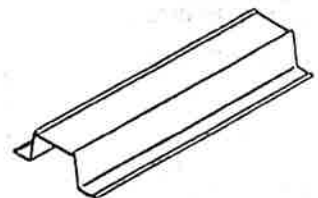
"S" - C-STUD/JOIST S-SECTIONS



"T" - TRACK T-SECTIONS



"U" - CHANNEL U-SECTIONS



"F" - FURRING CHANNEL F-SECTIONS

Technical Information

Screw and Weld Capacities

Screw Table Notes

- Capacities based on AISI S100 Section E4 specification.
- When connecting materials of different steel thicknesses or tensile strengths, use the lowest values. Tabulated values assume two sheets of equal thickness are connected.
- Capacities are based on Allowable Strength Design (ASD) and include safety factor of 3.0.
- Where multiple fasteners are used, screws are assumed to have a center-to-center spacing of at least 3 times the nominal diameter (d).
- Screws are assumed to have a center-of-screw to edge-of-steel dimension of at least 1.5 times the nominal diameter (d) of the screw.
- Tension capacity is based on the lesser of pull-out capacity in sheet closest to screw tip, or pull-over capacity for sheet closest to screw head (based on head diameter shown).
- For all tension values shown in this table, pull-over values have been reduced by 50 percent assuming eccentrically loaded connections that produce a non-uniform pull-over force on the fastener.
- Values are for pure shear or tension loads. See AISI S100 Section E4.5 for combined shear and pull-over.
- Higher values, especially for screw strength, may be obtained by specifying screws from a specific manufacturer.
- Shear and tension data for screws was developed with the assistance of the Wei-Wen Yu Center for Cold-Formed Steel Structures (CCFSS), using manufacturers' data and evaluation reports available at the time of publication.

Allowable Screw Connection Capacity (Pounds Per Screw)

Electrode	Thickness	57	65	75	80	90	100	110	120	130	140	150	160	170	180	190	200
D20	0.0188	57	65	75	80	90	100	110	120	130	140	150	164	177	190	203	216
30EQD	0.0235	57	65	75	80	90	100	110	120	130	140	150	164	177	190	203	216
33EQD	0.0235	57	65	75	80	90	100	110	120	130	140	150	164	177	190	203	216
33EQS	0.0295	57	65	75	80	90	100	110	120	130	140	150	164	177	190	203	216
43EQS	0.0400	57	65	75	80	90	100	110	120	130	140	150	164	177	190	203	216

*Values are based on testing using AISI S100 procedures.

Weld Table Notes

- Weld capacities are based the AISI S100 Specification Sections E2.4 for fillet welds and E2.5 for groove welds.
- When connecting materials of different steel thicknesses or tensile strengths (Fu), the lowest values should be used.
- Capacities are based on Allowable Strength Design (ASD) and include appropriate safety factors.
- Weld capacities are based on either 0.938" or 0.125" diameter E60 or E70 electrodes. The use of 0.030" to 0.035" diameter wire electrodes may provide best results.
- Longitudinal capacity is loading in parallel direction of the length of the weld.
- Transverse capacity is loading in perpendicular direction of the length of the weld.
- For flare groove welds, the effective throat of weld is conservatively assumed to be less than 2t.

Weld Capacity (Pounds Per 1" Weld)

Electrode	Thickness	57	65	75	80	90	100	110	120	130	140	150	160	170	180	190	200
43EQD	0.0400	57	65	75	80	90	100	110	120	130	140	150	160	170	180	190	200

¹ For welds with L/t > 25 where L is weld length and t is the thickness of the welded member.
² For t <= tw < 2t where t = thickness of welded member and tw is effective throat thickness of weld.

Section Properties

Section Properties - Nonstructural Studs

Table Notes

- For 33EQD properties, refer to 30EQD values.
- The centerline bend radius is based on inside corner radii shown in the steel thickness table on page 5.
- Effective properties incorporate the strength increase from the cold work of forming as applicable per AISI S100 Section A7.2.
- Tabulated gross properties are based on the full-unreduced cross section of the studs away from punchouts.
- For deflection calculations, use the effective moment of inertia.
- Allowable moment is the lesser of M_{n1} and M_{n2} . Stud distortional buckling is based on an assumed $K\phi = 0$.
- See page 5 for additional table notes.

Nonstructural Supreme Studs (SFS) - Section Properties

162SFS-D20	0.0188	57	0.094	0.32	0.044	0.055	0.086	0.028	0.545	0.042	0.033	0.93	1.00	397	131	0.011	0.022	-1.365	0.770	1.622	0.292	29.1
102SFS-30EQD	0.0235	57	0.117	0.40	0.055	0.068	0.604	0.035	0.543	0.052	0.048	1.63	1.70	621	182	0.022	0.027	-1.358	0.776	1.616	0.292	29.0
250SFS-D20	0.0188	57	0.111	0.38	0.117	0.093	1.027	0.033	0.545	0.110	0.060	1.71	1.72	258	190	0.013	0.049	-1.217	0.719	1.683	0.477	28.1
250SFS-30EQD	0.0235	57	0.138	0.47	0.145	0.116	1.025	0.041	0.542	0.138	0.090	3.00	2.60	505	306	0.025	0.060	-1.212	0.716	1.677	0.470	28.0
350SFS-D20	0.0188	57	0.130	0.44	0.252	0.144	1.305	0.037	0.533	0.203	0.077	2.20	2.40	180	150	0.015	0.097	-1.088	0.662	1.647	0.653	27.6
350SFS-30EQD	0.0235	57	0.161	0.55	0.313	0.179	1.302	0.046	0.531	0.304	0.112	3.83	3.84	361	248	0.030	0.110	-1.003	0.689	1.842	0.655	27.6
362SFS-D20	0.0188	57	0.102	0.45	0.273	0.151	1.439	0.037	0.591	0.253	0.080	2.28	2.58	173	164	0.016	0.104	-1.074	0.655	1.673	0.671	27.0
362SFS-30EQD	0.0235	57	0.164	0.56	0.339	0.187	1.437	0.046	0.529	0.331	0.118	3.97	3.08	338	265	0.030	0.128	-1.060	0.652	1.667	0.672	27.6
400SFS-D20 ¹	0.0188	87	0.139	0.47	0.343	0.172	1.572	0.038	0.528	0.300	0.087	2.48	2.03	156	156	0.016	0.129	-1.034	0.537	1.954	0.720	27.5
400SFS-30EQD	0.0235	57	0.173	0.59	0.427	0.213	1.569	0.047	0.524	0.417	0.129	4.40	4.41	305	275	0.032	0.159	-1.020	0.634	1.949	0.721	27.4
550SFS-D20 ²	0.0188	57	0.167	0.57	0.728	0.264	2.084	0.042	0.502							0.020	0.250	-0.904	0.574	2.327	0.894	-
550SFS-30EQD ¹	0.0235	57	0.208	0.71	0.903	0.328	2.081	0.052	0.500	0.806	0.204	6.97	6.09	218	218	0.030	0.320	-0.900	0.571	2.322	0.850	26.9
600SFS-D20 ²	0.0188	57	0.177	0.60	0.894	0.288	2.250	0.043	0.494							0.021	0.314	-0.889	0.556	2.462	0.875	-
600SFS-30EQD ¹	0.0235	57	0.220	0.75	1.112	0.371	2.247	0.053	0.492	0.976	0.219	7.46	6.00	200	200	0.041	0.380	-0.864	0.553	2.457	0.876	26.7

¹Web height-to-thickness ratio exceeds 200. Web stiffeners are required at all support points and concentrated loads.

²Web height-to-thickness ratio exceeds 260. Section is not in compliance with AISI S100 Section B1, but may be used in accordance with SFS/SA's published composite wall data for these members.

Section Properties

Section Properties - Structural Studs

Table Notes

1. The centerline bend radius is based on inside corner radii shown in the steel thickness table on page 5.
2. Effective properties incorporate the strength increase from the cold work of forming as applicable per AISI S100 Section A7.2.
3. Tabulated gross properties are based on the full-unreduced cross section of the studs away from punchouts.
4. For deflection calculations, use the effective moment of inertia.
5. Allowable moment is the lesser of M_{d1} and M_{d2} . Stud distortional buckling is based on an assumed $K\phi = 0$.
6. See page 5 for additional table notes.

Structural Supreme Studs (SFS) - Section Properties																						
250SFS162-33EQS	0.0295	57	0.191	0.65	0.202	0.162	1.029	0.075	0.628	0.195	0.134	4.57	4.17	978	471	0.055	0.127	-1.475	0.863	1.305	0.400	33.4
250SFS162-43EQS	0.0400	57	0.257	0.88	0.270	0.216	1.025	0.100	0.622	0.270	0.185	8.32	6.26	1798	636	0.137	0.100	-1.463	0.856	1.892	0.402	33.4
250SFS200-43EQS	0.0400	57	0.287	1.01	0.320	0.256	1.030	0.177	0.771	0.311	0.215	7.34	7.14	1790	636	0.150	0.344	-1.920	1.104	2.315	0.312	38.4
350SFS162-33EQS	0.0295	57	0.220	0.75	0.436	0.249	1.407	0.085	0.619	0.425	0.179	6.10	6.02	696	300	0.084	0.239	-1.330	0.799	2.032	0.572	32.5
350SFS162-43EQS	0.0400	57	0.297	1.01	0.505	0.334	1.402	0.112	0.615	0.585	0.257	8.78	9.12	1730	715	0.150	0.315	-1.310	0.792	2.020	0.574	32.3
350SFS200-43EQS	0.0400	57	0.337	1.15	0.680	0.393	1.420	0.200	0.771	0.075	0.301	10.28	10.33	1738	716	0.180	0.617	-1.754	1.036	2.309	0.461	38.4
362SFS162-33EQS	0.0295	57	0.224	0.78	0.473	0.261	1.452	0.080	0.610	0.462	0.166	6.34	6.26	670	402	0.068	0.257	-1.314	0.792	2.054	0.591	32.4
362SFS162-43EQS	0.0400	57	0.302	1.03	0.634	0.350	1.448	0.114	0.613	0.634	0.267	9.12	9.48	1674	737	0.161	0.338	-1.302	0.785	2.042	0.593	32.3
362SFS200-43EQS	0.0400	57	0.342	1.16	0.746	0.412	1.476	0.203	0.770	0.732	0.314	10.70	10.74	1674	737	0.183	0.659	-1.735	1.027	2.404	0.479	38.4
400SFS162-33EQS	0.0295	57	0.235	0.80	0.593	0.297	1.509	0.088	0.613	0.501	0.206	7.04	6.95	604	433	0.088	0.314	-1.260	0.771	2.124	0.643	32.2
400SFS162-43EQS	0.0400	57	0.317	1.08	0.796	0.390	1.504	0.118	0.609	0.798	0.298	10.16	10.57	1508	795	0.169	0.413	-1.258	0.785	2.112	0.645	32.0
400SFS200-43EQS	0.0400	57	0.357	1.22	0.935	0.487	1.517	0.210	0.787	0.919	0.350	11.94	11.98	1508	795	0.191	0.795	-1.692	1.004	2.450	0.531	38.2
550SFS162-33EQS	0.0295	57	0.270	0.95	1.249	0.454	2.115	0.098	0.591	1.235	0.333	11.36	9.72	433	433	0.081	0.615	-1.119	0.700	2.404	0.794	31.5
550SFS162-43EQS	0.0400	57	0.377	1.20	1.670	0.611	2.110	0.130	0.587	1.679	0.515	17.59	14.95	1070	944	0.201	0.813	-1.108	0.694	2.454	0.790	31.3
550SFS200-43EQS	0.0400	57	0.417	1.42	1.951	0.700	2.162	0.234	0.748	1.933	0.589	20.10	16.90	1079	944	0.223	1.518	-1.592	0.921	2.737	0.699	37.7
600SFS162-33EQS	0.0295	57	0.204	1.00	1.535	0.512	2.205	0.100	0.593	1.522	0.363	12.38	10.62	395	395	0.086	0.743	-1.078	0.680	2.592	0.827	31.3
600SFS162-43EQS	0.0400	57	0.397	1.35	2.005	0.688	2.280	0.133	0.579	2.065	0.559	19.00	16.37	986	976	0.212	0.983	-1.067	0.673	2.583	0.829	31.1
600SFS200-43EQS	0.0400	57	0.437	1.49	2.390	0.797	2.338	0.240	0.741	2.374	0.640	21.85	18.54	986	976	0.233	1.822	-1.452	0.897	2.850	0.741	37.5
800SFS162-43EQS	0.0400	57	0.477	1.62	4.128	1.032	2.941	0.143	0.548	3.070	0.706	24.11	21.67	732	732	0.255	1.862	-0.931	0.803	3.133	0.912	30.4
800SFS200-43EQS	0.0400	57	0.517	1.76	4.721	1.180	3.021	0.261	0.710	4.721	0.848	28.94	24.89	732	732	0.276	3.400	-1.203	0.814	3.350	0.854	36.9



Date: Dec 31, 2013

CASCADE LIGHTING REPRESENTA
128 NE 7th Ave
PORTLAND OR 97232
Phone: (503) 242-2522
Fax: (503) 274-5407

Job Name
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
CLRPDX12-12667
Eugene OR

Bid Date
Jan 14, 2014

Submittal Date
Dec 31, 2013

Lease Crutcher Lewis
550 SW 12th Avenue
Portland, OR 97205

Sera Architectures
338 NW 5th
Portland, OR 97209

Glumac
900 SW 5th Ave Suite 1600
Portland, OR 97204



Transmittal

CASCADE LIGHTING REPRESENT.
128 NE 7th Ave
PORTLAND OR 97232
Phone: (503) 242-2522
From: **KIM BLESSING**

Project University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Quote# CLRPDX12-12667
Location Eugene OR
Contact:

ATTACHED WE ARE SENDING YOU 1 COPIES OF THE FOLLOWING ITEMS:

- | | | |
|-----------------------------------|--|--------|
| <input type="checkbox"/> Drawings | <input type="checkbox"/> Specifications | Other: |
| <input type="checkbox"/> Prints | <input type="checkbox"/> Information | |
| <input type="checkbox"/> Plans | <input checked="" type="checkbox"/> Submittals | |

THESE ARE TRANSMITTED FOR:

- | | | |
|--|---|---------------------------------|
| <input checked="" type="checkbox"/> Prior Approval | <input type="checkbox"/> Resubmittal for Approval | <input type="checkbox"/> Record |
| <input type="checkbox"/> Approval | <input type="checkbox"/> Corrections | Bids due on: |
| <input type="checkbox"/> Approval as Submitted | <input type="checkbox"/> Your Use | Other: |
| <input type="checkbox"/> Approval as Noted | <input type="checkbox"/> Review and Comment | |

Type	MFG	Part
L1	HE Williams Inc.	82-4-332-WG-8214-4-VBY-2-EB2/ 1(ADVANCE IOPA#P32-LW-SC)-UNV
L2	HE Williams Inc.	DIG-24-232-WPR-EB2(ADVANCE IOPA#P32-LW-SC)-UNV
L3	HE Williams Inc.	76-4-232-WG-7614-4-VBY-2- EB2(ADVANCE IOPA#P32-LW-SC)-UNV
L4	HE Williams Inc.	DDI-4-232-WPR-AC CABLE 48"- EB2(ADVANCE IOPA#P32-LW-SC)-UNV
L5	HE Williams Inc.	29-4-232-A-CT-EB2(ADVANCE IOPA#P32-LW-SC)-UNV
L6	HE Williams Inc.	92-4-332-DR-WET/2-SSMB- EB3(ADVANCE IOPA#P32-LW-SC)-UNV
L14	Finelite, Inc.	MU-O-4-LEDT8-3500K-SC-VOLT-FA50- FE
L18	HE Williams Inc.	AV8-8-232-WPC-EB4(ADVANCE IOPA#P32-LW-SC)-UNV
R6	HE Williams Inc.	LEDPSQ45-2000-35K-BLACK TRIM- ED*AD-VOLT
S1	Baselite Corporation	SFM-2-WG-PR4-49-20W(LED)
S2	Baselite Corporation	SFM-2-WG-FR4-49-20W(LED)
S3	Baselite Corporation	SFM-1-CG-RE3-49-10W(LED)
X2	HE Williams Inc.	EXIT-G-AC-WHT
	LVS INC	EPC-A

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L1

PROPOSED SUBSTITUTION HEW#82-4-332-WG-8214-4-VBY-2-EB2/1ADVANCE IOPA#P32-LW-S6

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>Vista Pettz</i>	
Date <i>1/7/14</i>	
Remarks	

The Construction Specifications Institute
Northwest Region

September 1997



Advancement
of Construction
Technology



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

82-4-332-WG-8214-4-VBY-2-EB2/
1(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

L1

CLRPDX12-12667

PREMIUM TURRET INDUSTRIAL

82

SUBMITTAL:

T5 | T8

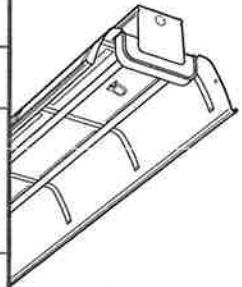
JOB:

TYPE:

VOLTAGE:

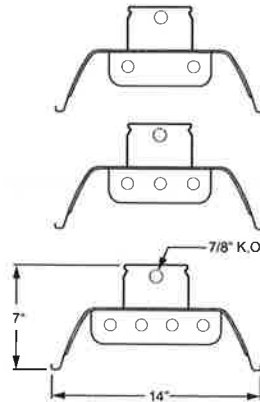
EXAMPLE → **82 - 4 - 2 54T5H - OPTIONS - EB2 - UNV**

SERIES NOMINAL LENGTH TOTAL LAMPS WATTAGE/TYPE OPTIONS/ACCESSORIES BALLAST TYPE VOLTAGE



FEATURES

- ▶ Up to **95.5% optical efficiency**.
- ▶ Heavy-duty ribbed reflector with upright component—illuminates the ceiling for increased efficiency.
- ▶ Spring-loaded, turret style sockets enclosed in heavy-duty steel housing.
- ▶ Hinging/locking lamp bracket reduces installation time.
- ▶ Two heavy-duty, spring-loaded quarter-turn fasteners secure reflector to housing.
- ▶ Channel connector furnished for continuous row of 8' units.
- ▶ Ballast(s) secured by two captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation.
- ▶ This fixture is proudly made in the USA.



SPECIFICATIONS

Housing – 20-gauge die-formed, ribbed C.R.S.
Reflector – 22-gauge die-formed, ribbed C.R.S. 10% typical upright component with 92% minimum average reflective white polyester powder coated finish.
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 – Electronic ballast standard, instant start T8, program start T5, rated Class P.
Mounting – Surface or suspended (see options in ordering information).
Labels – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations.

ORDERING INFORMATION

SERIES

82 Premium Turret Industrial

NOMINAL LENGTH

4 4'
8 8'

TOTAL LAMPS

2, 3, 4, 6, or 8 (2-, 3-, or 4-lamp cross-section)

LAMP WATTAGE/TYPE

28T5S 4', 28-watt T5 (2-lamp ballast only)
32 4', 32-watt T8
54T5H 4', 54-watt T5HO
59 8', 59-watt T8 (2-lamp ballast only)
86 8', 86-watt T8 (2-lamp ballast only)

OPTIONS/ACCESSORIES

For generic **EM ballast** options (must specify voltage), see Fluorescent Information section.

See back for mounting and accessory details.

CT Closed top reflector
RA-82 Reflector row aligner (1 pair)
ML-4 48" metal louver (T5 and T5HO only)
ML-5 50" metal louver (T8 only)
M4-A12125 48" metal frame with pattern #12 lens (T5 and T5HO only)
M5-A12125 50" metal frame with pattern #12 lens (T8 only)

OPTIONS/ACCESSORIES (Continued)

EP-82 Reflector end plate (1 pair)
MSA Myers sway adapter
T2 Tong hanger
325 1-1/2" ceiling spacer
GAT GAT fastener (T-bar clip)
VBY (2) Y-hangers
VBY-2 (2) Y-hangers and (2) 2' chains
WG-8211 11-gauge white powder coat wireguard
WG-8214 11-gauge white powder coat wireguard

BALLAST TYPE

EB2 2-lamp electronic ballast
EB3 3-lamp electronic ballast
EB4 4-lamp electronic ballast
EB2/2 (2) 2-lamp electronic ballasts
EB3/3 (2) 3-lamp electronic ballasts
EB4/2 (1) 4-lamp and (1) 2-lamp electronic ballast
EB4/4 (2) 4-lamp electronic ballasts
EB2/2/2 (3) 2-lamp electronic ballasts

VOLTAGE

120 120V **347** 347V
277 277V **480** 480V (T5HO only)
UNV 120-277V

EB2/1(ADVANCE IOPA#P32-LW-SC)



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

82-4-332-WG-8214-4-VBY-2-EB2/
1(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

L1

CLRPDX12-12667

82

PREMIUM TURRET INDUSTRIAL

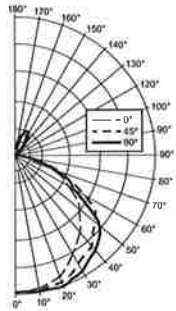
T5 | T8

PHOTOMETRY

Catalog #: 82-4-254T5H-EB2

TEST REPORT INFORMATION

- ▶ Test Report #: 15226.0
- ▶ Date: 02/08/10
- ▶ Lamp Type: FP54T5HO/835
- ▶ Lamp Quantity: 2



CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0°	2673.	2673.	2673.	
5°	2649.	2657.	2664.	253.6
15°	2567.	2630.	2691.	745.4
25°	2396.	2564.	2655.	1176.5
35°	2093.	2367.	2497.	1468.7
45°	1763.	2138.	2308.	1627.0
55°	1442.	1890.	1665.	1567.4
65°	990.	1154.	1156.	1139.0
75°	501.	578.	316.	520.4
85°	109.	134.	93.	139.4
90°	19.	48.	30.	
95°	5.	32.	21.	30.8
105°	14.	33.	131.	64.1
115°	35.	21.	27.	53.4
125°	63.	117.	30.	109.1
135°	77.	326.	148.	178.0
145°	105.	463.	436.	232.0
155°	121.	392.	512.	162.6
165°	143.	285.	372.	72.9
175°	136.	140.	146.	13.4
180°	127.	127.	127.	

ZONAL CAVITY COEFFICIENTS

Ceiling	.80			.70			.50			
	Wall	.70	.50	.30	.70	.50	.30	.50	.30	.10
Room Cavity Ratio	0	1.12	1.12	1.12	1.08	1.08	1.08	1.01	1.01	1.01
1	1.03	.98	.94	.99	.95	.92	.90	.87	.84	
2	.94	.86	.80	.90	.84	.78	.79	.74	.70	
3	.86	.76	.69	.83	.74	.67	.70	.64	.60	
4	.78	.67	.59	.76	.66	.58	.62	.56	.51	
5	.71	.59	.51	.69	.58	.50	.55	.48	.43	
6	.65	.53	.44	.63	.51	.44	.49	.42	.37	
7	.60	.47	.39	.58	.46	.38	.44	.37	.32	
8	.55	.42	.34	.53	.41	.33	.39	.32	.27	
9	.51	.38	.30	.49	.37	.29	.35	.28	.23	
10	.47	.34	.27	.45	.33	.26	.32	.25	.21	

Effective Floor Cavity Reflectance = .20

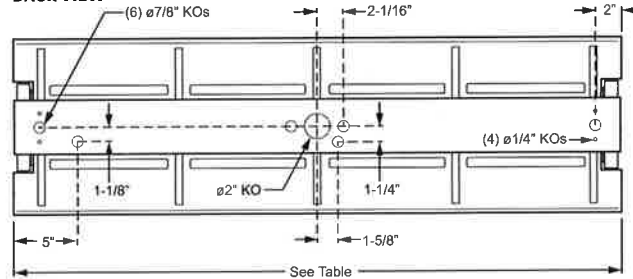
LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 - 30	2176.	21.8	22.8
0 - 40	3644.	36.4	38.1
0 - 60	6839.	68.4	71.6
0 - 90	8638.	86.4	90.4
90 - 120	148.	1.5	1.6
90 - 130	257.	2.6	2.7
90 - 150	667.	6.7	7.0
90 - 180	916.	9.2	9.6
Total Luminaire:			
0 - 180	9554.	95.5	100.0

Total Luminaire Optical Efficiency: 95.5%
IES Spacing Criteria: End = 1.2, Diagonal = 1.4, Across = 1.4

FIXTURE DETAILS

BACK VIEW



Nominal Size	Unit Length
4' T5	48"
4' T8	49-7/8"
8' T5	96"
8' T8	99-7/8"

Note: 8' fixture uses (2) 4' reflectors

MOUNTING OPTIONS

MSA	325	GAT	T-2	VBY or VBY-2

ACCESSORIES

ML-4 or ML-5	M4-A1215 or M5-A1215	WG-8211 or WG-8214	EP-82	RA-82

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L2

PROPOSED SUBSTITUTION HEW #DIG-24-232-WPR-EB2(ADVANCE IOPA#P32-LW-SC)-UNV

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives

Firm Name
128 NE 7th

Address
Portland, OR 97232

City, State, Zip
12-30-13

Date
503-445-6230

Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>Vera Petter</i>	
Date <i>1/7/14</i>	
Remarks	

**The Construction Specifications Institute
Northwest Region**

September 1997





Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

DIG-24-232-WPR-EB2(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

L2

CLRPDX12-12667

RECESSED DIRECT/INDIRECT

DI

SUBMITTAL:

2x4

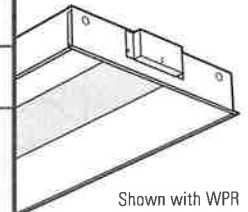
JOB:

TYPE:

VOLTAGE:

EXAMPLE **DIG - S24 - 232 - AD - OPTIONS - EB2 - UNV**

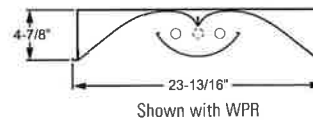
SERIES CEILING TYPE FIL. NOM. NOM. TOTAL WATTAGE/ SHIELDING OPTIONS BALLAST TYPE VOLTAGE
 STYLE W. L. LAMPS TYPE



Shown with WPR

FEATURES

- ▶ Acrylic diffuser option provides up to 88% fixture efficiency.
- ▶ Matte white overlay and highly reflective non-glare white powder coated reflectors and end plates provide soft, uniform illumination and increased efficiency.
- ▶ Lamps shielded from direct view by diffuser.
- ▶ Shallow housing depth.
- ▶ Ballast accessible from room side of fixture.
- ▶ Aesthetically pleasing slot grid option available.
- ▶ Ballast secured by two captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation.
- ▶ This fixture is proudly made in the USA.



Shown with WPR

SPECIFICATIONS

Housing – 20-gauge die-formed C.R.S.

Reflector – Precision die-formed C.R.S. with highly reflective non-glare matte white polyester powder coated finish.

Shielding – Die-formed C.R.S., 50% open perforation, white polyester powder coated diffuser with matte white acrylic overlay.

Finish – Highly reflective non-glare matte 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 – Electronic ballast standard, instant start T8, program start T5, rated Class P.

Mounting – NEMA Type “G” standard. NEMA Type “SS” available (earthquake clips included). For flange installations use the Drywall Kit (DFK), ordered separately, see Fluorescent Information section.

Labels – UL/CUL listed as recessed fluorescent luminaire suitable for dry or damp locations.

ORDERING INFORMATION

SERIES

DI Recessed Direct/Indirect

CEILING TYPE

G NEMA Type “G”

SG Screw slot NEMA Type “SS” (earthquake clips included)

For flange installations use the Drywall Kit (DFK), ordered separately, see Fluorescent Information section.

FIXTURE STYLE

S Static, no air capability

NOMINAL WIDTH

2 2'

NOMINAL LENGTH

4 4'

TOTAL LAMPS

1, 2, or 3

LAMP WATTAGE/TYPE

28T5S 4', 28-watt T5

32 4', 32-watt T8

54T5H 4', 54-watt T5HO

SHIELDING

See back for shielding details.

WPR White perforated round

WP White perforated flat

AD Acrylic

WPRL White perforated with round louver

WPASL White perforated with aluminum solid louver

WPR/SLT/LW White slot-perforated lengthwise round

WPR/SPLIT White perforated round with split

WPR/ACRY/CTR/CLR White perforated round with center clear acrylic (consult factory for additional colors)

WPR/DUSTCOVER White perforated round with dust and debris cover

OPTIONS

For generic EM ballast options (must specify voltage), see Fluorescent Information section.

EQCLIPS Earthquake clips (4 per fixture)

BALLAST TYPE

EB1 1-lamp electronic ballast

EB2 2-lamp electronic ballast

EB3 3-lamp electronic ballast

EB2/1 (1) 2-lamp and (1) 1-lamp electronic ballast

VOLTAGE

120 120V

277 277V

UNV 120-277V

347 347V

EB2(ADVANCE IOPA#P32-LW-SC)





Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

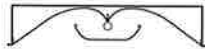
DI RECESSED DIRECT/INDIRECT

2x4

SHIELDING OPTIONS



Shown with WPR or WRP/SLT/LW



Shown with WP



Shown with AD



Shown with WPRL



Shown with WPASL



Shown with WPR/SPLIT



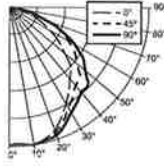
Shown with WPR/ACRY/CTR/CLR

PHOTOMETRY - DI WITH WPR OPTION

Catalog #: DIG-S24-232-WPR

TEST REPORT INFORMATION

- ▶ Test Report #: 13833.0
- ▶ Date: 12/10/07
- ▶ Lamp Type: F32T8
- ▶ Lamp Quantity: 2



LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 - 30	1146.	19.4	27.1
0 - 40	1862.	31.6	44.1
0 - 60	3377.	57.2	80.0
0 - 90	4223.	71.6	100.0

Total Luminaire:	Lumens	% Lamp	% Fixture
0 - 180	4223.	71.6	100.0

Total Luminaire Optical Efficiency: 71.6%
IES Spacing Criteria: End = 1.2, Diagonal = 1.3, Across = 1.3

CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0	1432.	1432.	1432.	
5	1433.	1433.	1433.	136.8
15	1412.	1425.	1439.	403.8
25	1270.	1308.	1348.	605.5
35	1068.	1140.	1213.	715.9
45	895.	1036.	1153.	797.9
55	620.	822.	933.	717.4
65	378.	601.	610.	545.2
75	177.	256.	248.	257.5
85	36.	42.	44.	43.1
90	4.	3.	3.	

ZONAL CAVITY COEFFICIENTS

Room Cavity Ratio	Ceiling									
	Wall	.80			.70			.50		
		.70	.50	.30	.70	.50	.30	.50	.30	.10
0	.85	.85	.85	.83	.83	.83	.80	.80	.80	
1	.79	.76	.73	.77	.74	.71	.71	.69	.67	
2	.72	.67	.62	.70	.65	.61	.63	.59	.56	
3	.66	.59	.53	.64	.58	.53	.56	.51	.48	
4	.61	.52	.46	.59	.51	.46	.50	.45	.41	
5	.55	.46	.40	.54	.45	.39	.44	.39	.35	
6	.51	.41	.35	.49	.41	.35	.39	.34	.30	
7	.47	.37	.31	.45	.36	.30	.35	.30	.26	
8	.43	.33	.27	.42	.33	.27	.32	.26	.22	
9	.39	.30	.24	.38	.29	.23	.28	.23	.19	
10	.37	.27	.21	.36	.26	.21	.26	.21	.17	

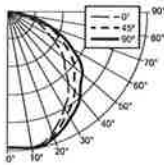
Effective Floor Cavity Reflectance = .20

PHOTOMETRY - DI WITH AD OPTION

Catalog #: DIG-S24-232-AD

TEST REPORT INFORMATION

- ▶ Test Report #: 14225.0
- ▶ Date: 07/25/08
- ▶ Lamp Type: F32T8
- ▶ Lamp Quantity: 2



LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 - 30	1418.	24.0	27.1
0 - 40	2319.	39.3	44.3
0 - 60	4105.	69.6	78.4
0 - 90	5235.	88.7	100.0

Total Luminaire:	Lumens	% Lamp	% Fixture
0 - 180	5235.	88.7	100.0

Total Luminaire Optical Efficiency: 88.7%
IES Spacing Criteria: End = 1.2, Diagonal = 1.3, Across = 1.3

CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0	1759.	1759.	1759.	
5	1771.	1766.	1763.	168.6
15	1752.	1769.	1784.	501.2
25	1565.	1614.	1666.	747.8
35	1399.	1439.	1527.	901.6
45	1028.	1188.	1309.	912.4
55	792.	986.	1124.	873.2
65	510.	697.	787.	670.6
75	257.	364.	404.	374.1
85	62.	84.	82.	85.9
90	0.	0.	0.	

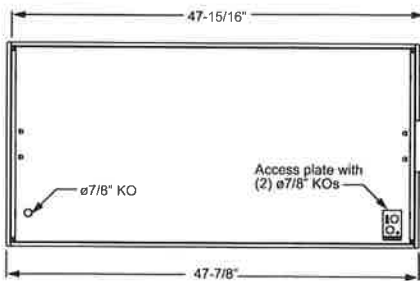
ZONAL CAVITY COEFFICIENTS

Room Cavity Ratio	Ceiling									
	Wall	.80			.70			.50		
		.70	.50	.30	.70	.50	.30	.50	.30	.10
0	1.06	1.06	1.06	1.03	1.03	1.03	.99	.99	.99	
1	.97	.93	.90	.95	.91	.88	.87	.85	.82	
2	.89	.82	.76	.87	.80	.75	.77	.73	.69	
3	.81	.72	.66	.79	.71	.65	.68	.63	.58	
4	.75	.64	.57	.73	.63	.56	.61	.55	.50	
5	.68	.57	.49	.66	.56	.48	.54	.47	.42	
6	.62	.51	.43	.61	.50	.42	.46	.42	.37	
7	.58	.46	.38	.56	.45	.37	.43	.37	.32	
8	.53	.41	.33	.52	.40	.33	.39	.32	.28	
9	.49	.37	.29	.47	.36	.29	.35	.28	.24	
10	.45	.33	.26	.44	.33	.26	.32	.25	.21	

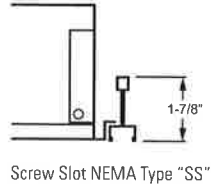
Effective Floor Cavity Reflectance = .20

FIXTURE DETAILS

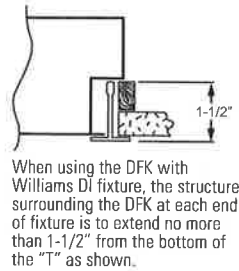
BACKVIEW



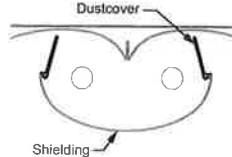
SLOT GRID (Williams' SG)



DRYWALL KIT (DFK)



DUSTCOVER OPTION



SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L3

PROPOSED SUBSTITUTION HEW#76-4-232-WG-7614-4-VBY-2-EB2(ADVANCE IOPA#P32-LW-SC)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>visa [Signature]</i>	
Date <i>1/7/14</i>	
Remarks	

The Construction Specifications Institute
Northwest Region

September 1997



Advancement
of Construction
Technology



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

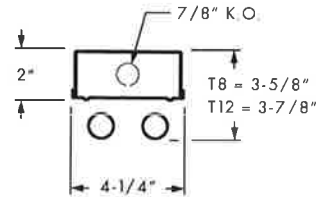
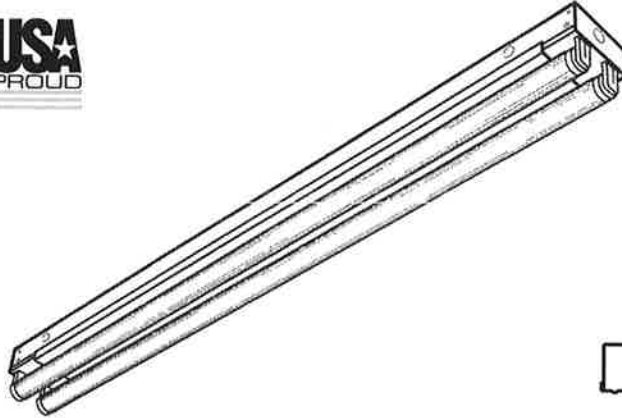
76-4-232-WG-7614-4-VBY-2-EB2(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

L3

CLRPDX12-12667

1, 2, OR 3 LAMP STANDARD STRIP



SERIES **76**
VOLTAGE TYPE JOB _____

SPECIFICATIONS

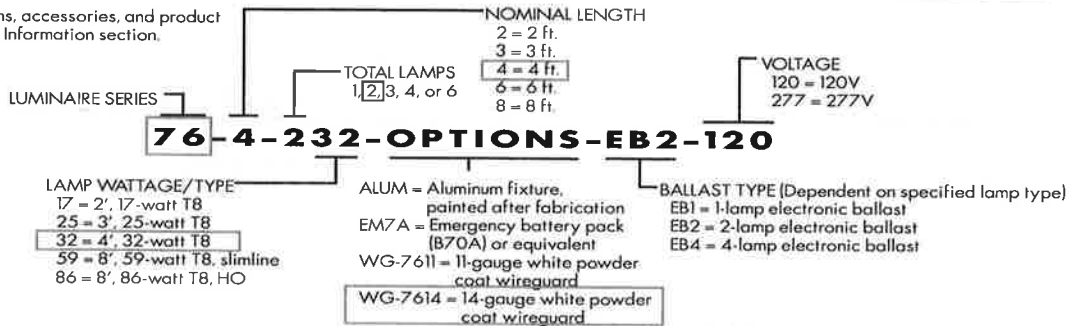
- HOUSING – 22-gauge die-formed C.R.S. or optional .040" thick aluminum.
- FINISH – 92% minimum average reflective white powder coat with multi-stage iron/phosphate prepared metal.
- ELECTRICAL – Electronic ballast standard (where available), rated Class P.
- LABELS – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations.
- MOUNTING – Surface or suspended.

FEATURES

- Factory-mounted, prewired sockets cut installation time.
- Hinging/locking lamp bracket cuts installation time.
- One quarter-turn fastener secures wireway cover to housing.
- Channel connector furnished for continuous row applications.
- Ballast secured by two captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation and minimal ballast noise.
- All parts painted after fabrication to facilitate installation, increase efficiency, and inhibit corrosion.
- This fixture is proudly made in the USA.

SUBMITTAL INFORMATION

For more options, accessories, and product details, refer to Information section.



VBY/2' hangers 2' chains

EB2(ADVANCE IOPA#P32-LW-SC)



FLUORESCENT LIGHTING
Strip page 7



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Catalog Number:
76-4-232-WG-7614-4-VBY-2-EB2(ADVANCE IOPA#P32-LW-SC)-UNV
Notes:

Type:
L3
CLRPDX12-12667

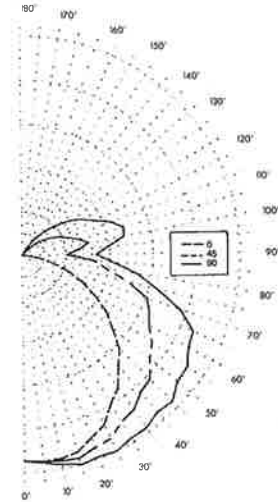
76 SERIES **PHOTOMETRY INFORMATION**

Williams Catalog #76-4-232-EB2-120
Test Report #8591.0, Dated 12/27/95

Lamp Type: F32T8/SPX35/RS
Lamp Quantity: 2

CANDLEPOWER DISTRIBUTION

VERT. ANG.	HORIZONTAL ANGLE			ZONAL LUMENS
	0	45	90	
0	1128.	1128.	1128.	
5	1135.	1135.	1142.	108.4
15	1120.	1155.	1192.	327.3
25	1033.	1117.	1191.	515.1
35	897.	1044.	1166.	651.8
45	740.	977.	1150.	744.2
55	555.	860.	1093.	759.7
65	361.	763.	1025.	728.6
75	171.	597.	761.	566.8
85	29.	394.	495.	350.2
90	3.	244.	403.	
95	0.	309.	468.	303.0
105	0.	323.	574.	321.9
115	0.	237.	441.	219.0
125	0.	150.	333.	136.7
135	0.	68.	200.	63.9
145	0.	13.	90.	19.2
155	0.	0.	13.	2.3
165	0.	0.	0.	0
175	0.	0.	0.	0
180	0.	0.	0.	0



LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% FIXTURE
0 - 30	951.	16.1	16.3
0 - 40	1603.	27.2	27.5
0 - 60	3107.	52.7	53.4
0 - 90	4752.	80.5	81.7
90 - 120	844.	14.3	14.5
90 - 130	981.	16.6	16.9
90 - 150	1064.	18.0	18.3
90 - 180	1066.	18.1	18.3
Total Luminaire			
0-180	5818.	98.6	100.0

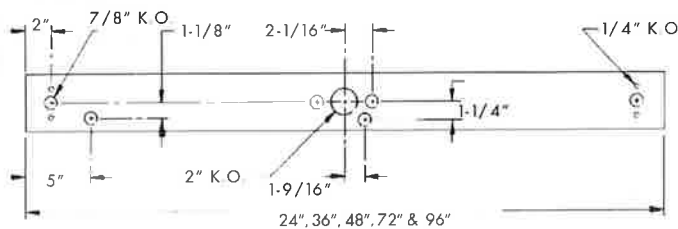
ZONAL CAVITY COEFFICIENTS
EFFECTIVE FLOOR CAVITY REFL = .20

CEILING	.80			.70			.50			
	WALL	.70	.50	.30	.70	.50	.30	.50	.30	.10
0	113	113	113	108	108	108	100	100	100	
1	101	96	91	97	92	87	84	81	78	
2	91	82	75	87	79	72	72	67	62	
3	83	72	63	79	69	61	63	57	51	
4	75	63	54	72	60	52	56	49	43	
5	68	55	46	65	53	44	49	41	36	
6	63	49	40	59	47	38	43	36	31	
7	58	44	35	55	42	34	39	32	26	
8	53	39	30	50	38	29	35	28	23	
9	49	35	27	46	34	26	31	24	19	
10	45	32	24	43	31	23	28	22	17	

TOTAL LUMINAIRE OPTICAL EFFICIENCY = 98.6 %
SPACING CRITERIA: ACROSS= 1.6 ALONG= 1.3

BACK VIEW

NOTE:
2" K.O. and (3) 7/8" K.O.s are on 4', 6', & 8' units only



H. E. WILLIAMS, INC.

H.E. Williams, Inc. • Carthage, Missouri • www.hewilliams.com • 417-358-4065 • Fax: 417-358-6015
Information contained herein is subject to change without notice

HEWJP43033 06/11/10RJ

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L4

PROPOSED SUBSTITUTION HEW#DDI-4-232-WPR-AC CABLE 48"-EB2(ADVANCE IOPA#P32-LW

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

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Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives

Firm Name
128 NE 7th

Address
Portland, OR 97232

City, State, Zip
12-30-13

Date
503-445-6230

Tel:

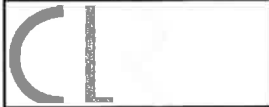
General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>visa PMA</i>	
Date <i>1/7/14</i>	
Remarks	

**The Construction Specifications Institute
Northwest Region**

September 1997





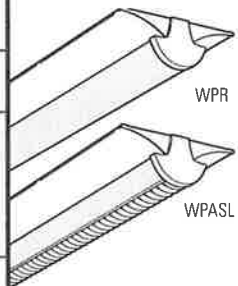
Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

DDI-4-232-WPR-AC CABLE 48"-EB2(ADVANCE IOPA#P32-LW-SC)-UNV
Notes:

L4

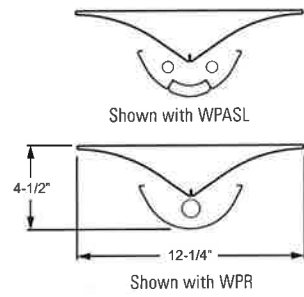
CLRPDX12-12667

DROP DIRECT/INDIRECT		DDI
SUBMITTAL:		
JOB:		
TYPE:	VOLTAGE:	T5 T8
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px;">EXAMPLE</div> <div style="text-align: center;"> DDI - 4 - 2 32 - WPR - OPTIONS - EB2 - UNV <small>SERIES NOMINAL LENGTH TOTAL WATTAGE/LAMPS TYPE SHIELDING OPTIONS BALLAST TYPE VOLTAGE</small> </div> </div>		



FEATURES

- ▶ Ideal replacement for traditional surface mount, wrap around, or suspended fixtures.
- ▶ Choice of fully perforated or louvered/perforated shielding for varied appearance and degree of down light.
- ▶ Highly reflective matte white paint for increased efficiency.
- ▶ Translucent matte white acrylic overlay with perforations provides uniform luminous effect.
- ▶ Uplight option provides approximately 15% uplight for pendant applications.
- ▶ Injection-molded decorative end caps add aesthetic appeal.
- ▶ Optional injection-molded reflector bands provide a smooth transition for continuous rows.
- ▶ Optional No. 14 AWG quick-connect polarized wiring available to allow easy wiring and service for continuous row mounting.
- ▶ Mounting choices include surface, stem and canopy, or aircraft cable.
- ▶ This fixture is proudly made in the USA.



SPECIFICATIONS

Housing – 22-gauge die-formed, welded C.R.S. (20-gauge for 8' lengths) with 16-gauge C.R.S. end plates.
Reflector – Precision-formed 22-gauge C.R.S. with highly reflective non-glare matte white polyester powder coat.
Shielding – 20-gauge precision-formed C.R.S., 50% open perforation with highly reflective non-glare matte white polyester powder coat and matte white acrylic overlay.
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 – Electronic ballast standard, rated Class P. Default offering shown in chart below.

Lamp	Instant Start	Program Start
T5		•
T8	•	
40TT	•	
50TT		•
55TT		•

Mounting – Surface, stem and canopy, or 1/16" diameter adjustable steel leveling aircraft cable.
Labels – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations.

ORDERING INFORMATION

SERIES
 Drop Direct/Indirect

NOMINAL LENGTH
 2'
 4'
 8'

TOTAL LAMPS
 or (T5 or T8: 1- or 2-lamp cross-section, TT: 1-lamp cross-section only)

LAMP WATTAGE/TYPE
2' FIXTURE OPTIONS
 14T5S 2', 14-watt T5 (1- or 2-lamp ballast[s] only)
 17 2', 17-watt T8
 24T5H 2', 24-watt T5HO
 40TT 2', 40-watt long twin tube (1-lamp only)
 50TT 2', 50-watt long twin tube (1-lamp only)
 55TT 2', 55-watt long twin tube (1-lamp only)
4' or 8' FIXTURE OPTIONS
 28T5S 4', 28-watt T5 (1- or 2-lamp ballast[s] only)
 4', 32-watt T8
 54T5H 4', 54-watt T5HO

SHIELDING

White perforated round
 White perforated with aluminum solid louver

OPTIONS

See Fluorescent Information Section for generic **EM ballast**, **quick-connect**, and **mounting** options.
UP Uplight apertures (suspended, 2-lamp cross-sections only)

BALLAST TYPE

1-lamp electronic ballast
 2-lamp electronic ballast
 4-lamp electronic ballast
 (2) 2-lamp electronic ballast

VOLTAGE

120V
 277V
 120-277V
 347V

EB2(ADVANCE IOPA#P32-LW-SC)

AC CABLE 48"



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
 Architect: SERA Architects PC (PORTLAND)

Catalog Number:

DDI-4-232-WPR-AC CABLE 48"-EB2(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

Type:

L4

CLRPDX12-12667

DDI

DROP DIRECT/INDIRECT

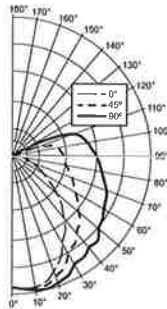
T5 | T8

PHOTOMETRY

Catalog #: **DDI-4-232-WPR**

TEST REPORT INFORMATION

- ▶ Test Report #: 11164.0
- ▶ Date: 08/17/01
- ▶ Lamp Type: F54T5HO/835
- ▶ Lamp Quantity: 1



CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
0°	0°	45°	90°	
0°	832.	832.	832.	
5°	840.	842.	844.	80.4
15°	817.	837.	861.	237.4
25°	709.	767.	826.	354.8
35°	570.	673.	775.	422.4
45°	425.	594.	753.	457.7
55°	271.	489.	685.	432.7
65°	153.	417.	641.	401.8
75°	71.	359.	586.	361.7
85°	12.	321.	542.	330.0
90°	0.	313.	521.	
95°	0.	297.	492.	303.9
105°	0.	247.	446.	233.0
115°	0.	23.	260.	78.9
125°	0.	0.	27.	6.4
135°	0.	0.	0.	0.0
145°	0.	0.	0.	0.0
155°	0.	0.	0.	0.0
165°	0.	0.	0.	0.0
175°	0.	0.	0.	0.0
180°	0.	0.	0.	

ZONAL CAVITY COEFFICIENTS

Room Cavity Ratio	Ceiling			.80			.70			.50		
	Wall	.70	.50	.30	.70	.50	.30	.50	.30	.10		
0	.72	.72	.72	.69	.69	.69	.64	.64	.64			
1	.64	.60	.57	.61	.58	.55	.53	.51	.49			
2	.58	.52	.47	.55	.50	.45	.46	.42	.38			
3	.53	.45	.40	.50	.44	.39	.40	.36	.32			
4	.48	.40	.34	.46	.38	.33	.36	.31	.27			
5	.44	.35	.29	.42	.34	.28	.31	.27	.23			
6	.40	.31	.26	.38	.30	.25	.28	.23	.20			
7	.37	.28	.23	.35	.27	.22	.25	.21	.17			
8	.34	.25	.20	.33	.24	.19	.23	.18	.15			
9	.32	.23	.18	.30	.22	.17	.20	.16	.13			
10	.29	.21	.16	.28	.20	.15	.19	.14	.12			

Effective Floor Cavity Reflectance = .20

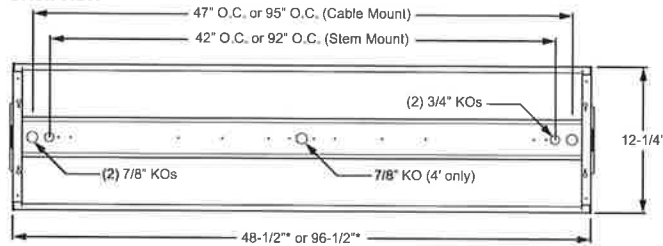
LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 - 30	673.	11.4	18.2
0 - 40	1095.	18.6	29.6
0 - 60	1985.	33.7	53.6
0 - 90	3079.	52.2	83.2
90 - 180	622.	10.5	16.8
Total Luminaire:			
0 - 180	3701.	62.7	100.0

Total Luminaire Optical Efficiency: 62.7%
 Spacing Criteria: End = 1.1, Diagonal = 1.3, Across = 1.4

FIXTURE DETAILS

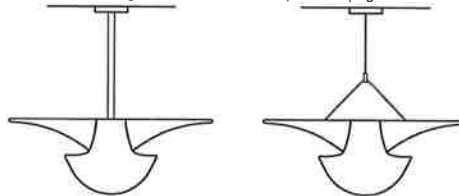
BACK VIEW



Overall length dimensions are for stand-alone unit with end caps. Units without end caps for continuous row mounting are 48" or 96" long.

SUSPENDED MOUNTING OPTIONS

The unique styling of the DDI is well-suited for pendant or cable mounting when ordered with optional upright.



SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L5

PROPOSED SUBSTITUTION HEW #29-4-232-A-CT-EB2(ADVANCE IOPA#P32-LW-SC)-UNV

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

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4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>Lisa Peltz</i>	
Date <i>1/1/14</i>	
Remarks	

The Construction Specifications Institute
Northwest Region

September 1997



Advancement
of Construction
Technology

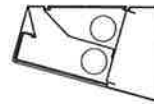
UP/DOWN WALL MOUNT**29****SUBMITTAL:****JOB:****TYPE:****VOLTAGE:**

EXAMPLE → **29** - **4** - **2** **32** - **A** - **OPTIONS** - **EB2** - **UNV**

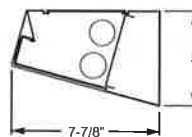
SERIES NOMINAL LENGTH TOTAL WATTAGE/ LAMPS TYPE SHIELDING OPTIONS BALLAST TYPE VOLTAGE

FEATURES

- ▶ Available with multi-level switching for up and/or down light.
- ▶ All-welded construction.
- ▶ Clear prismatic diffusers enclose both top and bottom lamps.
- ▶ Available in T8 or long twin tube lamps for design flexibility.
- ▶ Up to 80% optical efficiency.
- ▶ Versatile, durable fixture is ideal for many different applications.
- ▶ Ballast secured by two captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation.
- ▶ Custom colors available.
- ▶ This fixture is proudly made in the USA.



Shown with DL

**SPECIFICATIONS**

Housing – 20-gauge, die-formed, welded C.R.S.

Reflective Surfaces – 92% minimum average reflective white polyester powder coat on interior steel components.

Shielding – Clear prismatic acrylic top and bottom lens. Bottom lens with 15% DR additive.

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 – Electronic ballast standard, instant start T8, program start T5, rated Class P.

Mounting – Directly to wall.

Labels – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations.

ORDERING INFORMATION**SERIES**

29	Up/Down Wall Mount
-----------	--------------------

NOMINAL LENGTH

2	2'
3	3'
4	4'

TOTAL LAMPS

1 or 2

LAMP WATTAGE/TYPE**2' LAMP OPTIONS**

17	2', 17-watt T8
40TT	2', 40-watt long twin tube

3' LAMP OPTIONS

25	3', 25-watt T8
-----------	----------------

4' LAMP OPTIONS

32	4', 32-watt T8
-----------	----------------

SHIELDING

A	Acrylic
----------	---------

OPTIONS

For generic EM ballast options (must specify voltage), see Information section.

BLH	Black housing
NL130/EB1*UNV	Night light (13W)

OPTIONS (Continued)

CT	Closed top (down light only)
PS	Pull switch, single circuit (120V only)
DL-PS	Divided lamp compartment (2-lamp unit with single-circuit pull switch operating downlight. Uplight is operated via wall switch—120V only, requires EB1/1.)
DL-PS2	Divided lamp compartment (2-lamp unit with 2-circuit internal, 4-position pull switch operating both lamps—120V only, requires EB1/1)
GCO	Grounded convenience outlet (120V only)
GFCO	Ground fault convenience outlet (120V only)

BALLAST TYPE

EB1	1-lamp electronic ballast
EB2	2-lamp electronic ballast
EB1/1	(2) 1-lamp electronic ballasts

VOLTAGE

120	120V
277	277V
UNV	120-277V
347	347V

EB2(ADVANCE IOPA#P32-LW-SC)



Job Name:
University of Oregon (Master) - University of
Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

29 UP/DOWN WALL MOUNT

TEST REPORT INFORMATION

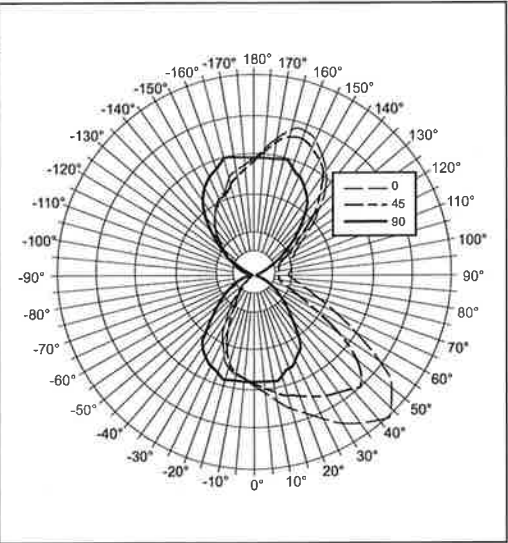
- ▶ Test Report #: 8361.0
- ▶ Date: 07/17/95
- ▶ Lamp Type: F32T8/735
- ▶ Lamp Quantity: 2

PHOTOMETRY INFORMATION

Catalog #: 29-4-232-A

CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle					Zonal Lumens
	0°	45°	90°	135°	180°	
0°	764.	764.	764.	764.	764.	72.9
5°	803.	786.	761.	742.	728.	
15°	959.	893.	778.	684.	645.	223.6
25°	1097.	941.	708.	500.	385.	333.3
35°	1275.	1026.	620.	288.	210.	414.6
45°	1408.	1111.	399.	120.	110.	459.6
55°	1207.	851.	243.	54.	48.	395.9
65°	709.	427.	145.	38.	17.	246.7
75°	456.	238.	57.	0.	0.	136.2
85°	301.	179.	15.	0.	0.	97.1
90°	249.	179.	0.	0.	0.	
95°	265.	201.	10.	29.	31.	114.3
105°	286.	196.	76.	67.	79.	137.5
115°	307.	201.	140.	99.	124.	166.5
125°	416.	357.	271.	219.	227.	264.0
135°	644.	600.	455.	363.	372.	367.9
145°	887.	845.	658.	519.	511.	425.4
155°	1046.	999.	776.	603.	589.	371.7
165°	1096.	1040.	862.	728.	681.	249.6
175°	929.	903.	835.	787.	764.	80.5
180°	838.	838.	838.	838.	838.	



LUMEN SUMMARY

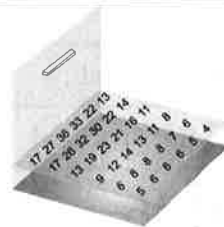
Zone	Lumens	% Lamp	% Fixture
0 - 30	648.	11.0	13.8
0 - 40	1078.	18.3	22.9
0 - 60	1950.	33.0	41.5
0 - 90	2457.	41.7	52.3
90 - 120	434.	7.4	9.2
90 - 130	709.	12.0	15.1
90 - 150	1526.	25.9	32.5
90 - 180	2245.	38.0	47.7
Total Luminaire:			
0 - 180	4702.	79.7	100.0
Total Luminaire Optical Efficiency: 79.7%			

ZONAL CAVITY COEFFICIENTS

	Room Cavity Ratio									
	Ceiling	.80			.70			.50		
Wall	.70	.50	.30	.70	.50	.30	.50	.30	.10	
0	.86	.86	.86	.80	.80	.80	.68	.68	.68	
1	.79	.75	.72	.73	.70	.67	.59	.57	.55	
2	.72	.66	.61	.66	.61	.57	.52	.49	.46	
3	.66	.58	.52	.61	.54	.49	.46	.42	.39	
4	.60	.51	.45	.55	.48	.42	.41	.37	.34	
5	.55	.46	.39	.51	.42	.37	.37	.32	.29	
6	.50	.41	.34	.47	.38	.32	.33	.28	.25	
7	.46	.37	.30	.43	.34	.28	.29	.25	.22	
8	.43	.33	.27	.40	.31	.25	.26	.22	.19	
9	.40	.30	.24	.36	.28	.22	.24	.19	.16	
10	.37	.27	.21	.34	.25	.20	.22	.17	.14	

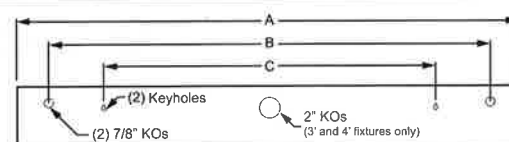
Effective Floor Cavity Reflectance = .20

FOOTCANDLE ESTIMATOR



Footcandle calculations based on standard reflectance of 80/50/20 and a light loss factor of .85.
Fixture installed at 8' mounting height in 12' x 12' room with 10'-0" ceiling. Values shown are at 36" work surface height.

BACKVIEW



	A	B	C
2' Unit	24-5/8" O.C.	19" O.C.	16" O.C.
3' Unit	36-5/8" O.C.	29" O.C.	32" O.C.
4' Unit	48-5/8" O.C.	42-1/2" O.C.	32" O.C.

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L6

PROPOSED SUBSTITUTION HEW #92-4-332-DR-WET/2-SSMB-EB3(ADVANCE IOPA#P32-LW-SG)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>H.Petz</i>	
Date <i>1/7/14</i>	
Remarks <i>Not location fixture required</i>	

**The Construction Specifications Institute
Northwest Region**

September 1997



**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center Architect: SERA Architects PC (PORTLAND)

92-4-332-DR-WET/2-SSMB-EB3(ADVANCE IOPA#P32-LW-SC)-UNV

Notes:

L6

CLRPDX12-12667

FULLY ENCLOSED INDUSTRIAL – 5" DEEP**92****SUBMITTAL:****T5 | T8****JOB:****TYPE:****VOLTAGE:**

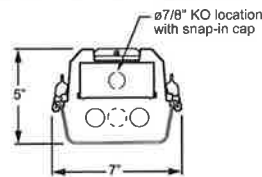
EXAMPLE

92 - 4 - 2 32 - A - OPTIONS - EB2 - UNV

▼	▼	▼	▼	▼	▼	▼	▼
SERIES	NOMINAL LENGTH	TOTAL WATTAGE/LAMPS	TYPE	SHIELDING	OPTIONS/ACCESSORIES	BALLAST TYPE	VOLTAGE

**FEATURES**

- ▶ Captive suitcase type latches ensure tight seal and reduce installation time and maintenance.
- ▶ NSF/ANSI Standard 2–Splash Zone certified.
- ▶ UL listed as fluorescent fixture suitable for wet location¹ when ordered with factory-installed watertight hubs.
- ▶ Dust and moisture resistant.
- ▶ Seamless thermo-set polyurethane gasket poured and formed in place to ensure tight seal.
- ▶ Ballast(s) secured by two captive bolts and nuts to ensure a tight, reliable fit for maximum heat dissipation.
- ▶ This fixture is proudly made in the USA.

**ORDERING INFORMATION****SERIES**

92 Fully Enclosed Industrial–5" Deep

NOMINAL LENGTH

2	2'
4	4'
8	8'

TOTAL LAMPS

1, 2, 3, 4, or 6 (1-, 2-, or 3-lamp cross-section)

LAMP WATTAGE/TYPE

17	2', 17-watt T8
32	4', 32-watt T8
54T5H	4', 54-watt T5HO (1- or 2-lamp cross-section only)
59	8', 59-watt T8 (1- or 2-lamp cross-section only)
86	8', 86-watt T8 (1- or 2-lamp cross-section only)

SHIELDING

A	High-impact clear acrylic with internal stipple (standard)
DR	50% DR high-impact diffuser
PC	100% polycarbonate diffuser

OPTIONS/ACCESSORIESFor generic EM ballast options (must specify voltage), see Fluorescent Information section.¹

WET/1'	(1) 1/2" watertight hub (factory-installed in end of housing) ¹
WET/2'	(2) 1/2" watertight hubs (factory-installed in ends of housing) ¹
WTT/1'	(1) 1/2" watertight hub (factory-installed in back of housing) ¹
WTT/2'	(2) 1/2" watertight hubs (factory-installed in back of housing) ¹

OPTIONS/ACCESSORIES (Continued)

TP ²	Injection-molded tamper-resistant latches ²
SS LATCH	Stainless steel latches
TP/SS LATCH ²	Tamper-resistant stainless steel latches ²
TP/PC LATCH ²	Tamper-resistant polycarbonate latches ²
SSMB	Stainless steel ceiling mounting brackets (2 per fixture)
SSMB/VBY/	Stainless steel mounting brackets with Y-hangers and suspension chain (2 per fixture) (specify length of chain)

BALLAST TYPE

EB1	1-lamp electronic ballast
EB2	2-lamp electronic ballast
EB3	3-lamp electronic ballast
EB4	4-lamp electronic ballast
EB4/2	(1) 4-lamp and (1) 2-lamp electronic ballast

VOLTAGE

120	120V
277	277V
UNV	120-277V
347	347V

EB3(ADVANCE IOPA#P32-LW-SC)

SPECIFICATIONS

Enclosure – Outer housing consists of polyester reinforced fiberglass. Internal brass studs secure channel to outer housing.

Internal Housing – 22-gauge die-formed C.R.S.

Latching – Injection-molded suitcase type latches.

Reflective Surfaces – 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.

Shielding – High-impact acrylic with DR additive. Internal stipple surface diffuses lamp image.

Electrical – Electronic ballast standard, instant start T8, program start T5, rated Class P.

Mounting – Surface or suspended.

Labels & Certifications – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations. UL/CUL listed as suitable for wet locations when specified with WET/_ or WTT/_ option.¹ NSF/ANSI Standard 2–Splash Zone certified.

¹ When specifying EM option, EM ballast for enclosed and gasketed fixtures is required for fixture to be suitable for wet locations.

² This option requires a tamper-resistant tool (must be ordered separately). Please specify quantity required per project.





Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Catalog Number:
92-4-332-DR-WET/2-SSMB-EB3(ADVANCE IOPA#P32-LW-SC)-UNV
Notes:

Type:
L6
CLRPDX12-12667

92 **FULLY ENCLOSED INDUSTRIAL - 5" DEEP**

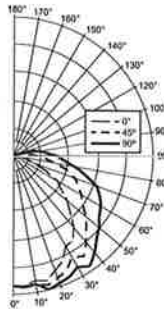
T5 | T8

PHOTOMETRY

Catalog #: 92-4-232-A-EB2

TEST REPORT INFORMATION

- ▶ Test Report #: 7849.0
- ▶ Date: 03/04/94
- ▶ Lamp Type: F32T8/735/RS
- ▶ Lamp Quantity: 2



CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0°	1038	1038	1038	
5°	1039	1045	1051	99.6
15°	1029	1064	1097	301.8
25°	917	999	1056	158.9
35°	818	964	1057	597.3
45°	630	807	923	613.8
55°	447	661	822	583.3
65°	279	556	750	532.4
75°	138	449	596	428.7
85°	36	274	402	268.7
90°	13	219	356	
95°	9	158	280	164.3
105°	9	92	179	97.3
115°	9	39	72	38.1
125°	9	21	31	17.5
135°	9	13	19	10.5
145°	9	11	17	7.4
155°	9	11	11	4.7
165°	0	0	0	0
175°	0	0	0	0
180°	0	0	0	0

ZONAL CAVITY COEFFICIENTS

Room Cavity Ratio	Ceiling			Wall			Floor		
	.80	.70	.50	.80	.70	.50	.80	.70	.50
0	.87	.87	.87	.84	.84	.84	.79	.79	.79
1	.78	.74	.70	.75	.72	.68	.67	.65	.62
2	.70	.64	.58	.68	.62	.57	.58	.54	.50
3	.64	.56	.49	.62	.54	.48	.51	.46	.42
4	.58	.49	.42	.56	.48	.41	.45	.40	.35
5	.53	.43	.36	.51	.42	.35	.40	.34	.30
6	.49	.39	.32	.47	.37	.31	.36	.30	.26
7	.45	.35	.28	.43	.34	.27	.32	.26	.22
8	.41	.31	.24	.40	.30	.24	.29	.23	.19
9	.38	.28	.21	.37	.27	.21	.26	.20	.16
10	.35	.25	.19	.34	.25	.19	.23	.18	.15

Effective Floor Cavity Reflectance = .20

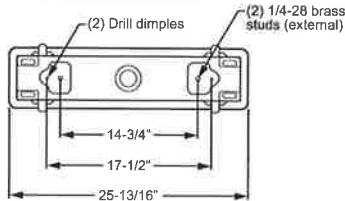
LUMEN SUMMARY

Zone	Lumens	% Lamp	% Fixture
0 - 30	860	15.1	20.4
0 - 40	1458	25.6	34.5
0 - 60	2655	46.6	62.6
0 - 90	3884	68.1	92.0
90 - 120	300	5.3	7.1
90 - 130	317	5.6	7.5
90 - 150	335	5.9	7.9
90 - 180	640	6.0	8.0
Total Luminaire:			
0 - 180	4224	74.1	100.0

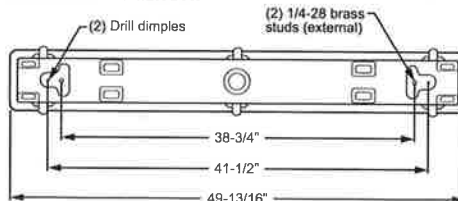
Total Luminaire Optical Efficiency: 74.1%
IES Spacing Criteria: Across = 1.5, Along = 1.2

FIXTURE DETAILS

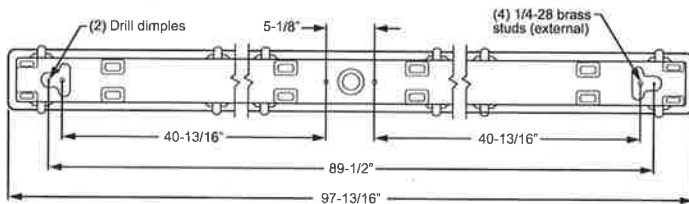
BACK VIEW - 2' LENGTH



BACK VIEW - 4' LENGTH



BACK VIEW - 8' LENGTH



OPTIONS & MOUNTING

<p>Integral 1/4-28 brass stud with nut and lock washer SSMB</p>	<p>"WTT" hub location (factory-installed option) "WET" hub location (factory-installed option)</p>	
<p>SSMB Stainless steel mounting bracket</p>	<p>WET_ or WTT_ Watertight hubs</p>	<p>SSMB/VBY Stainless steel mounting bracket with Y-hangers</p>

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Architectural Lighting Works

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L14

PROPOSED SUBSTITUTION Finelite #MU-O-4-LEDT8-3500K-SC-VOLT-FA50-FE

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input checked="" type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>Lisa Pelt</i>	
Date <i>1/7/14</i>	
Remarks <i>NO standardizes in T8 lamp</i>	

The Construction Specifications Institute
Northwest Region

September 1997



Advancement
of Construction
Technology



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Catalog Number:
MU-O-4-LEDT8-3500K-SC-VOLT-FA50-FE
Notes:

Type:
L14

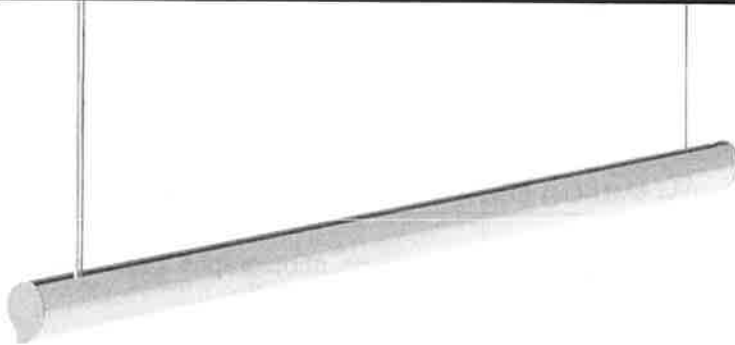
CLRPDX12-12667



FINELITE

LED T8

Muro-Oval Technical Sheet



Date

Project

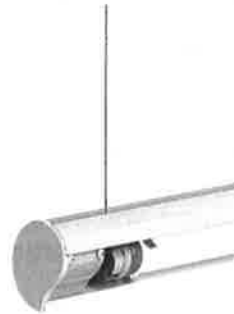
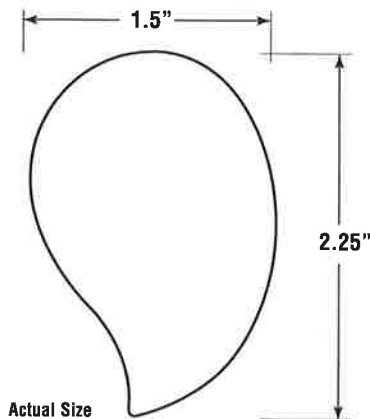
Type

Comments

DESCRIPTION

Muro-Oval is a slim LED accent luminaire delivering excellent illumination of vertical surfaces for interior applications. Advanced LED T8 module design makes Muro a powerful solution for highlighting your best vertical features efficiently.

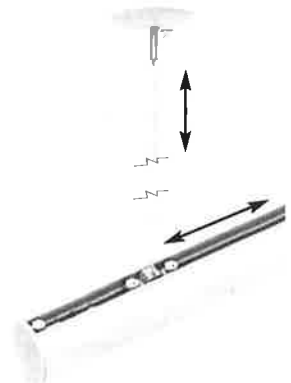
DIMENSIONS



LED MODULE

Muro utilizes an optimized LED T8 module with integral driver that is powered directly by standard 120V-277V. LED and driver module can be replaced as easily as a standard fluorescent lamp at end of useful life.

FULLY ADJUSTABLE TOP MOUNT CABLE GRIPPER

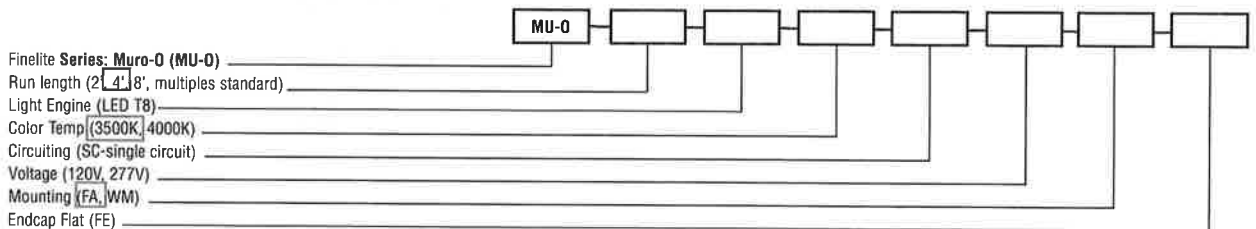


ADJUSTABLE MOUNTING:

Mounting points adjust along the entire length of the luminaire for added installation flexibility. Standard with fully adjustable cables.

ORDERING GUIDE

Sample Number: MU-O - 16' - LED T8 - 3500K - SC - 277 - FA - FE



Finelite, Inc. • 30500 Whipple Road • Union City, CA 94587-1530 • 510 / 441-1100 • Fax: 510 / 441-1510 • www.finelite.com

Due to continuing product improvements, Finelite reserves the right to change specifications without notice. Please visit www.finelite.com for most current data.

**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

MU-O-4-LEDT8-3500K-SC-VOLT-FA50-FE

Notes:

L14

CLRPDX12-12667



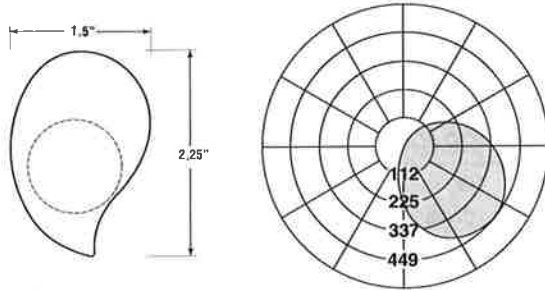
BUY AMERICAN ACT OF 2009 COMPLIANT

FINELITE

LED-T8

Muro-Oval Technical Sheet

PHOTOMETRY



Muro
57.3 Lumens Per Watt
1296 Lumens/22.6 Watts
CRI: 87
CCT: 4100K
ITL Report: 69522

CANDLEPOWER SUMMARY

	0	45.0	90.0	135.0	180.0	Flux
0	235	235	235	235	235	
5	282	271	235	194	174	22
15	346	314	226	122	81	62
25	396	343	208	52	5	93
35	429	356	183	2	0	119
45	446	356	153	0	0	140
55	449	344	117	0	0	151
65	435	320	76	0	0	152
75	403	285	36	0	0	141
85	364	243	5	0	0	122
90	344	224	0	0	0	
95	323	205	0	0	0	101
105	270	163	0	0	0	78
115	216	124	0	0	0	56
125	161	83	0	0	0	35
135	104	45	0	0	0	18
145	52	15	0	0	0	7
155	9	0	0	0	0	1
165	0	0	0	0	0	0
175	0	0	0	0	0	0
180	0	0	0	0	0	0

RUN LENGTH (Independent Pendant Luminaires*)



2ft Nominal Length



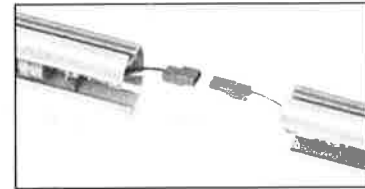
4ft Nominal Length



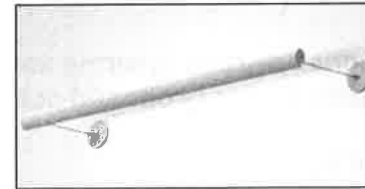
8ft Nominal Length

Note: Overall lengths include 0.125" thick at endcaps on each
* Add 3.75" to lengths above for stem mounting.

PLUG TOGETHER WIRING



WALL MOUNT OPTION (STEM MOUNTING)



SPECIFICATIONS

CONSTRUCTION: 6063-T6 extruded aluminum body with plug-together wiring standard. Wire enclosure brackets constructed of 16 gauge steel.

ENDCAPS: (FE) Flat endcap, aluminum die-cast endcap 0.125" at each end.

REFLECTORS: Gloss white 96% reflective.

ELECTRICAL: 120V or 277V prewired. Fixture and electrical components are ETL listed and ETL labeled.

FEED: 18 gauge straight cord standard.

LIGHT ENGINE: Muro (4100K) delivers 1296 lumens at 22.6W. LED T8 module with integrated internal driver. Philips EnduraLED modules are standard.

MOUNTING: (FA) 50" fully adjustable aircraft cable standard with safety stop. Contact factory for additional lengths up to 150". Flexible mounting bracket adjusts along the length of the luminaire to accommodate existing mounting points. Optional: (WM) Wall Mounted Stem bracket mounts directly to wall j-box, extends fixture 18" from wall. Other lengths available. Consult factory.

SUPPORT CABLES: Plated steel cable and hardware.

FINISHES: Finelite Signal White powder coat finish standard. Optional adders: Custom color available for housing and endcaps. Contact factory.

LENGTHS: 2', 4', and 8' section lengths can be combined to make longer runs. Contact factory for additional lengths.

WEIGHT: Fixture weight = 0.6 lb./ft.

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Kenall

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type L18

PROPOSED SUBSTITUTION HEW #AV8-8-232-WPC-EB4(ADVANCE IOPA#P32-LW-SC)-UNV

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

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4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

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Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives

Firm Name
128 NE 7th

Address
Portland, OR 97232

City, State, Zip
12-30-13

Date
503-445-6230

Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input checked="" type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>VPettis</i>	
Date <u>1/7/14</u>	
Remarks	

**The Construction Specifications Institute
Northwest Region**

September 1997



Job Name:

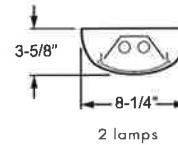
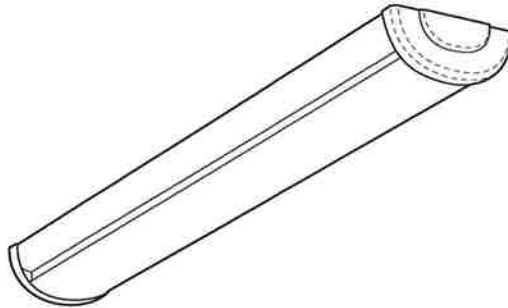
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

8" WIDE ARCHITECTURAL VANDAL WRAP

SERIES **AV8**
VOLTAGE TYPE JOB _____



SPECIFICATIONS

- HOUSING – Extruded, marine grade aluminum with die-cast end caps.
- SHIELDING – .150" thick polycarbonate lens. Lens is secured to housing with multiple tamper-resistant tri-groove screws.
- REFLECTIVE SURFACES – 92% minimum average reflective white powder coat on interior components.
- FINISH – Non-glare white polyester powder coated exterior textured finish with multi-stage iron/phosphate prepared metal.
- ELECTRICAL – Electronic ballast standard, instant start T8, programmed start T5, rated Class P.
- LABELS – UL/CUL listed as fluorescent luminaire suitable for dry or damp locations. UL/CUL listed for wet location under covered ceiling when specified with WET/CC option (surface mount only).
- MOUNTING – Surface, pendant, or corner.

FEATURES

- Ideal for schools, hallways, dormitories, locker rooms, or any other vandal prone areas.
- Marine grade aluminum housing designed to withstand harsh environments.
- Tamper-resistant screws provided to protect against vandals (optional TPST 1/4" drive socket available). Standard phillips head screws also provided.
- Die-cast end caps envelop the diffuser for added strength and durability.
- Extremely durable damage-resistant polycarbonate lens is standard.
- Versatile mounting options include surface, pendant, or vandal-resistant corner mount.
- Features easy row mount capability with integral alignment pieces.
- All parts painted after fabrication to facilitate installation, increase efficiency, and inhibit corrosion.
- This fixture is proudly made in the USA.

ORDERING INFORMATION

Submittal

EXAMPLE: **AV8** - **4** - **2** **32** - **CPC** - **OPTIONS** - **EB2** - **UNV**

SERIES
AV8 Architectural Vandal Wrap, 8" wide

NOMINAL LENGTH
4' 4"
8' 8"

TOTAL LAMPS
1 or 2

LAMP WATTAGE/TYPE
28T5S 4' 28-watt T5
32 4' 32-watt T8
54T5H¹ 4' 54-watt T5HO¹

SHIELDING
CPC Clear polycarbonate lens, .150" thick
WPC White polycarbonate lens, .150" thick

¹ T5H Fixtures are equipped with 90°C rated ballasts.

OPTIONS

- EM packs must be low profile. Not available with generic EM ballast options.
- WET/CC Wet location under covered ceiling (surface mount only)
- SWS(AV)12² Pendant swivel stem mount with 12" stem²
- SS(AV)12² Pendant stem mount with 12" stem²
- CMB Vandal-resistant corner mount (For dry and damp location only)
- C1B Quick-connect, wiring harness, single circuit

² Two stem sets required for 4' fixture. One additional stem set required for each 4' length when row mounted.

BALLAST TYPE³

- Ballast size restricted. Ballast and/or EM ballast sizes restricted to maximum ballast cross-section of 1-3/4" W. x 1-1/4" H.
- EB1 1-lamp electronic ballast
- EB2 2-lamp electronic ballast

VOLTAGE
120 120V
277 277V
UNV 120 - 277V
347 347V

³ This fixture requires a tamper-resistant tool (must be ordered separately). Please specify quantity required per project

EB4(ADVANCE IOPA#P32-LW-SC)



FLUORESCENT LIGHTING
Wrap Around page 19



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Catalog Number:
AV8-8-232-WPC-EB4(ADVANCE IOPA#P32-LW-SC)-UNV
Notes:

Type:
L18

CLRPDX12-12667

AV8
SERIES

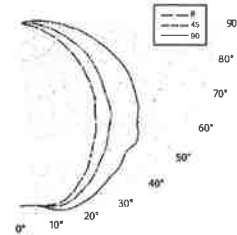
PHOTOMETRY INFORMATION

Williams Catalog #AV8-4-232-CPC-EB2
Test Report #13626 0, Dated 07/31/07

Lamp Type: F32T8/835/RS
Lamp Quantity: 2

CANDLEPOWER DISTRIBUTION

VERT ANG	HORIZONTAL ANGLE			ZONAL LUMENS
	0	45	90	
0	1116	1116	1116	
5	1113	1113	1113	106.2
15	1099	1128	1165	319.8
25	962	1035	1121	480.2
35	794	907	1052	575.7
45	631	775	1000	617.1
55	443	592	870	565.1
65	266	436	721	465.2
75	102	264	519	310.4
85	13	135	328	172.8
90	1	84	233	



ZONAL CAVITY COEFFICIENTS

EFFECTIVE FLOOR CAVITY REFL = .20

CEILING WALL RCR	.80			.70			.50		
	.70	.50	.30	.70	.50	.30	.50	.30	.10
0	75	75	75	73	73	73	69	69	69
1	68	65	62	66	63	60	60	58	56
2	62	56	52	60	55	51	52	49	46
3	56	50	44	55	48	44	46	42	39
4	52	44	38	50	43	38	41	37	33
5	47	39	33	45	38	32	36	32	28
6	43	35	29	42	34	28	33	28	24
7	40	31	25	38	30	25	29	24	21
8	37	28	22	35	27	22	26	22	18
9	34	25	20	33	24	19	24	19	16
10	31	23	17	30	22	17	21	17	14

LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% FIXTURE
0 - 30	906	15.4	24.4
0 - 40	1482	25.1	39.9
0 - 60	2664	45.2	71.7
0 - 90	3613	61.2	97.2
90 - 120	106	1.8	2.8
90 - 130	106	1.8	2.8
90 - 150	106	1.8	2.8
90 - 180	106	1.8	2.8
0 - 180	3718	63.0	100.0

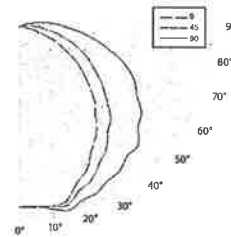
SPACING CRITERIA: END = 1.2 DIAG = 1.3 ACROSS = 1.4

Williams Catalog #AV8-4-154T5H-CPC-EB1
Test Report #13627 0, Dated 08/01/07

Lamp Type: FP54T5HO/835
Lamp Quantity: 1

CANDLEPOWER DISTRIBUTION

VERT ANG	HORIZONTAL ANGLE			ZONAL LUMENS
	0	45	90	
0	876	876	876	
5	880	874	874	83.5
15	875	894	921	253.6
25	765	819	885	380.0
35	641	725	846	461.3
45	510	619	807	495.4
55	358	482	716	461.1
65	213	360	607	385.9
75	80	231	452	269.0
85	9	119	292	150.4
90	2	77	217	



ZONAL CAVITY COEFFICIENTS

EFFECTIVE FLOOR CAVITY REFL = .20

CEILING WALL RCR	.80			.70			.50		
	.70	.50	.30	.70	.50	.30	.50	.30	.10
0	72	72	72	70	70	70	67	67	67
1	65	62	59	63	61	58	58	55	53
2	59	54	50	57	53	49	50	47	44
3	54	48	42	52	46	42	44	40	37
4	49	42	37	48	41	36	39	35	31
5	45	37	31	44	36	31	35	30	26
6	41	33	27	40	32	27	31	26	23
7	38	30	24	37	29	24	28	23	20
8	35	27	21	34	26	21	25	20	17
9	32	24	19	31	23	18	22	18	15
10	30	22	17	29	21	16	20	16	13

LUMEN SUMMARY

ZONE	LUMENS	% LAMP	% FIXTURE
0 - 30	717	14.3	23.6
0 - 40	1178	23.6	38.7
0 - 60	2135	42.7	70.1
0 - 90	2940	58.8	96.6
90 - 120	105	2.1	3.4
90 - 130	105	2.1	3.4
90 - 150	105	2.1	3.4
90 - 180	105	2.1	3.4
0 - 180	3045	60.9	100.0

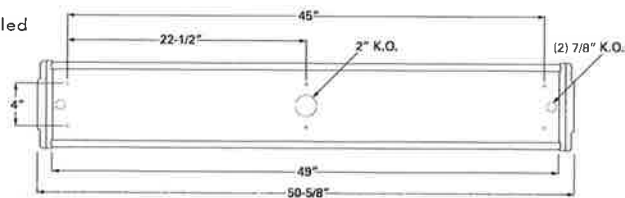
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MOUNTING OPTIONS

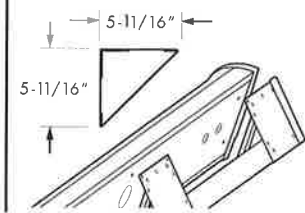
Visit our website for detailed mounting instructions:
www.hewilliams.com



H.E. WILLIAMS, INC.



CMB Dry and damp location only



SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Gotham

SECTION 26 51 00 **PAGE** 4 **PARAGRAPH** 2.1

DESCRIPTION Type R6

PROPOSED SUBSTITUTION HEW #LEDPSQ45-2000-35K-BLACK TRIM-ED*AD-VOLT

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

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Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature

Cascade Lighting Representatives
 Firm Name

128 NE 7th
 Address

Portland, OR 97232
 City, State, Zip

12-30-13
 Date

503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input checked="" type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>V. Petter</i>	
Date <i>1/7/14</i>	
Remarks <i>Flangeless trim required for wood application. Dimming required for future applications of R-6 fixture.</i>	

September 1997

The Construction Specifications Institute Northwest Region



Advancement of Construction Technology

**Job Name:**University of Oregon (Master) - University of
Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

4.5" SQUARE LED DOWNLIGHT

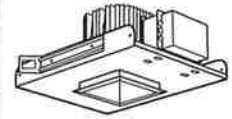
LEDPSQ45

SUBMITTAL:

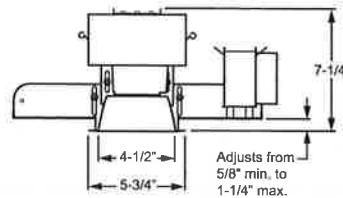
LED

JOB:**TYPE:****VOLTAGE:****EXAMPLE** LEDPSQ45 - 2000 - 40K - OPTIONS - ED*AD - 120

▼	▼	▼	▼	▼	▼
SERIES	LUMEN PACKAGE	MODULE COLOR TEMPERATURE	OPTIONS	DRIVER	VOLTAGE

**FEATURES**

- ▶ Philips' remote phosphor LED technology delivers an exemplary combination of light output, high-efficacy, and pleasing color.
- ▶ Rated for 50,000 hours at 70% lumen maintenance (L70).
- ▶ 1100-, 1300-, 2000-, or 2800-lumen Philips Fortimo module.
- ▶ 2700K, 3000K, 3500K, and 4000K color temperatures.
- ▶ LED module and driver accessible from below ceiling plane for ease of maintenance.
- ▶ Optional 0-10V dimming down to 10% light output available.
- ▶ Optional system-integrated emergency LED driver available.
- ▶ Finned, extruded aluminum, passive heat sink dissipates heat for superior thermal management.
- ▶ Delivers quality illumination in a small 4.5" aperture.
- ▶ Integral pan throat field-adjusts to accommodate ceilings up to 1-1/4" thick.
- ▶ Self-flanged aluminum reflector offers maximum optical performance and provides crisp, clean installation without unsightly light leaks.
- ▶ Adjustable hanger brackets with bar hangers standard.
- ▶ Sturdy one-piece pan construction.
- ▶ Easy-access 14-gauge galvanized steel junction box with two snap-on covers.
- ▶ This fixture is proudly made in the USA.

Pan Size: 11-1/4" x 14-3/4"
Ceiling Cutout: 5" square**SPECIFICATIONS**

Housing – 20-gauge die-formed galvanized steel pan/plaster frame with adjustable throat (5/8" to 1-1/4"). Extruded aluminum heat sink.

Reflector – Low-iridescent lower trim with clear satin finish.

LED Module & Driver – Powered by Philips Fortimo Gen 3 DLM LED module with Philips Advance Xitanium constant current, Class 2 driver.

Electrical – Prewired at factory for easy field installation. Integral thermal protector.

Mounting – Recessed.

Labels – cETLus conforms to UL STD 1598; Certified to CAN/CSA STD C22.2 No. 250.0. Suitable for damp locations.

Qualifications – RoHS compliant.

Warranty – 5-Year Parts Warranty provided by Philips on LED module and driver.

ORDERING INFORMATION**SERIES**

LEDPSQ45 4.5" Square LED Downlight

LUMEN PACKAGE (Must specify)

1100	Philips Fortimo DLM1100 LED module
1300	Philips Fortimo DLM1300 LED module
2000	Philips Fortimo DLM2000 LED module
2800	Philips Fortimo DLM2800 LED module

LED MODULE COLOR TEMPERATURE (Must specify)

27K	2700K
30K	3000K
35K	3500K
40K	4000K

OPTIONS

EM/BSL17C/1	Emergency LED driver (maximum 500 lumens module output in EM mode)
MWT	Matte white trim

DRIVER (Must specify)

ED*AD	Advance Xitanium LED driver prewired for non-dimming applications
EDD*AD	Advance Xitanium LED dimming driver prewired for 0-10V controls

VOLTAGE (Must specify)

120	120V
277	277V

BLACK TRIM



**Job Name:**University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

LEDPSQ45-2000-35K-BLACK TRIM-ED*AD-VOLT

Notes:

R6

CLRPDX12-12667

LEDPSQ45**4.5" SQUARE LED DOWNLIGHT**

LED

PHOTOMETRY INFORMATION

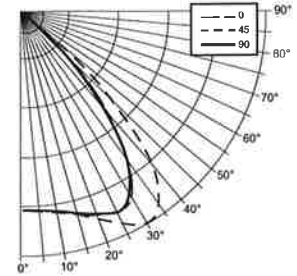
Catalog #: LEDPSQ45-2000-40K

TEST REPORT INFORMATION

- ▶ Test Report #: 100757988CHI-029
- ▶ Date: 06/27/12
- ▶ Lamp Type: LED
- ▶ Lamp Quantity: 1
- ▶ **Rated Lumens: 1710**
- ▶ **Watts: 28.3**
- ▶ **Lumens Per Watt: 60.4**
- ▶ **CRI: 80.9**
- ▶ **CCT: 3984K**

CANDLEPOWER DISTRIBUTION

Vertical Angle	Horizontal Angle			Zonal Lumens
	0°	45°	90°	
0°	780.	780.	780.	75.0
5°	783.	781.	782.	75.0
15°	824.	817.	819.	233.0
25°	868.	908.	866.	406.2
35°	750.	946.	733.	502.7
45°	362.	600.	346.	344.1
55°	58.	147.	54.	94.2
65°	25.	20.	25.	23.2
75°	10.	9.	10.	10.2
85°	11.	7.	12.	6.9
90°	1.	2.	3.	

**LIGHT CONE QUICK CALCULATOR TABLE**

Mounting Height (Ft)	FC at Edge of Cone	FC at Nadir	Cone Dia. (Feet)	
			Across	Diagonal
8	4.3	8.5	11.5	11.5
10	2.7	5.5	14.4	14.4
12	1.9	3.8	17.3	17.3
14	1.4	2.8	20.2	20.2
16	1.1	2.1	23.0	23.0
18	0.8	1.7	25.9	25.9
20	0.7	1.4	28.8	28.8

LUMEN SUMMARY

Zone	Lumens	% Fixture
0° - 30°	714.	41.8
0° - 40°	1217.	71.2
0° - 60°	1655.	96.8
0° - 90°	1696.	99.2
Total Luminaire:		
0° - 180°	1710	100.0
IES Spacing Criteria: Diagonal = 1.4 Across = 1.4		

FIXTURE PERFORMANCE DATA

Catalog Number	Lumen Output	Total Power (W)	Luminaire Efficacy	CCT (K)	CRI
LEDPSQ45-2000-40K	1710	28.3	60.4	3984	80.9
LEDPSQ45-2800-27K	2387	49.1	48.6	2713	81.8
LEDPSQ45-2800-40K	2475	45.3	54.7	4139	81.3



The U.S. Department of Energy's Lighting Facts® Program has verified product performance based on industry-standardized testing. For details, see H.E. Williams LEDPSQ45 at www.lightingfacts.com.



SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM RAB

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type S1

PROPOSED SUBSTITUTION Baselite #SFM-2-WG-PR4-49-20W(LED)

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Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>V. Patten</i>	
Date <i>1/7/14</i>	
Remarks <i>Wattage not equal. Lumen</i>	

The Construction Specifications Institute
Northwest Region



September 1997
 Comparison not provided to assess LED capability.
 Mounting is not clear. Fixture is to be wall mounted horizontally. SFMI would work if acceptable on a ceiling mount. To be accepted manufacturer must provide calculation of fixture and provide

information in writing that SFMI mounting or wall (horizontal position) is warranted.

**Job Name:**University of Oregon (Master) - University of
Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

S1

CLRPDX12-12667

S E R I E S - S F M

PREPARED BY: _____

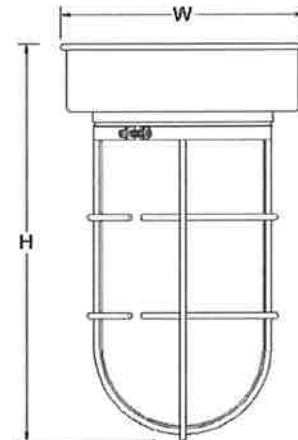
TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

**SFM1**

MOUNTING- ~~Ceiling mount.~~ Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

? Can this be wall mount as well? Need information in writing.

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION
					INC	CF	LED	
SFM	1	CG- Cast guard	CL3-3" clear	41-black	100W	26 or 32w	10W	7 3/4"H x 4 1/2"W
			FR3-3" frosted	42-dr. green				
			PR3-3" prismatic	43-red				
	2	WG- Wire guard	RE3-3" red	44-white	200w	42W	20W	9 1/2"H x 6"W
			BL3-3" blue	45-med. blue				
			GR3-3" green	46-yellow				
		AH3-3" amber	48-polish alum.				11"H x 6"W	
		Hyde	49-galvanized					
			50-navy blue					
			CL4-4" clear	51-arch.				
			FR4-4" frosted	52-patina				
			PR4-4" prismatic	53-rust				
			RE4-4" red	54-stucco				
			BL4-4" blue	55-sage				
			GR4-4" green	59-coppertone				
			AH4-4" amber	60-canal green				
			Hyde	61-anod. charcoal				
				62-anod. bronze				
				63-iron rust				

* Junction Box sold separately

PHONE: 877-999-1990
FAX: 877-999-1955

12260 EAST END AVE. CHINO, CA 91710



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

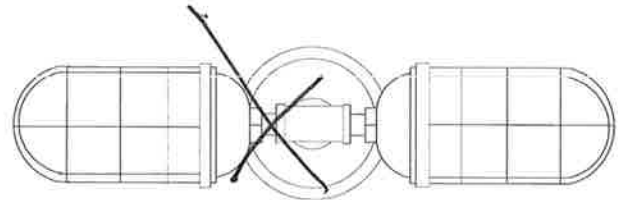
SERIES-VE

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED



FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

VE

NOT APPROVED

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION				
					INC	CF ¹	LED ¹						
VE	1	CG- Cast guard	CL3-3" clear	41-black	100W			E19	4 1/4"H x 25"W x 9" proj.				
			FR3-3" frosted	42-dr. green						26 or 32w	10W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.
			PR3-3" prismatic	43-red									
	2	WG- Wire guard	RE3-3" red	44-white	200w			E19	4 1/4"H x 25"W x 9" proj.				
			BL3-3" blue	45-med. blue						42W	20W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.
			GR3-3" green	46-yellow									
		AH3-3" amber	48-polish alum.										
		Hyde	49-galvanized										
			50-navy blue										
			51-arch.										
			52-patina										
			53-rust										
			CL4-4" clear	54-stucco									
			FR4-4" frosted	55-sage									
			PR4-4" prismatic	59-coppertone									
			RE4-4" red	60-canal green									
			BL4-4" blue	61-anod. charcoal									
			GR4-4" green	62-anod. bronze									
			AH4-4" amber	63-iron rust									
			Hyde										

¹REMOTE BALLAST

PHONE: 877-999-1990
FAX: 877-999-1955



12260 EAST END AVE. CHINO, CA 91710

**Job Name:**

University of Oregon (Master) - University of
Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

SFM-2-WG-PR4-49-20W(LED)

Notes:

S1

CLRDPX12-12667

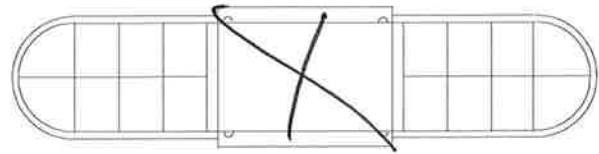
S E R I E S = H Z

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED

**HZ**

NOT APPROVED.

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION	
					INC	CF ¹	LED ¹		
HZ	1	CG- Cast guard	CL3-3" clear	41-black	100W			4"H x 21"W x 5" proj.	
			FR3-3" frosted	42-dr. green					
			PR3-3" prismatic	43-red					
				RE3-3" red	44-white	26 or 32w	10W	5 1/2"H x 30"W x 6 1/2" proj.	
				BL3-3" blue	45-med. blue				
				GR3-3" green	46-yellow				
			AH3-3" amber	48-polish alum.	200w		4"H x 21"W x 5" proj.		
			Hyde	49-galvanized					
				50-navy blue					
	2	WG- Wire guard	CL4-4" clear	51-arch.	26, 32 or 42W	20W	5 1/2"H x 30"W x 6 1/2" proj.		
								52-patina	
								FR4-4" frosted	53-rust
								PR4-4" prismatic	54-stucco
								RE4-4" red	55-sage
								BL4-4" blue	59-coppertone
			GR4-4" green	60-canal green					
			AH4-4" amber	61-anod. charcoal					
			Hyde	62-anod. bronze					
				63-iron rust					

¹REMOTE BALLAST

PHONE: 877-999-1990
FAX: 877-999-1955

12260 EAST END AVE. CHINO, CA 91710



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

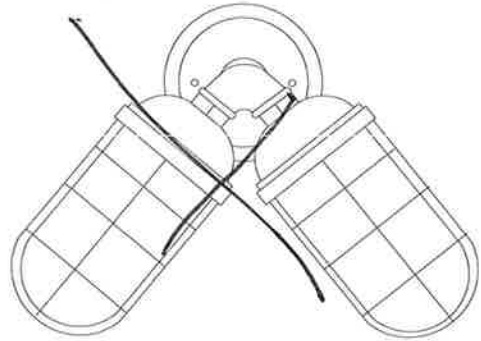
SERIES = VA

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED



VA

NOT APPROVED.

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION
					INC	CF	LED		
VA	1	CG- Cast guard	CL3-3" clear	41-black	100W			E16	10"H x 18"W x 6" proj.
			FR3-3" frosted	42-dr. green					
			PR3-3" prismatic	43-red					
	2	WG- Wire guard	RE3-3" red	44-white	200w	26 or 32w	10W	E16/ 1/2 WTM 1/2	10"H x 18"W x 6" proj.
			BL3-3" blue	45-med. blue					
			GR3-3" green	46-yellow					
			AH3-3" amber Hyde	48-polish alum.					
			CL4-4" clear	49-galvanized					
			FR4-4" frosted	50-navy blue					
			PR4-4" prismatic	51-arch.					
			RE4-4" red	52-patina					
			BL4-4" blue	53-rust					
GR4-4" green	54-stucco								
AH4-4" amber Hyde	55-sage	20W	E17/ 1/2 WTM 1/2	11 1/2"H x 20"W x 7" proj.					
	59-coppertone								
	60-canal green								
	61-anod. charcoal	26, 32 or 42W							
	62-anod. bronze								
	63-iron rust								

PHONE: 877-999-1990
FAX: 877-999-1955



12260 EAST END AVE. CHINO, CA 91710

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM RAB

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type S2

PROPOSED SUBSTITUTION Baselite #SFM-2-WG-FR4-49-20W(LED)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>HPetta</i>	
Date <i>1/7/14</i>	
Remarks <i>wattage not equal. Lumen comparison</i>	

The Construction Specifications Institute
Northwest Region



Advancement
of Construction
Technology

September 1997
not provided to assess LED capability for application.
Mounting is not clear. SFMI could work if acceptable on a wall mount.
To be accepted manufacturer must provide calculation of fixture and provide information in writing that SFMI mounting on wall is warranted.



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

SERIES-SFM

PREPARED BY: _____

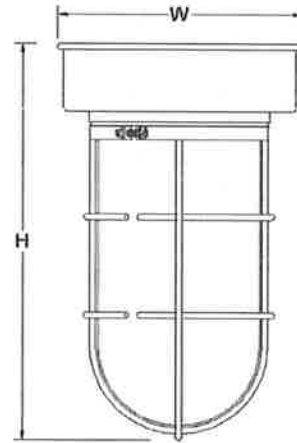
TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED.** A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.



SFM1

MOUNTING- Ceiling mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

WALL MOUNT REQUIRE. NEED INFORMATION in writing

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION
					INC	CF	LED	
SFM	1	CG-Cast guard	CL3-3" clear	41-black	100W			7 3/4"H x 4 1/2"W
			FR3-3" frosted	42-dr. green				
			PR3-3" prismatic	43-red				
	2	WG-Wire guard	RE3-3" red	44-white	200w	26 or 32w	10W	9 1/2"H x 6"W
			BL3-3" blue	45-med. blue				
			GR3-3" green	46-yellow				
		AH3-3" amber Hyde	48-polish alum.					
		CL4-4" clear	49-galvanized					
		FR4-4" frosted	50-navy blue					
		PR4-4" prismatic	51-arch.					
		RE4-4" red	52-patina					
		BL4-4" blue	53-rust					
		GR4-4" green	54-stucco					
		AH4-4" amber Hyde	55-sage					
			59-coppertone		42W	20W	11"H x 6"W	
			60-canal green					
			61-anod. charcoal					
			62-anod. bronze					
			63-iron rust					

* Junction Box sold separately





Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

SFM-2-WG-FR4-49-20W(LED)

Notes:

S2

CLRPDX12-12667

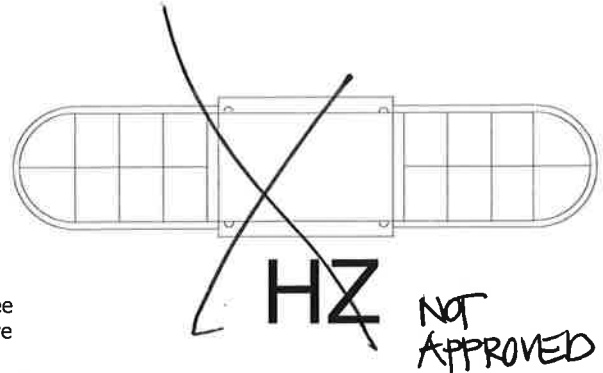
SERIES-HZ

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED



FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W.

Compact Fluorescent 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION
					INC	CF ¹	LED ¹	
HZ	1	CG- Cast guard	CL3-3" clear	41-black	100W			4"H x 21"W x 5" proj.
			FR3-3" frosted	42-dr. green				
			PR3-3" prismatic	43-red				
	2	WG- Wire guard	RE3-3" red	44-white	26 or 32w	10W	5 1/2"H x 30"W x 6 1/2" proj.	
			BL3-3" blue	45-med. blue				
			GR3-3" green	46-yellow				
	1	CG- Cast guard	GR3-3" green	48-polish alum.	100W			4"H x 21"W x 5" proj.
			AH3-3" amber	49-galvanized				
			Hyde	50-navy blue				
	2	WG- Wire guard	CL4-4" clear	51-arch.	200w		5 1/2"H x 30"W x 6 1/2" proj.	
			FR4-4" frosted	52-patina				
			PR4-4" prismatic	53-rust				
			RE4-4" red	54-stucco	26, 32 or 42W	20W	5 1/2"H x 30"W x 6 1/2" proj.	
			BL4-4" blue	55-sage				
			GR4-4" green	59-coppertone				
			AH4-4" amber	60-canal green				
			Hyde	61-anod. charcoal				
				62-anod. bronze				
				63-iron rust				

¹REMOTE BALLASTPHONE: 877-999-1990
FAX: 877-999-1955

12260 EAST END AVE. CHINO, CA 91710

**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Catalog Number:

SFM-2-WG-FR4-49-20W(LED)

Type:**S2**

Notes:

CLRPDX12-12667

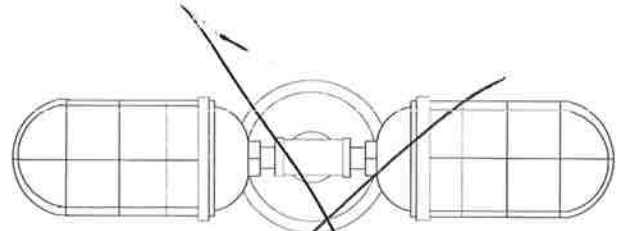
SERIES-VE

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED

**VE**

NOT APPROVED.

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION
					INC	CF ¹	LED ¹		
VE	1	CG- Cast guard	CL3-3" clear	41-black	100W			E19	4 1/4"H x 25"W x 9" proj.
			FR3-3" frosted	42-dr. green					
			PR3-3" prismatic	43-red					
				44-white	45-med. blue	26 or 32w	10W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.
	RE3-3" red	46-yellow							
	BL3-3" blue	48-polish alum.							
			GR3-3" green	49-galvanized	200w			E19	4 1/4"H x 25"W x 9" proj.
			AH3-3" amber	50-navy blue					
			Hyde	51-arch.					
			CL4-4" clear	52-patina					
			FR4-4" frosted	53-rust					
			PR4-4" prismatic	54-stucco					
			RE4-4" red	55-sage	42W	20W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.	
			BL4-4" blue	59-coppertone					
			GR4-4" green	60-canal green					
			AH4-4" amber	61-anod. charcoal	62-anod. bronze	63-iron rust			
			Hyde						

¹REMOTE BALLAST

PHONE: 877-999-1990
FAX: 877-999-1955



12260 EAST END AVE, CHINO, CA 91710



Job Name:

University of Oregon (Master) - University of
Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

SFM-2-WG-FR4-49-20W(LED)

Notes:

S2

CLRPDX12-12667

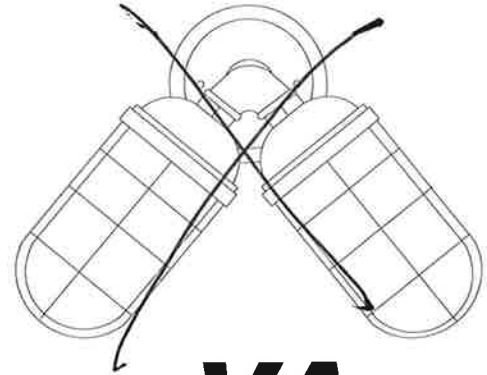
SERIES-VA

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED



VA NOT APPROVED

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION
					INC	CF	LED		
VA	1	CG- Cast guard	CL3-3" clear	41-black	100W			E16	10"H x 18"W x 6" proj.
			FR3-3" frosted	42-dr. green					
	PR3-3" prismatic	43-red	26 or 32w	10W	E16/ 1/2 WTM 1/2	10"H x 18"W x 6" proj.			
	RE3-3" red	44-white							
2	WG- Wire guard	BL3-3" blue	45-med. blue	200w			E17	11 1/2"H x 20"W x 7" proj.	
		GR3-3" green	46-yellow						
		AH3-3" amber Hyde	48-polish alum.	26, 32 or 42W	20W	E17/ 1/2 WTM 1/2	11 1/2"H x 20"W x 7" proj.		
		CL4-4" clear	49-galvanized						
		FR4-4" frosted	50-navy blue						
		PR4-4" prismatic	51-arch.						
		RE4-4" red	52-patina						
		BL4-4" blue	53-rust						
		GR4-4" green	54-stucco						
		AH4-4" amber Hyde	55-sage						
			59-coppertone						
			60-canal green						
			61-anod. charcoal						
			62-anod. bronze						
			63-iron rust						

PHONE: 877-999-1990

FAX: 877-999-1955



12260 EAST END AVE. CHINO, CA 91710

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM RAB

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type S3

PROPOSED SUBSTITUTION Baselite #SFM-1-CG-RE3-49-10W(LED)

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By <i>V. Petter</i>	
Date <i>1/7/14</i>	
Remarks <i>wattage not equal to specified fixture</i>	

The Construction Specifications Institute
Northwest Region

September 1997



Mounting is not clear; SFM would work if acceptable on a wall mount. To be accepted manufacturer must provide a calculation of fixture and provide information in writing that SFM mounting on wall is warranted.

**Job Name:**University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

SERIES-SFM

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

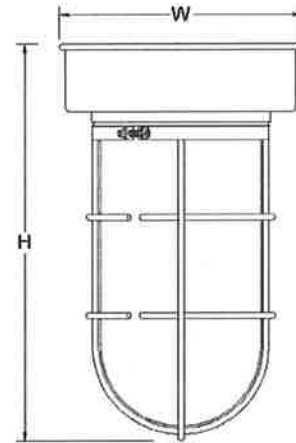
CERTIFICATION: UL LISTED

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.

MOUNTING- Ceiling mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

**SFM1**

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION
					INC	CF	LED	
SFM	1	CG- Cast guard	CL3-3" clear	41-black	100W			7 ¾"H x 4 ½"W
			FR3-3" frosted	42-dr. green				
			PR3-3" prismatic	43-red				
				RE3-3" red	44-white	26 or 32w	10W	9 ½"H x 6"W
				45-med. blue				
				46-yellow				
			BL3-3" blue	48-polish alum.	200w		9 ¾"H x 5 ¼"W	
			GR3-3" green	49-galvanized				
			AH3-3" amber Hyde	50-navy blue				
	2	WG- Wire guard	CL4-4" clear	51-arch.	42W	20W	11"H x 6"W	
			FR4-4" frosted	52-patina				
			PR4-4" prismatic	53-rust				
			RE4-4" red	54-stucco				
			BL4-4" blue	55-sage				
			GR4-4" green	59-coppertone				
	AH4-4" amber Hyde	60-canal green						
			61-anod. charcoal	62-anod. bronze				
			63-iron rust					

* Junction Box sold separately

PHONE: 877-999-1990
FAX: 877-999-1955

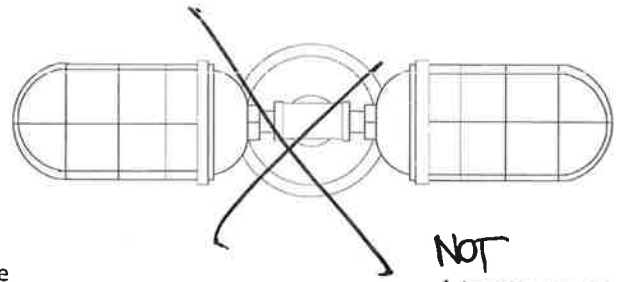
12260 EAST END AVE. CHINO, CA 91710

**Job Name:**University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

SERIES-VE

PREPARED BY: _____**TYPE:** _____**JOB NAME:** _____**CERTIFICATION:** UL LISTED**VE**

NOT APPROVED.

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.**LAMP HOLDERS**- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.**MOUNTING**- Wall mount. Fixtures are pre-wired with leads.**MATERIAL**- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION
					INC	CF ¹	LED ¹		
VE	1	CG- Cast guard	CL3-3" clear	41-black	100W			E19	4 1/4"H x 25"W x 9" proj.
			FR3-3" frosted	42-dr. green					
			PR3-3" prismatic	43-red					
				44-white	45-med. blue	26 or 32w	10W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.
	RE3-3" red	46-yellow							
	BL3-3" blue	48-polish alum.							
			GR3-3" green	49-galvanized					
			AH3-3" amber	50-navy blue					
			Hyde	51-arch.					
				52-patina					
				53-rust					
	2	WG- Wire guard	CL4-4" clear	54-stucco	200w			E19	4 1/4"H x 25"W x 9" proj.
FR4-4" frosted			55-sage						
PR4-4" prismatic			59-coppertone						
RE4-4" red			60-canal green	42W	20W	E19/ 1/2 WTM 1/2	5"H x 28"W x 10" proj.		
BL4-4" blue			61-anod. charcoal						
GR4-4" green			62-anod. bronze						
	AH4-4" amber								
			Hyde	63-iron rust					

¹REMOTE BALLASTPHONE: 877-999-1990
FAX: 877-999-1955

12260 EAST END AVE. CHINO, CA 91710

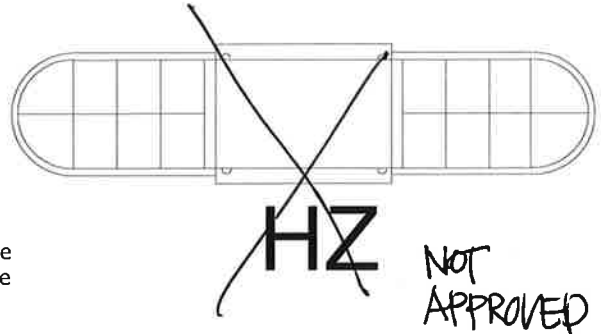
**Job Name:**University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

SFM-1-CG-RE3-49-10W(LED)

Notes:

S3

CLRDX12-12667

SERIES=HZ**PREPARED BY:** _____**TYPE:** _____**JOB NAME:** _____**CERTIFICATION:** UL LISTED**FINISH**-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.**LAMP HOLDERS**- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V. **LED**. A minimum of 60,000 hours to 100,000 expected life depending on installation location and ambient temperature.**MOUNTING**- Wall mount. Fixtures are pre-wired with leads.**MATERIAL**- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			DIMENSION
					INC	CF ¹	LED ¹	
HZ	1	CG- Cast guard	CL3-3" clear	41-black	100W			4"H x 21"W x 5" proj.
			FR3-3" frosted	42-dr. green				
	PR3-3" prismatic	43-red	26 or 32w	10W	5 1/2"H x 30"W x 6 1/2" proj.			
	RE3-3" red	44-white						
2	WG- Wire guard	BL3-3" blue	45-med. blue	200w			4"H x 21"W x 5" proj.	
		GR3-3" green	46-yellow					
			AH3-3" amber Hyde	48-polish alum.	26, 32 or 42W	20W	5 1/2"H x 30"W x 6 1/2" proj.	
			CL4-4" clear	49-galvanized				
			FR4-4" frosted	50-navy blue				
			PR4-4" prismatic	51-arch.				
			RE4-4" red	52-patina				
			BL4-4" blue	53-rust				
			GR4-4" green	54-stucco				
			AH4-4" amber Hyde	55-sage				
				59-coppertone				
				60-canal green				
				61-anod. charcoal				
				62-anod. bronze				
				63-iron rust				

¹REMOTE BALLASTPHONE: 877-999-1990
FAX: 877-999-1955

12260 EAST END AVE. CHINO, CA 91710



Job Name:
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

CLRPDX12-12667

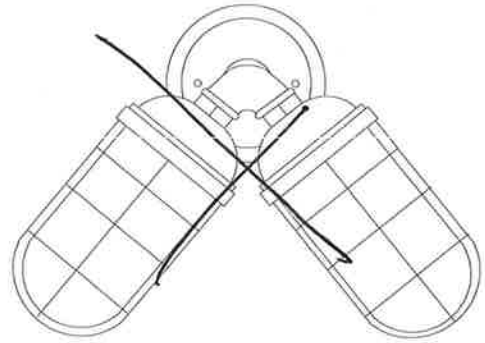
SERIES=VA

PREPARED BY: _____

TYPE: _____

JOB NAME: _____

CERTIFICATION: UL LISTED



VA
NOT APPROVED.

FINISH-Five stage pretreatment process, coated with a lead free TGI C polyester powder coat finish. Custom colors and Marine are available upon request.

LAMP HOLDERS- Accommodates **Incandescent** medium base porcelain socket, copper shell with nicked plate, rated 250V, 660W. **Compact Fluorescent** 4 pin heat resistant thermoplastic socket accommodates 26/32W (Gx24q-3 base) and 42W (Gx24q-4 base). Twist lock design provides for vibration and earthquake resistance, rated 75W, 600V.

MOUNTING- Wall mount. Fixtures are pre-wired with leads.

MATERIAL- Aluminum die cast

MODEL#	SIZE	GUARD	GLASS	FINISH	LIGHT SOURCE			MOUNTING	DIMENSION
					INC	CF	LED		
VA	1	CG-Cast guard	CL3-3" clear	41-black	100W			E16	10"H x 18"W x 6" proj.
			FR3-3" frosted	42-dr. green					
			PR3-3" prismatic	43-red					
	2	WG-Wire guard	RE3-3" red	44-white	200w	26 or 32w	10W	E16/ 1/2 WTM 1/2	10"H x 18"W x 6" proj.
			BL3-3" blue	45-med. blue					
			GR3-3" green	46-yellow					
			AH3-3" amber	48-polish alum.				E17	11 1/2"H x 20"W x 7" proj.
			Hyde	49-galvanized					
			CL4-4" clear	50-navy blue					
			FR4-4" frosted	51-arch.					
			PR4-4" prismatic	52-patina					
			RE4-4" red	53-rust					
			BL4-4" blue	54-stucco					
			GR4-4" green	55-sage					
			AH4-4" amber	59-coppertone					
Hyde	60-canal green								
	61-anod. charcoal	26, 32 or 42W	20W	E17/ 1/2 WTM 1/2	11 1/2"H x 20"W x 7" proj.				
	62-anod. bronze								
			63-iron rust						

PHONE: 877-999-1990
FAX: 877-999-1955



12260 EAST END AVE. CHINO, CA 91710

SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM Lithonia

SECTION 26 51 00 PAGE 4 PARAGRAPH 2.1

DESCRIPTION Type X2

PROPOSED SUBSTITUTION HEW #EXIT-G-AC-WHT

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By	
Date	
Remarks <i>Need to review drawings and verify mounting.</i>	

September 1997

Pendant mounting is required in some locations.



Advancement
of Construction
Technology



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

Notes:

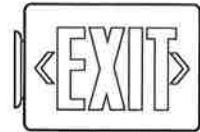
CLRPDX12-12667

LED EXIT SIGN **EXIT**

SUBMITTAL: _____

JOB: _____

TYPE: _____ **VOLTAGE:** _____



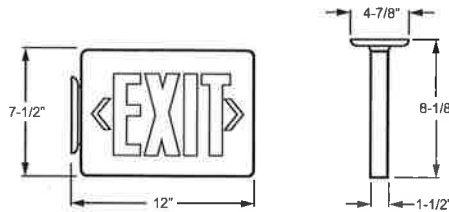
EXAMPLE → **EXIT - R - EM - WHT - OPTIONS**

SERIES LETTER COLOR POWER OPTIONS HOUSING COLOR OPTIONS/ACCESSORIES

SERIES

FEATURES

- ▶ Available as full-time AC powered unit or emergency unit with battery backup.
- ▶ LED lamp life of 25 years.
- ▶ Provided as universal single face/double face unit.
- ▶ Ni-Cad battery on emergency (EM) units provides 90 minutes of emergency operation.
- ▶ Automatic, low voltage disconnect (LVD) activates EM unit in event of partial power failure or brownout.
- ▶ Universal mounting canopy for top or side installation.
- ▶ Energy consumption of 3.2 watts for red letters and 3.8 watts for green letters.
- ▶ Charge rate/power on LED indicator light.
- ▶ Removable directional indicators.
- ▶ Available with industry-standard white or black housing.
- ▶ Custom messages available, consult factory for details.



EXIT SERIES

HOUSING — Injection-molded, VO flame retardant, high-impact thermoplastic housing.
ELECTRICAL — Universal transformer for 120 or 277 VAC operation.
MOUNTING — Universal mounting canopy included for top or side installation.

LETTER COLOR (Must specify)

R Red	G Green
--------------	----------------

POWER OPTIONS (Must specify)

AC AC operation	EM AC operation with emergency battery backup
------------------------	--

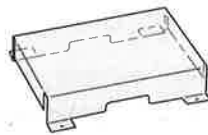
HOUSING COLOR (Must specify)

BLK Black	WHT Industry-standard white
------------------	------------------------------------

OPTIONS

COPY Consult factory for custom message	SALIDA Salida faceplate (industry-standard white only)
DC Dual circuit	SDT Self-diagnostic test

ACCESSORIES



PC1
Polycarbonate shield



WG
Wireguard

LABELS

Listed to UL 924 standard as an exit light suitable for dry or damp location.

Submitted by CASCADE LIGHTING REPRESENTATIVES

Catalog Number:

Type:



Job Name:

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

EXIT-G-AC-WHT

Notes:

X2

CLRPDX12-12667

EXIT

LED EXIT SIGN



SUBSTITUTION REQUEST

TO Lease Crutcher Lewis / Sera Architectures

PROJECT U of O Erb Memorial Union Craft Center

SPECIFIED ITEM LC&D

SECTION 26 09 23 PAGE 9 PARAGRAPH 2.9

DESCRIPTION Emergency Shunt Relay

PROPOSED SUBSTITUTION LVS #EPC-A

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of request. Applicable data is clearly identified.

Attached data also includes description of changes to Contract Documents the proposed substitution requires for proper installation.

Undersigned certifies following items, unless modified by attachments, are correct:

1. Proposed substitution does not affect dimensions shown on drawings.
2. Undersigned will pay for changes to building design, including engineering design, detailing, and construction costs caused by proposed substitution.
3. Proposed substitution has no adverse effect on other trades, construction schedule, or specified warranty requirements.
4. Maintenance and service parts available locally or readily obtainable for proposed substitution.

Undersigned further certifies the function, appearance, and quality of the proposed substitution are equivalent or superior to specified item.

Undersigned agrees to terms and conditions for substitutions found in Bidding Documents to this proposed substitution.

Submitted By:

Kim L Blessing
 Name (Printed or typed) *Kim L Blessing*

Signature
Cascade Lighting Representatives
 Firm Name
128 NE 7th
 Address
Portland, OR 97232
 City, State, Zip
12-30-13
 Date
503-445-6230
 Tel:

General Contractor (if after award of Contract)

For use by A/E	
<input type="checkbox"/> Approved	<input type="checkbox"/> Approved as noted
<input type="checkbox"/> Not Approved	<input type="checkbox"/> Received too late
By	
Date	
Remarks	

**The Construction Specifications Institute
Northwest Region**

September 1997



**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

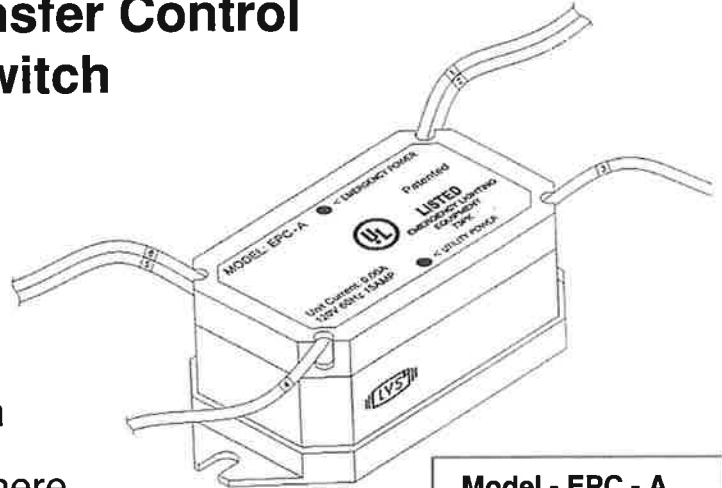
EPC-A

Notes:

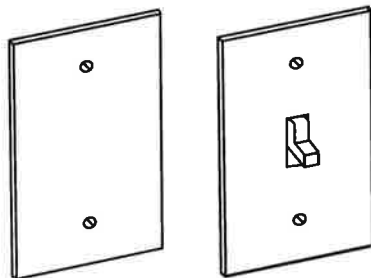
CLRPDX12-12667

LVS Invents Emergency Power Transfer Control without Test Switch

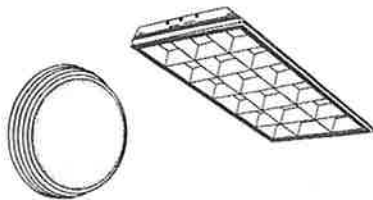
- Minimum size
- Maximum performance
- Fast, versatile installation
- Invisible & Accessible Anywhere



Model - EPC - A
2 3/4" x 1 1/2" x 1 1/4"



Behind wall switch or
Inside junction box with cover



Inside any size or type of luminaire

EPC-A

*The winner of the most innovative
new product award in
the control category at*

Lightfair 2003, New York

Emergency Luminaire Control Requirements

In the past, emergency luminaires powered by an emergency generator or inverter during a power outage had to be illuminated 24 hours a day, 7 days a week because of safety codes. However, these codes can now be met if a UL 924 listed emergency power transfer control is used to turn both regular and emergency luminaires on and off at the same time. During a utility power failure or room power interruption, only the designated emergency luminaires will illuminate automatically, regardless of room switch on or off position. LVS Emergency Power Controls have been tested, approved, and listed by Underwriters Laboratories under UL 924 standards for designated emergency light fixture controls. They meet and exceed all pertinent code requirements from NEC, NFPA, OSHA, and life safety codes, in addition to major local codes.

Automatic Diagnostic Test Feature

Model EPC-A is equipped with an automatic diagnostic test feature, which is initiated when the room switch is momentarily turned on and then off. This simple, effortless test procedure will turn the emergency luminaires on for 15 seconds, indicating that an emergency power source is available and that the Model EPC-A, ballast, and lamp are all functioning correctly. At all other times the room switch operates normally by turning both regular and emergency luminaires on at the same time. Another unique advantage of the Model EPC-A is that it leaves only the emergency luminaires on for an additional 15 seconds after regular luminaires are turned off, providing safety and convenience while leaving the area.

5-Year Limited Warranty

**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

EPC-A

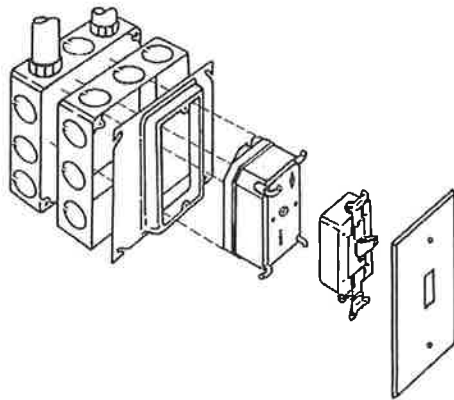
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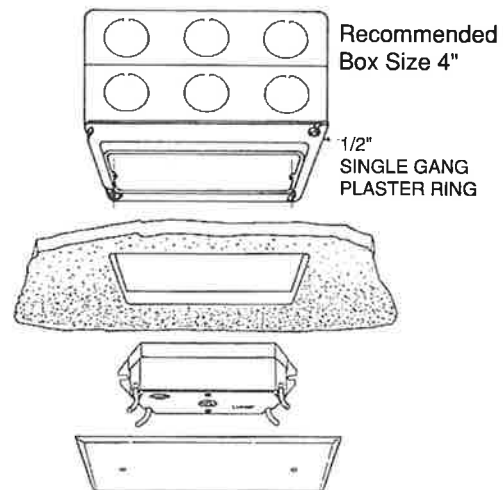
Installation

In order to install the EPC-A in accordance with national/local code requirements, a qualified electrician should review and understand the installation instructions: Check voltage and current requirements. Verify and lock out circuit breakers on both normal power and 24 hours emergency circuit. Install a self-adhesive 2" x 3" caution label in each fixture or load controlled by an EPC-A unit cautioning that this load is supplied from 2 different power sources, regular and emergency. Review wiring diagram and connect wires, one group at a time, in accordance with the numeric identification. In order to provide a safe light level, when regular power is interrupted, it is recommended that a minimum of two 4' fluorescent tubes providing approximately 5000 lumen are controlled by a 24 hour emergency circuit and are spaced no farther than 24' in any direction from each other in a normal 9' white ceiling environment. The EPC-A is a universal type unit, convenient and fast to install virtually anywhere.

EPC-A Installation behind Wall Switch



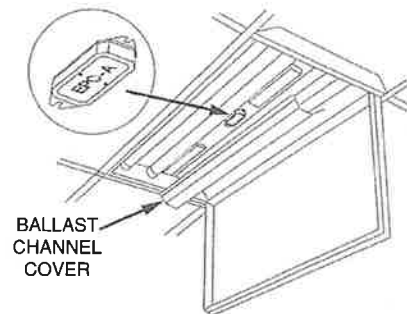
EPC-A Wall or Ceiling Installation



EPC-A is a universal mount unit, and if installed inside junction box remove mounting ears with side cutters. When total depth of 4" square box is 3-1/2" deep, box can accommodate up to 16 #12 gauge incoming conductors, 2 commercial 20 amp switches, and 1 EPC-A with 6 conductors, meeting all N.E.C. code requirements.

Generally power corrected electronic ballasts create high current surges.
Recommended electronic ballast load:
1500 watt, 120V & 277V

EPC-A is equipped with 2 mounting ears, double sided adhesive tape. In addition to adhesive tape, 1 mounting ear must be securely fastened.



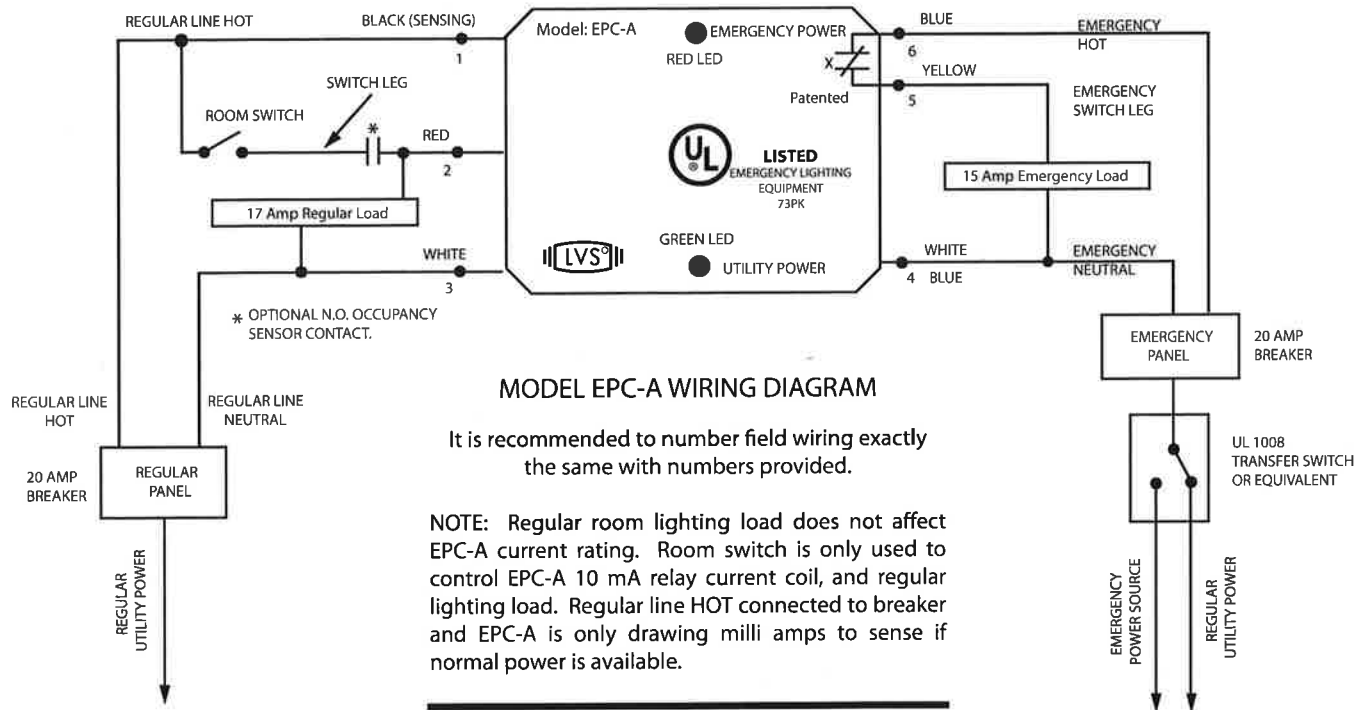
**Job Name:**

University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
Architect: SERA Architects PC (PORTLAND)

EPC-A

Notes:

CLRPDX12-12667



Emergency Power Source and Method of Operation

The emergency luminaire power is derived from a 24 hour emergency power distribution panel. The local utility company normally supplies the power to this panel, but during a utility power failure this panel is automatically switched over to a local emergency power source such as a generator or inverter. This transfer is accomplished by a UL 1008 transfer switch or an equivalent. The room switch turns on and off both regular and emergency luminaires simultaneously by having the room switch leg activate the Emergency Power Control. Wire input #1 is connected internally to a sensing circuit. During a power interruption, this circuit causes contact X to drop into a N.C. position. Review wiring schematic for details.

Initial Testing and Trouble Shooting of EPC-A

The EPC-A is equipped with a green LED which indicates if regular utility power is available and field wiring is connected correctly. The red LED on the EPC-A has the same function for emergency power in a new installation. These LED's should be left visible by leaving covers off and then proceed by turning on regular breaker first and check if all green LED's are illuminated. Turn on the emergency breaker and check if all red LED's are illuminated. The above test will confirm the correct wire connections and continuity to branch panels and emergency panels.

Emergency and Regular Luminaires Test

Model EPC-A is equipped with an automatic diagnostic test feature which is initiated when the room switch is momentarily turned on and then off. This simple, effortless test procedure will turn the emergency luminaires on for 15 seconds, indicating that an emergency power source is available and that the Model EPC-A, ballast, and lamp, are all functioning correctly. At all other times the room switch operates normally by turning both regular and emergency luminaires on at the same time. Another unique advantage of the Model EPC-A is that it leaves only the emergency luminaires on for an additional 15 seconds after regular luminaires are turned off, providing safety and convenience while leaving the area. If any emergency light fixture has failed to illuminate, check power, fixture and the EPC-A device, and replace the defective item. Now turn off the main facility breaker at a convenient time. This will automatically start the emergency generator or inverter. Transfer switch will automatically switch all emergency panels to emergency generator power, and all emergency light fixtures will then be illuminated.

Maintenance

No maintenance is required to keep the EPC-A device functional. However, regular testing procedure should be used when either the lamps or ballasts have been replaced or when facility remodeling has taken place.



Job Name:

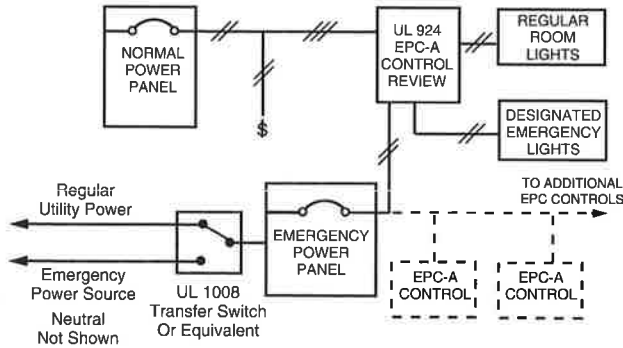
University of Oregon (Master) - University of Oregon - Erb Memorial Union Craft Center
 Architect: SERA Architects PC (PORTLAND)

EPC-A

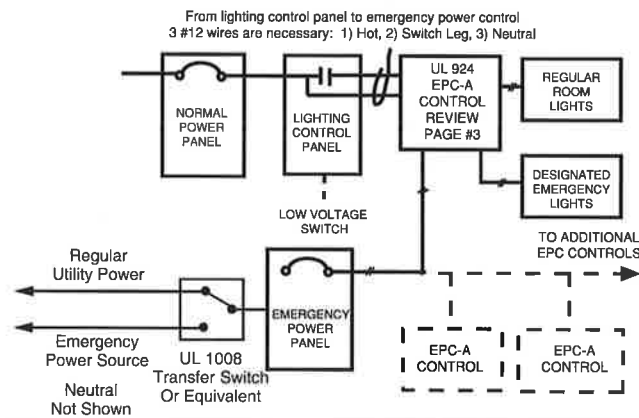
Notes:

CLRPDX12-12667

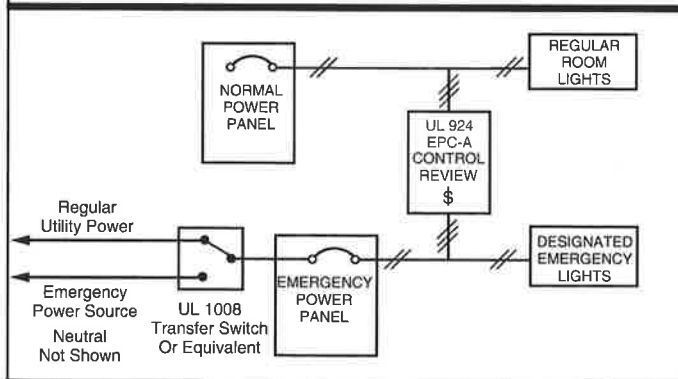
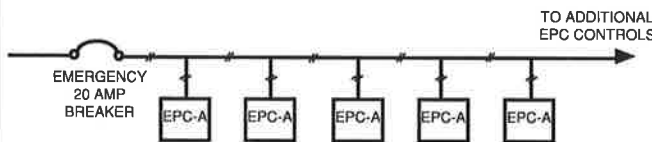
**STANDARD LINE VOLTAGE SWITCHING
 LINE DRAWING**



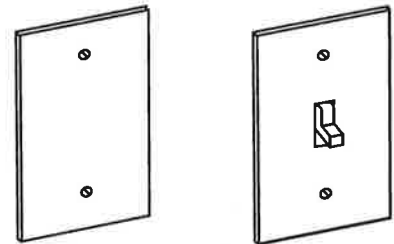
**RELAY PANEL LOW VOLTAGE SWITCHING
 LINE DRAWING**



On a 20 Amp circuit, 1 emergency power control (Model EPC-A) can control up to 15 Amp of emergency lighting load, or 15 emergency power controls can each control 1 amp of emergency lighting load.



- Emergency Power Transfer Control
- Invisible & Accessible Anywhere
- Fast, versatile installation
- Maximum performance
- Minimum size



Behind wall switch or
 Inside junction box with cover



Inside any size or type of luminaire

Features

- Regular Power & Emergency Power
- Testing LED Indicators
- Automatic Diagnostic Feature
- 15 Amp N.C. UL contact rating
- High Voltage surge protectors

General Specifications

UL94V-0 Flame Rating on all EPC products.
 Safe for installation above suspended ceiling.
 Shipping Weight: 8 oz. Temp.: 10-150 F
 Color: Black Size: 2-3/4" x 1-1/2" x 1-1/4"

5 YEAR WARRANTY



**LVS, Inc. 2555 Nicholson St.,
 San Leandro, CA 94577
 Tel: 1-800-982-4587
 Fax: 1-510-352-6707**