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**Midwestern State University**

**Health Science & Human Services Center**

**RSA Project No. 1612.00**

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PART 1 - GENERAL

1.1 DESCRIPTION

A. The following list is a compilation of materials and products that are standards for this Project.

1. It is intended to extend information in the technical specification sections by giving specific texture, finish, manufacturer, and model number of finish products, and to link the Specifications with the Drawings.

B. Where other manufacturers are listed herein or in other sections of the Project Manual/Specifications as acceptable, products of these may be submitted for evaluation by the Architect. However, determination by the Architect regarding equivalency will be made on a product-by-product basis and the listing of a manufacturer as acceptable may not necessarily imply that the particular product submitted will be accepted as an equivalent. Refer to section 012500 Substitutions for additional information.

PART 2 - SUMMARY OF FINISHES

DIVISION 03 - CONCRETE

DIVISION 04 - MASONRY

2.1 04 20 00 Unit Masonry

A. Face Brick

1. Description: 8” modular face brick. Provide solid brick and special shapes as required to construct the project.

2. Acceptable Products:

   a. BR-1 (Option 1): Brick product by Cloud Ceramics.
      1) 40% Driftwood Grey
      2) 40% Terra Cotta
      3) 10% Cimarron
      4) 5% Old Rose
      5) 5% Cameo

   b. BR-2 (Option 2): Brick product by Acme Brick, Ft. Worth, TX
      1) Brick product by Acme Brick, Ft. Worth, TX that matches the campus blend to be determined between the Architect, CMAR and Acme Brick Co.

3. Joint Type: Concave, tooled.


5. Bond: Place units in running bond unless noted otherwise on the drawings.

   a. Provide accents in soldier, rowlock and stretcher courses where indicated on drawings.

6. Provide samples and mock-up

B. Mortar Color: To be selected by Architect from any manufacturers’ full and complete color lines. Provide four mortar colors on mock-up as directed by Architect for selection. Upon final selection, rake unapproved mortar colors from mock-up and replace with approved color for Architect’s final approval. Generally, the intent is to match the campus standard mortar color.
2.2 04 72 00 Cast Stone Masonry
   A. Cast Stone Plinths, Belt Courses, Banding, Sills, Headers, Coping and Miscellaneous Trim Pieces as indicated on the drawings.
   B. Color and Texture: Custom color to match Architect’s sample.
   C. Samples and Mock-up: Submit partial and/or full sized samples of each shape and size in the approved color for Architect’s approval. Install approved color pieces on mock-up for Architect’s approval prior to fabricating pieces to be installed on the project.
   D. Mortar Color: To be selected by Architect from any manufacturers’ full and complete color lines. Provide four mortar colors on mock-up as directed by Architect for selection. Upon final selection, rake unapproved mortar colors from mock-up and replace with approved color for Architect’s final approval. Generally, the intent is to match the campus standard mortar color.

DIVISION 05 – METALS

2.3 05 50 00 Metal Fabrications
   A. Refer to Sections 05 50 00, 09 91 00 and 09 97 13.
   B. Finish: Paint. Refer to individual spec sections, section 055000 schedule, finish plans and other drawings for type of painted finish.
   C. Color: to be selected by Architect.

2.4 05 51 00 Metal Stairs
   A. Refer to Sections 05 51 00 and 09 97 13.
   B. Finish: Epoxy paint, ref. 09 97 13
   C. Color: to be selected by Architect.
   D. Offset: Offset top riser one tread width to allow continuous curved handrail and guardrail at inside switchbacks.

2.5 05 51 33 Metal Ladders:
   A. Refer to Sections 05 51 33 and 09 97 13.
   B. Finish: Epoxy paint, ref. 09 97 13
   C. Color: to be selected by Architect.

2.6 05 52 13 Pipe and Tube Railings
   A. Refer to Sections 05 52 13 and 09 97 13.
   B. Finish: Epoxy paint, ref. 09 97 13
   C. Colors: to be selected by Architect. Note: all pipe and tube railings shall be two color paint combination. Confirm final colors and locations of each color with Architect.

2.7 05 73 00 Decorative Railings
   A. Exterior Handrails and Guardrails at Entrance Steps and other locations as indicated on drawings:
      1. Design: refer to drawings for type and locations.
      a. Handrails at Building Entrances: Stainless steel 1 ½” diameter handrails meeting required codes at all entrances.
      b. Guardrails at Grade Changes or Entrances: Stainless steel 1 ½” diameter guardrails and handrails with intermediate members as required to meet required codes and 4” sphere limitation. If intermediate members are not indicated on drawings, submit request to Architect for clarification.
      2. Finish: Brushed stainless steel, # 4 finish.
   B. Interior Grand Stair & Elevated Balcony Railings:
cable infill at 3 ¼” on center. Substitutions will be considered by the Architect on a case by case basis.

a. **Materials:** Type 304 or 316 (as recommended by manufacturer) 1-1/2-inch stainless steel guardrail and handrails.

b. **Mounting at Base:**
   1. **First Floor Grand Stair and Second Floor Balcony Railing at East Atrium 100** - Install with four 1” diameter brushed stainless steel standoffs attached to side of stringer or concrete slab edge using 6”W x 8”H x ¼” thick stainless steel plates welded to verticals.
   2. **All other locations U.N.O.** – Weld stainless steel base plate to bottom of verticals and bolt to floor with stainless steel anchor bolts. Confirm final mounting type to floor with Architect prior to fabrication.

c. **Verticals:** Two 2” wide vertical stainless steel bars with cube cap top and side mount base as described in item b. at bottom. Locate posts no further than 4’ on center at equal distances.

d. **Infill panels:** 1 x 19 type weave, 3/16” stainless steel horizontal rope cables in SS316 alloy at 3 ¼” on center. Provide tensioners at ends and other locations as required to maintain a tight horizontal look with no cable deflection between verticals.

e. **Finish:** # 4 brushed stainless steel.

f. **Power:** N/A.

g. **Lighting:** N/A.

h. **Below Staircase Base (Cane) Railing:** N/A.

i. **Height:** 42” to top of guardrail. Refer to drawings and TAS requirements for handrail heights.

**DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

**2.8 06 20 23 Interior Finish Carpentry**

A. **Stain Grade Wood Millwork and Trim:**
   1. **Species:** Select American Cherry AWI Premium Grade A wood to match Architect’s sample.
   2. **Cut & Grain:**
      a. **Select American Cherry:**
         1) 80% sap free on finish side of wood
   3. **Finish:** Shop (paint booth) applied oil based stain with catalyzed lacquer finish; level 80 sheen to match Architect’s sample. Refer 09 91 00 and Architect’s Finish Selection Summary Spreadsheet.
      a. Project requires the highest quality millwork finish available with finish applied at a millwork shop in a paint booth, not field applied.
      b. **Approved hardwood suppliers:**
         1) The Wood Gallery – 10724 Goodnight Ln., Dallas 75220, ph. 972.869.9161
         2) Dakota Hardwoods – 641 W. Mockingbird Ln., Dallas, TX 75247, ph. 972.677.7437, contact: Scott Brant
         3) Substitutions – to be approved by Architect.
      c. **Approved finishers:**
         1) Submit qualifications and samples of work from proposed finishing sub for Architect approval.
   4. **WP-4:** 4” Stain Grade Wood Chairrail – TWC # CH066

B. **Paint-Grade Millwork and Trim:**
   1. **Species:** Poplar above 8’ AFF; Maple below 8’ AFF.
   2. **Finish:** Oil based enamel sprayed-on finish including final touchup (no brush marks; no exceptions!). Refer 09 91 00.
   3. **Color & Sheen:** Refer to Architect’s Finish Selection Summary Spreadsheet.
C. **Stain Grade Wood Micro-Perforated Acoustical and Non-Perforated Wood Paneling** (for use on East Atrium/Lobby 100 walls):

1. **Basis of Design:** Architectural Components Group, Inc. Marshfield, MO, Ph. 417.869.6777. Local Rep., Blake Peterson of Designed Performance Associates, Richardson, TX, Ph. 972.381.9100.
2. Other manufacturers’ products of equal quality will be considered by the Architect. Submit substitution request.
3. **Acceptable Product:** SS1-1215-C Quarter Sawn Cherry. Matching wood panels to match Architect’s sample with and without micro-perforations/acoustical backing at locations indicated on drawings.
4. **Species & Finish:** Quarter Sawn Select American Cherry stained and with clear satin sheen to match Architect’s sample; turn grain vertically.
5. **Perforation Pattern:** Offset pattern to be selected by Architect from manufacturer’s full and complete product lines and patterns.
6. **Perforation:** .05 mm holes spaces 1.9 mm on center offset.
7. **Overall Perforated Acoustical Panel Thickness:** 2 inches
   a. Thickness of Wood Panel: 3/4 inches
   b. Thickness of Acoustical Backing: 1 1/2 inches
8. Provide light gage metal framing, blocking and shims as required to install panels and align face of acoustical panels with non-acoustical panels
9. **AWI Quality Level Required:** Premium Grade
10. **Panel Sizes:** Refer to drawings.
11. **Acoustical Backing:** Factory attach to back of panels.
12. **Fire Rating:** Class 1(A)
13. **FSC Certification Requirement:** none required.
14. **Construction:** No urea formaldehyde allowed in the construction of panels.
15. **Attachment:** Standard Z clips.

D. **Wood Paneling and Flooring at Learning Stair**

1. **Species:** American Cherry to match Architect’s sample.
2. **Grade:** AWI premium grade.
3. **Risers:** Veneered ¾” plywood.
4. **Treads:** Matching 25/32” random length tongue and groove wood flooring.
5. **Finish:** Match Architect’s sample. Provide appropriate clear coat finish and thickness for heavy foot traffic.

2.9 06 41 00 Custom Casework

A. **Stain Grade Wood Casework:** meet same requirements including shop (paint booth) finishing (not field applied) as stipulated in 06 20 23 Interior Finish Carpentry.

B. **Plastic Laminate:**
   1. **Laminate:** Refer to Section 06 41 00.
   2. **Products:**
      a. **PL-1:** Arborite P391-CA, Type 4 or better, “Ruched Chiffon”.
      b. **PL-2:** Additional laminates as selected by the Architect from any of the manufacturers listed in 06 41 00 full and complete lines of products.
   3. **Sheen:** to be selected by the Architect from the full line of sheens available from any of the manufacturers listed in this section. Refer to Architect’s Finish Selection Summary Spreadsheet.
   4. **Quality:** AWI Custom Grade.

2.10 06 61 16 Solid Polymer Fabrications

A. **Material Only Allowance:** $35/SF

B. **Thickness:** 3 CM

2.11 06 82 13 Glass Fiber Reinforced Plastic Paneling

A. **Basis of Design:** Marlite
B. **Fire Rating:** Fire rated paneling and trim meeting Class I/A and Low Flame/Low Smoke (LF&S) requirements of ASTM E84.

C. **Color:** Bright white # P 199

D. **Surface:** Pebbled

E. **Trim:** Match color and type for specified paneling.

F. Refer Section 06 82 13 and Architect’s Finish Selection Summary Spreadsheet.

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

2.1 07 18 23 Floor Waterproofing

A. Refer to Section 07 18 23 and drawings.

B. **FW-P:** Provide and install at penthouse floor and dropped mechanical room floors at northeast quadrant of building.

1. **Color:** to be selected by Architect from manufacturer’s full and complete lines of colors.

2.2 07 32 13 Clay Roof Tiles

A. Refer to Section 07 32 13 and drawings.

B. **Basis of Design:** Ludowici Spanish Clay Tiles, New Lexington, OH, ph. 800.945.8453, local contact, Peter Heinz, Tola Architectural Sales, Ph 214.770.0895.

1. **Acceptable Product:** Ludowici 13 ¼” Full Cornered Spanish-S high profile tile with single barrel design which provides a distinctive ripple pattern across the roof.

2. **Nominal Size:** 9.75 inches wide x 13.25 inches long. Average exposure 8.25 inches center to center by 10.25 inches long.

3. **Colors:** custom weathered reddish clay mixture with smooth textured finish to match Spanish tile roof on the existing Hardin Administration Building. The intent is to match the existing weathered appearance of the Hardin Building clay tile roof with new tile utilizing antiquing treatments on the new Health Science Center.

4. **Fire Rating:** Class A with Ludowici Pro 70 underlayment over min. 40 mil WR Grace Ice and Water Shield HT.

5. **Accessory Tile Pieces:** as recommended by manufacturer including full corner eave tile, eave closure tile, top fixture tile, end band tile, detached gable rake tile, circular cover hip tiles, circular cover ridge tile and circular cover ridge end tiles.

6. **Mockup:**
   a. **Initial:** 100 SF of tiles laid on the ground for initial selection and positioning
   b. **Final:** 100 SF of tiles on an elevated sloped roof mockup with the specified substrate, underlayment and final trim pieces for Architect’s final approval.

2.3 07 42 13 Metal Wall Panels

A. Refer to Section 07 42 13 and drawings.

B. **Basis of Design for Prefinished Uninsulated Metal Panels** for use at Penthouse exterior walls and the exterior walls of atrium above the adjacent roof: Morin Matrix Series Panels with Concealed Fasteners or approved equal. Final design and mixture of MP-1, 2, 3 & 4 panel types to be provided by Architect. Current panel design shown on the drawings is not final. Confirm final panel layout with Architect prior to ordering and preparing shop drawings.

1. **MP-1:** Morin Matrix Series MX 1.0

2. **MP-2:** Morin Matrix Series MX 2.0

3. **MP-3:** Morin Matrix Series MX 3.0

4. **MP-4:** Morin Matrix Series MX 4.0

C. **Finish:** To be selected by Architect from one of the following:

1. High-performance organic two coat 70% fluoropolymer painted finish.

2. Class I Clear Anodized aluminum finish.
D. **Color:** To be selected by Architect from manufacturer’s full and complete lines of colors including metallic and mica colors.

2.4 **07 42 29** Terra Cotta Rainscreen Cladding

A. Refer to Section 07 42 29 and drawings.

B. **Basis of Design:**

1. **Acceptable Product:**
   a. **Option 1:** Terreal Piterak XS 18mm double skin rainscreen extruded cladding system with overlapping horizontal reveals on manufacturer’s recommended aluminum support profiles with stainless steel anchors. Provide a full and complete rainscreen system.
   b. **Option 2:** NeaCera 26 mm Flat Classic, Deep Striped and Grooved extruded panel rainscreen cladding system on manufacturer’s recommended aluminum support profiles with stainless steel anchors. Provide a full and complete rainscreen system.
   c. **Option 3:** Equivalent products by Boston Valley of similar thickness will be considered by the Architect.

2. **Nominal Size:** Refer to drawings. Generally 12” H x 24” L panels.

3. **Nominal Thickness:** Refer to options above.

4. **Colors:**
   a. **TC-1:** Unglazed reddish orange colored panels with large horizontal ribs
   b. **TC-2:** Unglazed reddish orange colored panels with small horizontal ribs
   c. **TC-3:** Glazed white colored panels with smooth face and black fleck
   d. **TC-4:** Glazed white colored panels with large horizontal ribs and black fleck
   e. **TC-5:** Glazed white colored panels with small horizontal ribs and black fleck

5. **Finish:** To be selected by Architect from matte, satin, and glossy or glazed finishes.

6. **Fire Rating:** Class A.

7. **Accessory Pieces:** Matching finished terra cotta corners, sills, coping and other trim as required by the Architect and as recommended by the manufacturer.

8. **Mockup:** 150 SF of panels installed vertically on required substrate with all of the required panel types provided and colors including trim pieces.

2.5 **07 42 44** Composite (Aluminum) Wall Panels

A. Refer to Section 07 42 44 and drawings.

B. **Basis of Design:** Rainscreen Rout and Return Dry-Seal System for installation at exterior of curved east atrium walls (exterior application) and at elevator shaft enclosure in the Atrium (interior application).

1. **MP-5 (for exterior applications):** Alpolic/HD/fr (heavy duty/fire retardant) as required by code.
   a. **Aluminum Skin Thickness:** .032”
   b. **Core:** type FR (fire resistive)

2. **MP-6 (for interior applications):** Alpolic/fr/PE (fire retardant) as required by code.
   a. **Aluminum Skin Thickness:** .020”
   b. **Core:** type PE (polyethylene)

C. **Colors:** To be selected by Architect from manufacturer’s full and complete lines of colors including metallic and mica colors. Generally, the Architect’s design intent is to select a white color on the exterior and a silver metallic color for the interior locations.

D. **Joint and Reveal Size:** 5/8” wide x 1” deep reveals fabricated in color to match panels. Final reveal size to be confirmed between Architect and selected fabricator.

**Panel Finish:** High performance organic two coat 70% fluoropolymer painted finish at exterior white panels and metallic silver finish at interior locations.

2.6 **07 52 16** Modified Bituminous Membrane Roofing:

A. Refer to Section 07 52 16.
B. Basis of Design:
2. Application Method: Torch-applied
4. Equal products from other manufacturers listed in this section are acceptable.

2.7 07 62 00 Sheet Metal Flashing and Trim
A. Refer to Section 07 62 00.
B. Basis of Design: Peterson Pac-Clad
C. Finishes:
   1. At Clay Tile Roof: Copper.
   2. All other Locations: High performance organic two coat 70% fluoropolymer painted finish.
D. Colors:
   1. At locations exposed to view: To be selected by Architect from manufacturer’s full and complete lines of all available finishes including upgraded metallic and mica finishes. Generally, Architect anticipates the colors to match the adjacent materials.
   2. At locations not exposed to view: Silver or white to match adjacent materials.

2.8 07 71 00 Manufactured Roof Specialties
A. Refer to Section 07 71 00.
B. Basis of Design:
   1. Prefinished Metal Copings: Pac-Tite tapered coping by Pac-Clad/Peterson
      a. Finish: High performance organic two coat 70% fluoropolymer painted finish.
   2. Gutters, Collection Boxes, Downspouts and Flashing Associated with Clay Tile Roof:
      a. Finish: Copper

2.9 07 81 23 Intumescent Fireproofing
A. Refer to Section 07 81 23 and drawings. Refer to schedule at end of 07 81 23 Section for locations and required fire ratings.
B. Color: To be selected by Architect. Match color as selected by Architect from any major paint manufacturer’s color lines.

2.10 07 92 00 Joint Sealants
A. Finishes:
   1. Joints in counter tops and between counter tops and adjacent materials: Custom color to match countertop material. Verify color with Architect prior to ordering sealant material.
   2. Joints in masonry: Custom color to match adjacent brick, terra cotta or cast stone. Verify final color with Architect on mock-up.
   3. Joints between aluminum door and window frames and adjacent materials: Custom color to match color of aluminum frame.
   4. Other joint sealant colors: Match color of adjacent materials with custom color sealant as required. Verify colors with Architect prior to installation.
B. Samples: Submit actual samples to Architect for approval prior to installation.

2.11 07 95 00 Expansion Control (Not Used)
DIVISION 08 – DOORS AND WINDOWS

2.12 08 11 13 Hollow Metal Doors and Frames
A. Refer Sections 08 11 13 and 09 91 00.
B. Finish:
   1. Galvanized G90 primer.
   2. Oil based enamel paint. Spray-paint only, including touch-up paint (do not brush; no exceptions!).
C. Color: Refer to Architect’s Finish Selection Summary Spreadsheet.

2.13 08 12 16 Interior Aluminum Frames (for interior locations other than those at the atrium)
A. Finish:
   1. Clear anodized, Class II aluminum finish
   2. Note: Refer to Section 08 41 13 for finish on storefront at entry vestibules of Lobbies.

2.14 08 14 16 Flush Wood Doors
A. Species: Select American Cherry to match Architect’s sample.
B. Finish: Stain to match Architect’s sample.
C. Cut: Plain sliced to match Architect’s sample
D. Grade: AWI Premium Grade.

2.15 08 31 13 Access Doors and Frames
A. Refer Sections 08 31 13 and 09 91 00.
B. At Restroom and exterior walls: Polished stainless steel.
C. All other locations:
   1. Factory finish: Prime painted with field applied painted finish.
   2. Field finish: Spray-painted with oil-based enamel to match adjacent wall or ceiling.

2.16 08 34 80 Automatic Overhead Coiling Fabric Smoke Curtains
A. Refer Sections 08 34 80 and 08 34 83.
B. Basis of Design:
   1. SC-1: Smoke Guard SG M4000 Accordion Curtain (atrium opening smoke control)
   2. SC-2: Smoke Guard SG M2500 Accordion Curtain (grand stair opening smoke control)
   3. SC-3: Smoke Guard SG M400 Elevator Curtain (elevator opening smoke control) (refer Section 08 34 83)
C. Finishes: Trim and curtain finishes to be selected by Architect from manufacturer’s full and complete lines of colors and finishes.

2.17 08 41 13 Aluminum-Framed Entrances and Storefronts (for covered entrances, exterior doors and ALL interior glazed frames in the atrium)
A. Frame Finish: Clear anodized, Class I aluminum finish
B. Finish for exposed hardware: # 4 brushed stainless steel or polished chrome (verify with Architect prior to ordering).

2.18 08 41 26 All-Glass Entrances and Storefronts
A. Trim Finish: Brushed # 4 stainless steel finish.
B. Glass: Clear
C. Thickness: ½” min. unless recommended to be thicker by manufacturer

2.19 08 44 13 Glazed Aluminum Curtain Walls
A. Frame Finish: Clear anodized, Class I aluminum
2.20 08 45 11 Translucent Linear Channel Glazing System

A. GL-7: Basis of Design: Pilkington Profilit K25/60/7 Dual Channel Glazing System for exterior applications. Supplied by Technical Glass Products, Snoqualmie, WA, Ph. 800.426.0279.
   1. Face Width: K25 - 10.31”
   2. Flange Height: 2.36”
   3. Glass Thickness: .28”
   4. Color Coating: Amethyst (slight blue transparent)
   5. Surface Texture: Clear translucent (submit samples for final selection)
   6. Coating: Low-E
   7. Insulation: 16 mm Lumira aerogel insulation
   8. U-Value: .19
   9. Light Transmission: 70%-75%
   10. Solar Heat Gain Coefficient: .31
   11. STC Rating Required: STC 44
   12. Frame: Thermally broken aluminum perimeter frame
   13. Glazing Type: Tempered,
   14. Connections: Concealed type

2.21 08 71 00 Door Hardware

A. Refer Section 08 71 00
B. Finish:
   1. Exterior Hardware: To be selected by Architect from one of the following:
      a. # 4 brushed stainless steel
      b. Clear anodized, Class I or thicker
      c. Satin nickel.
   2. Interior Hardware: To be selected by Architect from one of the following:
      a. # 4 brushed stainless steel
      b. Clear anodized, Class I or thicker

2.22 08 71 13 Automatic Door Operators

A. Finish: Door operator cover finish to match Aluminum Entrances and Storefront frame finish.

2.23 08 80 00 Glazing

A. Refer Section 08 80 00 and drawings.
B. Exterior Glazing & Building Entrances Basis of Design – 1” Insulated Panels: Vitro PPG Solarban 90 XL.
   1. GL-1 (Exterior Insulated Vision Panels):
      a. Exterior Lite: ¼ inch thick Solarban 90XL
      b. Interior Lite: ¼ inch thick clear
      c. Glass Tint: To be selected by Architect from manufacturer’s full and complete line of tinted glass products.
      d. Air Space: 1/2 inch
      e. Coating: Low-E on second surface.
      f. SHGC: 0.23
      g. VLT: 51%
      h. Exterior Reflectance: 12%
      i. U-Value (winter): 0.29
   2. GL-2 (Exterior Insulated Vision Panels with Ceramic Frit or Etched Pattern):
      a. Exterior Lite: ¼ inch thick Solarban 90XL.
      b. Interior Lite: ¼ inch thick clear.
      c. Glass Tint: To be selected by Architect from manufacturer’s full and complete line of glass products.
d. **Ceramic Frit or Etched Pattern**: Ceramic “Line” frit or etched pattern finish on surface number to be selected by the Architect. Confirm dimensions, pattern and color of ceramic frit or etching with Architect prior to fabrication.

e. **Air Space**: 1/2 inch

f. **Coating**: Low-E on second surface.

g. **SHGC**: 0.23

h. **VLT**: 51%

i. **Exterior Reflectance**: 12%

j. **U-Value (winter)**: 0.29

3. **GL-3 (Exterior Insulated Spandrel Panels):**
   a. **Exterior Lite**: ¼ inch thick Solarban 90XL.
   b. **Interior Lite**: ¼ inch thick clear.
   c. **Glass Tint**: To be selected by Architect from manufacturer’s full and complete line of glass products

   d. **Ceramic Frit or Etched Pattern**: Ceramic “Line” frit or etched pattern finish on surface number to be selected by the Architect. Confirm dimensions, pattern and color of ceramic frit or etching with Architect prior to fabrication.

   e. **Air Space**: 1/2 inch

   f. **Coating**: Low-E on second surface.

   g. **SHGC**: 0.23

   h. **VLT**: 51%

   i. **Exterior Reflectance**: 12%

   j. **U-Value (winter)**: 0.29

4. **Note**: Provide tempered glazing only where required by code and heat strengthened glazing in all other locations. Do not use tempered glass at restroom glazing where drywall inside is painted black or where spandrel frit is a dark color.

5. **Performance Characteristics**:
   a. **Visible Light Transmittance**: 51 percent
   b. **Outside Light Reflectance**: 12 percent
   c. **Winter Nighttime U-Value**: 0.29
   d. **Summer Daytime U-Value**: Manufacturers standard
   e. **Shading Coefficient**: 0.27
   f. **Solar Heat Gain Coefficient**: 0.23

C. **Interior Glazing Units**:

1. **GL-4 (Interior 1” Insulated Acoustical Panels):**
   a. **Exterior Lite (atrium side)**: 1/4 inch thick clear tempered glass.
   b. **Interior Lite (instruction side)**: 1/4 inch thick clear laminated safety glass.
   c. **Air Space**: 1/2 inch

2. **GL-5 (Interior Spandrel Glass Panels):**
   a. **Glass Lite**: 1/4 inch thick clear tempered glass. Provide **high iron content glass** with a slight greenish cast.

   b. **Ceramic Frit or Etched finish**:
      1) Apply to second surface.
      2) **Color**: To be selected by Architect from manufacturer’s full and complete line of colors. General intent is to provide a white ceramic frit or etching which, when combined with the heavy iron content glass, will result in a greenish-white colored glass.

3. **GL-6 (Decorative Laminated Safety Glass for use at base of open elevator shaft in Atrium)**
   a. **Basis of Design**: Forms + Surfaces BermanGlass 3D Kiln Cast Glass similar to that illustrated in the Battery Park images on F+S website. Provide continuous LED adjustable color lighting at base of glass with required circuiting and power. Connect to BMS controls for on/off timer.

   b. **Thickness**: 1/2 inch or thicker as recommended by manufacturer.
c. **Pattern**: 3D effect on surface of glass. Pattern to be same as that used at Battery Park.


### 2.24 08 87 33 Decorative Glazing Film (for use at 4th floor atrium storefront north wall)

**A. Basis of Design:**

1. **Acceptable Manufacturer:**
   a. Decorative Films – Frederick MD
   b. Additional manufacturer’s products will be considered on a case by case basis but are encouraged.

2. **Acceptable Product**: To be selected by Architect.

3. **Material Only Allowance**: $6/SF of surface area.

### 2.25 08 91 00 Louvers

**A. Finish:**

1. High performance organic two coat 70% fluoropolymer painted finish.
2. Custom color to be selected by Architect. Architect’s general intent is to match the adjacent materials louvers are installed in.

### DIVISION 09 - FINISHES

**2.26 09 29 00 Gypsum Board**

**A.** Refer to Section 09 29 00, drawings and Architect’s Finish Selection Summary Spreadsheet.

**B. Wall Texture**: Light orange peel. Submit samples for Architect review.

**C. X-ray Room Lead Shielding**: Per the Owner’s Physicist Report, provide 1/16” thick lead lined Gypsum Wall Board to 7’ AFF on all walls in each of the five energized X-ray Rooms in Radiological Sciences on the second floor. Where there is a demising wall between two X-ray rooms, lead lined GWB only needs to be applied to one side of the demising wall.

### 2.27 09 30 00 Tiling

**A. Tile Products:**

1. **CT-1**: $12/SF material only allowance
2. **CT-2**: $12/SF material only allowance
3. **CT-3**: $12/SF material only allowance
4. **CT-4**: $12/SF material only allowance
5. **CT-5**: $12/SF material only allowance
6. **CT-6** (Mosaic Wall Tile): Preliminary selection - Daltile Caprice Series F172 “Crimson Blend” 12 x 12. For GMP Include $30/SF material only allowance for mosaic wall tile.

**B. Grout:**

1. **Floor Tile**: Epoxy grout.
2. **Wall Tile**: Sanded grout.
3. Colors to be selected by Architect from any manufacturer listed in the specifications full and complete lines of products, including designer colors.

**C. Tile Trim pieces**: as required by Architect to match floor and wall tile.

**D. Joint Size**: Not to exceed 1/16” wide maximum unless otherwise approved by Architect. Confirm with manufacturer and Architect prior to installation.

### 2.28 09 51 13 Acoustical Panel Ceilings

**A. ACT-1**: Armstrong World Industries; “TechZone” # 3256

1. **Tile Product**: Optima
2. **Tile Panel Size**: 48 x 48 x 1 inches and other sizes (refer to drawings)
3. **Technical Zone Size**: 6 inches wide (refer to drawings)
4. **Color:** White Diamond.
5. **Edge:** Square Tegular.
6. **Grid:** 9/16 inch Interlude XL.
7. **NRC (Sound Absorption):** 0.95
8. **AC (Articulation Class):** 190
9. **CAC (Sound Blocking):** 26
10. **Light Reflectance:** 90%
11. **Fire Performance:** Class A (UL)
12. **Material:** DuraBrite Scrim surface with mineral fiber backing

**B. ACT-2:** Armstrong World Industries; Dune #1775.
1. **Size:** 24 x 24 x 5/8 inches.
2. **Color:** White Diamond.
3. **Edge:** Beveled Tegular.
4. **Grid:** Suprafine 9/16 inches.
5. **NRC (Sound Absorption):** 0.50
6. **AC (Articulation Class):** 170
7. **CAC (Sound Blocking):** 35
8. **Light Reflectance:** 83%
9. **Fire Performance:** Class A (UL)
10. **Material:** Mineral fiber
11. **Surface Finish:** Factory applied latex paint

**C. ACT-3:** Armstrong World Industries; Cortega #770 for non-fire rated applications and #824 for fire rated applications.
1. **Size:** 24 x 24 x 5/8 inches.
2. **Color:** White Diamond.
3. **Edge:** Square Lay-In.
4. **Grid:** Prelude XL 15/16 inch for non-fire rated applications and XL Fire Guard for fire rated applications.
5. **NRC (Sound Absorption):** 0.55
6. **AC (Articulation Class):** N/A
7. **CAC (Sound Blocking):** 35
8. **Light Reflectance:** 82%
9. **Fire Performance:** Class A (UL)
10. **Material:** Mineral fiber
11. **Surface Finish:** Factory applied latex paint
12. **Recycled Content:** 43%

**D. ACT-4 (for use at Grand Stair soffit above the first floor level):** Painted Perforated Metal Panels with 1/8" reveals on all edges.
1. **Acceptable Manufacturer:** Gordon, Inc., Bossier City, LA, Ph. 800.747.8954
2. **Acceptable Product:** Aluma Vault 3000E
3. **Size:** Refer to drawings.
4. **Perforation Pattern:** 1 ½" unperforated borders around the perimeter of each panel with perforations occurring inside of border. Perforation pattern to be selected by Architect from manufacturer's full and complete perforation options.
5. **Method of Attachment:** Torsion Spring
6. **Color:** Custom paint color to be selected by Architect.
7. **Finish:** Factory applied high performance organic two coat 70% fluoropolymer painted finish.
8. **Edge:** 1/8" painted reveals to match panels.

**2.29 09 65 13 Resilient Base and Accessories**

A. Refer to section 09 65 13 for full specification.

B. **Resilient Base:**
1. **RB-1:** 4" Cove base.
C. **Colors**: To be selected by Architect from any manufacturer listed in this section’s full and complete lines of all available finishes including upgraded colors and finishes.

2.30 09 65 19 Resilient Tile Flooring
A. **Luxury Vinyl Tile (LVT)**:
   1. **Material only allowance**: $10/SF
   2. **Products and Colors**: To be selected by Architect.

2.31 09 65 13 Resilient Sheet Flooring
A. **Basis of Design**:
   1. **Approved Product**: Forbo, Marmoleum Real Series. Other manufacturers’ products of equal quality will be considered by the Architect.
   2. **Size**: 32M x 200CM;
   3. **Color**:
      a. **RS-1** (field color): “Serene Grey” 3146
      b. **RS-2** (accent color): “Lava” 3139
      c. **RS-3** (accent color): “Henna” 3203
      d. **RS-4** (accent color): “Calico” 2713
      e. Other colors as selected by Architect from manufacturer’s full and complete color and product lines.

2.32 09 65 66 Rubber Flooring
A. **Basis of Design**: Norament Round by Nora Flooring with raised coin shaped profiles on horizontal surfaces and Norament Stair treads for use in the 3 fire stairs on the project.
B. **Colors**:
   1. **RF-1**: Preliminary selection Norament Round # 0882, “Platinum Gray” or approved equal. Final color to be selected by Architect from manufacturer’s full and complete color lines including premium colors.
   2. Other colors as selected by Architect from manufacturer’s full and complete color and product lines.
C. **Size**: 19.72” (501mm) x 19.72” x .13” (3.2mm)

2.33 09 66 23 Resinous Matrix Terrazzo Flooring
A. **Colors and aggregate**:
   1. **TR-1**: Color and aggregate to match Architect’s sample
   2. **TR-2**: Color and aggregate to match Architect’s sample
   3. **TR-3**: Color and aggregate to match Architect’s sample
   4. **TR-4**: Color and aggregate to match Architect’s sample
      a. Other colors and aggregates as selected by Architect from manufacturer’s full and complete color and product lines.
B. **Pattern/Design**: Refer to drawings. Provide shop drawings for Architect approval.
C. **Metal Dividers**: 1/32” 1/16” and 1/8” zinc. Use double back to back 1/32” wide dividers at control joints
D. **Flooring**: 3/8” thick poured epoxy.
E. **Base, Stair Treads and Risers**: 3/4 inch thick precast units to match floor. Base shall not be less than 10’ sections. Refer to drawings for patterning.
   1. Install 3 abrasive strips on leading edge of each tread. Ref 09 66 23.

2.34 09 68 13 Tile Carpeting
A. **Carpet Tile applied with Adhesive Discs (do not use adhesive)**:
   1. **CPT-1**: Shaw Contract Custom Carpet
      a. **Collection**: “Beyond the Fold”
      b. **Style**: “Folded Edge Tile” 5T062
      c. **Custom Sample Number**: X078S-0; request date April 28, 2017
d. **Color Reference**: Paprika 00157 and "Sundried Ecru" matching custom sample number above.

e. **Colors Listed on Sample**: A:C1644; B:CJ118; C:6180; D:5652D

f. **Size**: 18” x 36” plank

g. **Weight**: 24 oz.

h. **Backing**: Ecoworx

i. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.

2. **CPT-2**: Shaw Contract

a. **Collection**: "Beyond the Fold"

b. **Style**: "Expand Tile" 5T059

c. **Color**: "Ecru"59105

d. **Size**: 18” x 36” plank

e. **Weight**: 24 oz.

f. **Backing**: Ecoworx

g. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.

3. **CPT-3**: Shaw Contract Custom Carpet

a. **Collection**: "Beyond the Fold"

b. **Style**: "Folded Edge Tile" 5T062

c. **Custom Sample Number**: X278T-0; request date May 16, 2017

d. **Color Reference**: Ochre, Ecru.

e. **Colors Listed on Sample**: A:C1644; B:CJ118; C:6180; D:5726D

f. **Size**: 18” x 36” plank

g. **Weight**: 24 oz.

h. **Backing**: Ecoworx

i. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.

4. **CPT-4**: Shaw Contract Custom Carpet

a. **Collection**: "Beyond the Fold"

b. **Style**: "Folded Tile" EW18x36

c. **Custom Sample Number**: X434Y-0; request date July 28, 2017

d. **Color Reference**: N/A

e. **Colors Listed on Sample**: A:C1644; B:CJ118; C:6180; D:5652D

f. **Size**: 18” x 36” plank

g. **Weight**: 24 oz.

h. **Backing**: Ecoworx

i. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.

5. **CPT-5**: Shaw Contract Custom Carpet

a. **Collection**: "Beyond the Fold"

b. **Style**: "Folded Tile" EW18x36

c. **Custom Sample Number**: X435Y-0

d. **Color Reference**: Ochre, Ecru

e. **Colors Listed on Sample**: A:C1644, B:CJ118, C:6180, D:5726D

f. **Size**: 18” x 36” plank

g. **Weight**: 24 oz.

h. **Backing**: Ecoworx

i. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.
6. **CPT-6**: Shaw Contract Custom Carpet  
   a. **Collection**: “Beyond the Fold”  
   b. **Style**: “Folded Tile” EW18x36  
   c. **Custom Sample Number**: X436Y-0  
   d. **Color Reference**: Shimmer, Ecru  
   e. **Colors Listed on Sample**: A:C1644, B:CJ118, C:6180, D:5790D  
   f. **Size**: 18” x 36” plank  
   g. **Weight**: 24 oz.  
   h. **Backing**: Ecoworx  
   i. **Installation Method**: Confirm in field with Architect. It is anticipated that a monolithic pattern will be utilized using mixed plank products specified in this section as well as others from this and related collections.

7. **CPT-7**: To be selected by Architect. Provide material only allowance of $32/SY.

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2.35 **09 72 00** Wall Covering  
   A. Refer to Section 09 72 00 and drawings  
   B. **Basis of Design**: Tri-kes Digital Graphic wall covering.  
   C. **Location**: Atrium 100, north wall first floor.  
   D. **VWC Material & Graphic Design Assistance Allowance**: $15/SF + $1,000 for graphic design assistance.  
   E. **Initial Digital Graphics Design and File**: To be provided by Architect.

2.36 **09 77 63** Digital Graphic Wall Panels  
   A. Refer to Section 09 77 63 and drawings  
   B. **Basis of Design**: Koroseal Interior Products  
   1. **Series**: Digital Print Media  
   2. **Panel Type**: Acrylic  
   C. **Location**: West Atrium east wall first and second floor. Floor to ceiling digital graphic panels.  
   D. **Basic Digital Graphics Design and File**: To be provided by Architect. Additional graphic design assistance will be required by the manufacturer.  
   E. **Mounting Method**: Lumaline Flex-Display.  
   F. **Size**: refer section 09 77 63.  
   G. **Material only allowance**: $45/SF.

2.37 **09 84 36** Fabric Wrapped Acoustical Wall Units  
   A. **Thickness**: 2 inches thick.  
   B. **Reveals**: Refer to drawings for locations.  
   C. **Fabric Material Only Allowance**: $42/SY  
   D. **Location**: Dean’s Conference Room walls from top of chairrail to bottom of ceiling.

2.38 **09 91 00** Painting  
   A. **Acceptable Manufacturers**:  
   1. Sherwin Williams  
   2. Glidden  
   3. Kelly Moore  
   4. PPG Industries  
   B. **Colors**:  
   1. **PT-1**: Sherwin Williams; **Color**: SW9170 “Acier”  
   2. **PT-2**: Sherwin Williams; **Color**: to match SW1901 “Glamorous White”  
   3. **PT-3**: Sherwin Williams; **Color**: SW6381 “Anjou Pear”  
   4. **PT-4**: Sherwin Williams; **Color**: SW7585 “Sundried Tomato”  
   5. **PT-5**: Sherwin Williams; **Color**: SW6228 “Refuge”  
   6. **PT-6**: Sherwin Williams; **Color**: SW7046 “Anonymous”
7. **PT-X:** Other colors to be selected by Architect from any of the manufacturers listed in section 09 91 00.

C. **Staining:** All staining to be performed in controlled conditions in millwork shop paint booth by highly qualified millwork finishers. Staining shall **NOT** be done in the field (no exceptions). Staining shall match Architect’s control samples.

D. **Dry Erase Walls:** Sherwin Williams Dry Erase Coating over two coats of flat latex and primer coat. Install per manufacturer’s recommendations.

### 2.39 09 97 13 Steel Coatings

A. **Epoxy Colors:** Custom colors to be selected by Architect.

### DIVISION 10 - SPECIALTIES

#### 2.40 10 11 03 Visual Display Boards

A. **Glass Dry-Erase Markerboards:**
   1. **GL-8:** Clarus, Glass Float Series; **Color:** “Pure White” # C100. Provide a quantity of (1) in a location to be determined.

B. **Porcelain Dry-Erase Markerboard:**
   1. **Rails and Frames:** Clear anodized.
   2. **Markerboard Surface:** Bright white semi-gloss finish.
   3. Provide at locations called for on plans.

C. **Cabinet White Boards**
   1. **Cabinet Finish:** American Cherry.
   2. **White Board:** Bright white semi-gloss finish
   3. **Tackboard Fabric:** Color to be selected from manufacturer's full and complete lines of all fabrics and products including premium grades.
   4. Provide one at Dean's Suite at location to be determined.

D. **Vinyl Dry Erase Wall Covering**
   1. **Finish:** Bright white, semi-gloss finish, non-magnetic type.
   2. **Installation:** Install over 20 ga. sheet metal fully adhered to wall for magnetic properties.
   3. Provide at locations called for on plans.

E. **Glass Enclosed Display Case**
   1. **Size:** 30"T x 36"W x 4"D
   2. **Finish:** Clear glass with clear anodized Class I finish.
   3. **Location:** Confirm final location with Architect at Atrium Lobby

#### 2.41 10 14 00 Signage

A. Refer to section 10 14 00 and drawings.

B. **Colors:** To be selected by Architect

C. **Signage Design:** refer to drawings

D. **Handicap Parking Sign Frame & Metal Mesh Finish:** Powder coated frame and metal mesh with blue and white signage.

E. **Building Plaques:** Bronze pebbled background with raised satin bronze copy and border. Refer to signage drawings for sizes. Provide (2) in the building: one at west Atrium and one at southeast vestibule.

F. **Monument Sign:** Campus standard. Relocate existing monument sign from demolished MaGaha Building. Re-letter and refurbish as required to meet campus standard requirements. Provide ground mounted flood light on each of the (2) long sides of sign with required power and circuiting, connect to BMS system.

#### 2.42 10 21 13 Stainless Steel Toilet Compartments

A. Refer to section 10 21 13 and drawings.

B. **Basis of Design:** Hadrian, Inc., Mentor, OH, Ph. 800.536.1469.

C. **Style:** No Sight Line, Standard Series, floor mounted overhead braced partitions.
D. Finish: # 4 brushed stainless steel  
E. Design: Zero sight lines. No gaps between panels.

### 2.43 10 21 23 Cubicle Curtains and Tracks

A. Refer to section 10 21 23 and drawings.  
B. Basis of Design:  
   1. Ceiling Mounted Track: InPro Corporation, Clickeze Optitrac CE5000N, Cubicle Track in white color. Provide operating wand, chain carriers and other accessories as required for a complete system at each location.  
   2. Curtain: Tri-Kes Winter Forest Privacy Curtain Series with open mesh top 24 inches and 8” gap at floor. Final pattern and color to be selected from manufacturer’s full and complete lines and colors. Curtains shall completely enclose each bed on all sides.

### 2.44 10 22 26 Operable Partitions

A. Refer to section 10 22 26 and drawings.  
B. Basis of Design:  
   3. STC: 52 min.  
   4. Location: Between Dental Lab Classrooms 103A and 103B.  
   5. Finishes: COM fabric with material only allowance of $42/SY. Metal trim shall be manufacturer’s painted finish, color to be selected by Architect from manufacturer’s full and complete lines including premium colors.

### 2.45 10 26 13 Wall and Corner Guards

A. Refer to section 10 26 13 for products and drawings for locations.  
B. Corner Guard Products:  
   1. WP-1 (Corner Guard): 1 ½” x 1 ½” x 60”H angle; # 4 brushed stainless steel finish.  
   2. WP-2 (End Wall Protector): channel sized to encapsulate end of wall x full height of wall; # 4 brushed stainless steel finish.  
   3. WP-3 (Vinyl Wall Guard Railing): 5”H continuous curved face vinyl chairrail.  
   4. WP-4 (Wood Chairrail): 4”H continuous American Cherry chairrail. Refer to drawings for profile and Section 06 20 23.

### 2.46 10 28 13 Toilet Accessories

A. Finish: Stainless steel # 4 finish or polished chrome. Refer to 10 28 13

### 2.47 10 44 00 Fire Protection Specialties

A. Recessed FEC Cabinet Door and Trim Finish: Stainless steel # 4 finish on door with red lettering and clear glass.  
B. Knox Boxes:  
   1. Type: as required by local fire marshal  
   2. Number and locations: Provide one box at the west Atrium vestibule entrance and the second at one of the east vestibule entrances to the building as determined by the local fire marshal.

### 2.48 10 51 23 Plastic Laminate Clad Lockers

A. Finish: Plastic laminate cladding to be selected by Architect from any major laminate manufacturer listed in section 064100. Sheen to be selected from manufacturer’s full and complete line of sheens.

### 2.49 10 81 13 Bird Control Devices

2.50  10 821 23 Grilles
A. **Basis of Design:** Ag40 Bar Grille by Architectural Grill or approved equal.
B. **Material:** Aluminum
C. **Finish:** Color and finish to be selected from manufacturer’s full and complete line of aluminum, anodized and painted finishes.

**DIVISION 11 - EQUIPMENT**

2.51  11 31 00 Residential Appliances
A. **Finish:** # 4 brushed stainless steel finish with black trim.

2.52  117300 Patient Care Equipment
A. **Finish:** Architect to select from manufacturer’s full and complete lines of finishes.

**DIVISION 12 - FURNISHINGS**

2.53  12 24 13 Roller Shades
A. **Schedule:**
   1. **Motorized:** Provide at all exterior windows in all Classrooms and at Dean’s Suite Conference Room. Provide power and circuiting as required for fully operational system.
   2. **Manual Chain Type:** Provide at all other perimeter windows except at west Building Lobby/Atrium, Lobby Atrium 100, vestibules and stairwells. Confirm final locations with Architect.
   3. **Shade Material:** To be selected by Architect from manufacturer’s full and complete lines of shading material, perforation patterns and light transmittance percentages.

2.54  12 36 40 Quartz Countertops
A. Refer to Sections 06 61 16, 12 36 40 and Architect’s Finish Selection Summary Spreadsheet.
B. **Material:** 3cm slab product with 1 ½” exposed edges.
C. **Edge profile:** Verify with Architect.
D. **Products:**
   1. **SS-1:** Caesarstone # 7141 “Quartz Reflections”.
   2. **SS-2:** Additional quartz surfacing products to be selected by Architect from any of the listed manufacturers’ full and complete lines of products. Provide $40/SF material only allowance.
E. **Quality:** AWI Custom Grade.
F. **Finish:** Polished

2.55 Stone Countertops
A. **Material:** 2 cm and 3cm slab product as indicated on drawings with 1 ½” laminated or molded leading edge.
B. **Edge profile:** 1 ½” bullnose, typical.
C. **Colors:** to be selected by Architect from dealer’s full and complete line of products
D. **Material Only Allowance:** $50/SF

2.56  12 48 13 Entrance Floor Mats
A. **Recessed Floor Mats:**
   1. **EM-1: Basis of Design:** Mats Inc., Advanced Track 1 ½” Deep Recessed System with clear anodized aluminum frame and carpeted treads.
   2. **Tread Color:** To be selected by Architect from manufacturer’s full and complete line of products.
   3. **Substitutions:** Equal products will be considered by the Architect.
DIVISION 14 - CONVEYING SYSTEMS

2.57  14 21 00  Electric Traction Elevators
   A. Hoistway Doors and Jambs: Stainless steel with #4 brushed finish.
      1. Front Cab and Door Panels: Premium model stainless steel with #4 brushed finish.
   B. Side Panels: #4 brushed stainless steel below 36\" AFF with ¼\" x ¼\" vertical reveals separating each wall into three equal vertical panels. Provide ¼\" x ¼\" horizontal reveal at 36\" AFF finished in stainless steel. Plastic laminate panels above 36\" AFF with ¼\" x ¼\" vertical reveals separating each wall into three equal vertical panels. Reveals shall be finished in same material as adjacent wall finish.
   C. Rear Glass Wall: ½\" laminated safety glass or thicker if recommended by manufacturer. Provide 4\"H continuous stainless steel band at height required to attach handrail centered on it in #4 finish.
   D. Handrails on Rear Glass Wall: Provide one continuous stainless steel tubular handrail on rear wall attached to 4\" high stainless steel plate with #4 brushed finish. Return ends of handrail to SS plate with a slight curved radius.
   E. Ceiling Finish: #8 polished stainless steel finish with ¼\" x ¼\" reveals. Align reveals with side and rear wall panel reveals. Provide a grid of 3 panels in the ceiling each direction (9 total panels)
   F. LED Perimeter Cove Light: Provide recessed indirect LED cove light around perimeter of cab.
   G. Floor Finish: 3/8\" epoxy terrazzo with min. 3 color pattern to be supplied by Architect.
   H. Base: Brushed #4 stainless steel.
   I. Exterior Decorative Shroud: Provide manufacturer’s decorative shrouds at the top and bottom of elevator cabs to conceal unfinished portion of cars from public view where exposed at Atrium.

DIVISION 21 - FIRE SUPPRESSION

2.58  Division 21
   A. Fire Alarm and Strobe Covers: Bright white

DIVISION 21 - FIRE SUPPRESSION

2.59  211000 Water-based Fire-suppression Systems
   A. Valve cabinets: Stainless steel

DIVISION 22 – PLUMBING

2.60  224000 Plumbing Fixtures
   A. Porcelain water closets, urinals and wall hung lavatories: White with chrome or stainless steel trim and accessories.
   B. Lavatory bowls: White porcelain with under counter mounting unless noted otherwise.
   C. Break room sinks: Stainless steel under counter mounted unless noted otherwise.
   D. Lab sinks: Stainless steel under counter mounted unless noted otherwise.
   E. EWC’s and hydration stations: Stainless steel
   F. Mop sinks: White
   G. Floor drain strainers: Satin nickel

DIVISION 22 - HEATING VENTILATING AND AIR CONDITIONING

2.61  233713 Diffusers, Registers, and Grilles
   A. Square mechanical grilles, registers and diffusers in ceilings: Bright white
B. **Slotted mechanical grilles and registers:** Clear anodized aluminum.
C. **Eyeball mechanical supply grilles:** Bright white or silver, confirm final color with Architect.
D. **Thermostats:** Bright White, unless on wood paneling, then match wood paneling

**DIVISION 26 - ELECTRICAL**

*2.62 260923 Lighting Control Devices*
A. Bright white nylon Designer series (Leviton Decora or equal) with matching screw heads, typical unless on wood paneling, then match wood paneling.
B. Stainless steel in mechanical and service areas.

*2.63 262726 Wiring Devices*
A. Wall plates including telephone and data plates and other wall mounted controls: Bright white nylon Designer series (Leviton Decora or equal) with matching screw heads except where located in wood paneling at the Learning Stair. At Learning Stair in east Atrium 100, match wood veneer or provide receptacle and cover plate in a color that is visually compatible.
B. Wall plates in mechanical and service areas: Stainless steel
C. Floor Devices: To be selected.

*2.64 26 51 00 Interior Lighting*
A. Finishes to be selected.

*2.65 26 56 00 Exterior lighting*
Finishes to be selected.

**DIVISION 28 - ELECTRONIC SAFETY AND SECURITY**

*2.66 283111 Digital, Addressable Fire-alarm System*
A. White alarms and pull stations

*2.67 28 23 00 Video Surveillance*
A. Colors to be selected by Architect

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

*2.68 32 17 23 Pavement Markings*
A. **Stall Striping**
1. **Standard parking:** White
2. **Visitors parking:** White
3. **Accessible Parking:** White and Blue
B. **Curb Painting**
1. **Service Parking:** White curb with blue letters.
2. **Fire Lanes:** Verify with Fire Marshal.
3. **Other:** Confirm with Owner.

*2.69 32 17 26 Tactile Warning Surface Tile*
A. Color to be selected.

*2.70 Site Brick and Concrete Pavers.*
A. Type and color to be selected. Refer to landscape drawings.

**END OF SECTION**
SECTION 012100
ALLOWSANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section Includes: Administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Construction Manager. If necessary, additional requirements will be issued by Change Order.
B. Types of allowances include the following:
   1. Lump-sum allowances.
   2. Unit-cost allowances.
   3. Quantity allowances.
   4. Contingency allowances.
   5. Testing and inspecting allowances.

1.3 SELECTION AND PURCHASE
A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS
A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION
A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES
A. Allowance shall include cost to Construction Manager of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
B. Unless otherwise indicated, Construction Manager 's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials (selected by Architect under allowance) shall be included as part of the Contract Sum and not part of the allowance.
C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or
supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 CONTINGENCY ALLOWANCES
   A. Change Orders authorizing use of funds from the contingency allowance will include Construction Manager’s related costs and reasonable overhead and profit margins.
   B. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 TESTING AND INSPECTING ALLOWANCES
   A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
   B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
   C. Costs of services not required by the Contract Documents are not included in the allowance.
   D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES
   A. Allowance Adjustment: To adjust allowance amounts, Architect will prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
      1. Include installation costs in purchase amount only where indicated as part of the allowance.
      2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
      3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
      4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
   B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
      1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
      2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION
   A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.
3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Exterior Building Mockup - $30,000.
B. Allowance No. 2: Interior Open Wall Photographic Documentation - $2,500.
C. Allowance No. 3: Window Testing - $40,000.
D. **Allowance No. 4:** Liebert CRAC Units: (5) Unity Communications Cards with Programming/ Graphics tied into Andover BACnet MSTP - $6,000.00.
E. **Allowance No. 5:** Fulton Condensing Boilers: (1) Gateway Communications (serves multiple boilers) Card with Programming/Graphics tied into Andover BACnet MSTP - $3,500.00.
F. Allowance No. 6: Mitsubishi Split System;
G. **Allowance No. 7:** Marlowe Domestic Water Softeners;
H. **Allowance No. 8:** Syncroflo Domestic Water Packaged Booster Pump: (1) BACnet MS/TP serial interface card with on-site programming from startup tech.
I. **Allowance No. 9:** Beacon Medeas Medical Vacuum Pump: (1) BACnet option - $1,200.00.
J. **Allowance No. 10:** Beacon Medeas Instrument Air Compressor: (1) BACnet option - $1,200.00.
K. **Allowance No. 11:** Beacon Medeas Med Gas Alarm: (1) BACnet option - $1,200.00.

END OF SECTION
SECTION 012300

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section Includes: Administrative and procedural requirements for alternates.

1.3 DEFINITIONS
A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES
A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – Terra Cotta: Landscape and Irrigation:
1. Base Bid: Provide 18 mil thickness terra cotta exterior cladding. The base bid terra cotta scope remains in the project as base bid there is no alternate version of the terra cotta scope. Landscape and irrigation construction per the Landscape and Irrigation documents is not to be included in base bid.

2. Alternate Bid: Provide 30 mil thickness terra cotta in lieu of base bid thickness. Include all Landscape and irrigation work per the Landscape and Irrigation documents.
B. Alternate No. 2 – Parking and paving: All hardscape and paving:
1. Base Bid: Provide north parking lot drive/fire lane and parking spaces only on the south side of the drive. Provide concrete flatwork under all colonnades on west, north, east, and south sides of the building. Provide concrete flatwork from the curb at Louis J. Rodriguez Drive to the bi-parting west entrance doors.
2. Alternate Bid: In addition to base bid paving, add parking spaces on the north side of the drive. In addition to the base bid hardscape described above, provide all other new paving and hardscape indicated on the project documents. This includes pedestrian circulation, vehicular drives, parking, and associated curbs.

A. Alternate No. 3 – Stair tower roofs: Opposite rolled member from vertical bow truss
1. Base Bid: Provide flat roofs on 3 stair towers with Mod. Bit. roofing. Include two scuppers per stair tower to drain to main roof. Base bid excludes the opposite rolled steel members indicated in the bow trusses at the east atrium curtainwall.
2. Alternate Bid: Provide Spanish tile roofs at all 3 stair towers. Include the opposite rolled steel member in bow trusses as indicated on the structural documents.

B. Alternate No. 4 - Hospital Headwalls:
2. Alternate Bid: In addition to the manufactured base bid headwalls, provide manufactured headwall units at all locations in lieu of the simulated headwalls provided in base bid.

C. Alternate No. 5 – ITV Classroom Equipment:
1. Base Bid: Delete all ITV equipment. Provide infrastructure as required for future equipment.
2. Alternate Bid: Provide all ITV Equipment in addition to infrastructure.

D. Alternate No. 6: Not Used.

E. Alternate No. 7 – Internal office suite partition heights at all interior offices:
1. Base Bid: Construct all internal partitions within office suites to deck with acoustic insulation to full height of all walls. Acoustic insulation is not required at ceilings.
2. Alternate Bid: Where indicated in the drawings by partition type designations revise internal partitions to be constructed to 6" above finish ceiling. At such locations provide acoustic batts to top of such partitions. Provide batt insulation to minimum of 4 feet either side of partitions that do not go to deck.

F. Alternate No. 8: Not Used.

G. Alternate No. 9: Not Used.

H. Alternate No. 10 – Brick specification:

I. Alternate No. 11 – Countertops: Not Used.
1. Base Bid: Provide quartz countertops at all locations. Public restroom lavatory tops are stone.
2. Alternate Bid: Provide plastic laminate countertops at all locations in lieu of quartz. Public restroom lavatory tops remain as stone.

J. Alternate No. 12 – Copings Not Used.
1. **Base Bid:** Cast stone copings to be provided as indicated on current drawings.

2. **Alternate Bid:** Metal copings to be provided where current drawings indicate cast stone copings.

K. **Alternate No. 13 – Shell in Social Work office suite:**
1. **Base Bid:** Provide the complete finish out of the Social Work office suite as indicated on the drawings.
2. **Alternate Bid:** The Social Work office suite to be constructed as shell space. Interior partitions, finishes, ceiling, lighting, and infrastructure are not provided. Note: This assumes that Social Work would remain in its current location until such time as the Social Work office finish out can be completed. Provide minimal lighting, egress door and mechanical trunk lines to space as part of shell construction.

L. **Alternate No. 14 – Shell in the Advising office suite:**
1. **Base Bid:** Provide the complete finish out of the Advising office suite as indicated on the drawings.
2. **Alternate Bid:** The Advising office suite to be constructed as shell space. Interior partitions, finishes, ceiling, lighting, and infrastructure are not provided. Note: This assumes that Advising would remain in its current location until such time as the Advising office finish out can be completed. Provide minimal lighting, egress door and mechanical trunk lines to space as part of shell construction.

M. **Alternate No. 15 – Shell in the third floor Breakroom:**
1. **Base Bid:** Provide the complete finish out of the 3rd floor Breakroom as indicated on the drawings.
2. **Alternate Bid:** The 3rd floor Breakroom to be constructed as shell space. Interior partitions, finishes, ceiling, lighting, and infrastructure are not provided. Note: This assumes that the Breakroom would be finished out when funds are available. Provide minimal lighting, egress door and mechanical trunk lines to space as part of shell construction.

N. **Alternate No. 16 – Shell in the Dental Hygiene suite: Not Used.**
1. **Base Bid:** Provide the complete finish out of the Dental Hygiene Department as indicated on the drawings.
2. **Alternate Bid:** The Dental Hygiene Suite is to be constructed as shell space. Interior partitions, finishes, ceiling, lighting, and infrastructure are not provided. Note: This assumes that Dental Hygiene would remain in its current location until such time as the Dental Hygiene suite finish out can be completed. Provide minimal lighting, egress door and mechanical trunk lines to space as part of shell construction.

O. **Alternate No. 17 – Shell in 1/3 of the office space on the 4th floor:**
1. **Base Bid:** Provide the complete finish out of all 4th floor office areas as indicated on the drawings.
2. **Alternate Bid:** Identify 1/3 of the 4th floor office spaces to remain as shell space. Note: This assumes that the 4th floor shell spaces would be finished out when funds are available. Provide minimal lighting, egress doors and mechanical trunk lines to spaces as part of shell construction.

P. **Alternate No. 18 – Floor finishes in public corridors:**
1. **Base Bid:** Provide terrazzo flooring at the public circulation areas on the 1st floor only. Substitute LVT flooring in lieu of terrazzo at 2nd, 3rd, and 4th floors.
2. **Alternate Bid:** Provide terrazzo flooring at public circulation area on 1st, 2nd, 3rd, and 4th floors. Floor patterns are to remain as indicated on drawings regardless of whether base bid or alternate floor material is used.

END OF SECTION
SECTION 013233
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section Includes: Administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Periodic construction photographs.
   3. Open-wall photographs.
   4. Final completion construction photographs.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS
A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
   1. Maintain key plan in latest version of BlueBeam software with each set of construction photographs that identifies each photographic location.
B. Key Plan: Key plan of Project site and building shall be maintained in latest version of BlueBeam software with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
C. Digital Images: Digital images in JPG format exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
   1. Digital Camera: Minimum sensor resolution of 8 megapixels.
   2. Format: Minimum 3200 by 2400 pixels with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
   3. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Architect.
      d. Name of Construction Manager.
      e. Date and time photograph was taken.
      f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
      g. Unique sequential identifier keyed to accompanying key plan.
   4. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
D. Preconstruction Photographs: Before starting construction, take not less than 30 digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag construction limits before taking construction photographs.
   2. Take not less than 20 photographs to show existing conditions adjacent to property before
starting the Work.

3. Take not less than 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take not less than 30 digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. During each of the following construction phases, take not less than four of the required shots from same vantage point each time to create a time-lapse sequence as follows:

1. Commencement of the Work, through completion of subgrade construction.
2. Above-grade structural framing.
3. Exterior building enclosure.
4. Interior Work, through date of Substantial Completion.

F. Open Wall Photographs: Allow $1,500 for an independent photographer to take digital photographs of exterior walls prior to installation of specified cladding and interior walls prior to closing up walls. Capture all utilities and blocking in walls. Attach photos to final PDF as-builts electronically in Bluebeam or similar program. Locate keys geographically correctly on plans.

G. Final Completion Construction Photographs: Take not less than 30 digital photographs after date of Substantial Completion for submission as project record documents.

1. Do not include date stamp.

H. Additional Photographs: Owner and Architect may request digital photographs in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional digital photographs within 24 hours of request.
3. Circumstances that could require additional digital photographs include, but are not limited to, the following:
   a. Special events planned at Project site.
   b. Immediate follow-up when on-site events result in construction damage or losses.
   c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
   d. Substantial Completion of a major phase or component of the Work.
   e. Extra record photographs at time of final acceptance.
   f. Owner's request for special publicity photographs.

END OF SECTION
SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Provisions established in General and Supplementary Conditions of the Contract, Division 01 -
      General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
   A. Section Includes: Requirements for the submittal schedule and administrative and
      procedural requirements for submitting following:
      1. Product Data.
      2. Shop Drawings.
      3. Samples
      4. Other submittals.

1.3 DEFINITIONS
   A. Action Submittals: Written and graphic information and physical samples that require Architect's
      responsive action. Action submittals are those submittals indicated in individual Specification
      Sections as "action submittals."
   B. Informational Submittals: Written and graphic information and physical samples that do not
      require Architect's responsive action. Submittals may be rejected for not complying with
      requirements. Informational submittals are those submittals indicated in individual Specification
      Sections as "informational submittals."

1.4 ACTION SUBMITTALS
   A. Submittal Schedule: Submit a schedule of submittals within 21 days of the notice to proceed,
      arranged in chronological order by dates required by construction schedule. Include time required
      for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include
      additional time required for making corrections or revisions to submittals noted by Architect and
      additional time for handling and reviewing submittals required by those corrections.
      1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and
         Construction Manager's construction schedule.
      2. Initial Submittal Schedule: Submit concurrently with startup construction schedule.
         Include submittals required during the first 60 days of construction. List those
         submittals required to maintain orderly progress of the Work and those required early
         because of long lead time for manufacture or fabrication.
      3. Final Submittal: Submit concurrently with the first complete submittal of
         Construction Manager's construction schedule.
         a. Submit revised submittal schedule to reflect changes in current status and timing for
            submittals.
      4. Format: Arrange the following information in a tabular format:
         a. Scheduled date for first submittal.
         b. Specification Section number and title.
         c. Submittal category: Action; informational.
         d. Name of subcontractor.
         e. Description of the Work covered.
         f. Scheduled date for Architect's final release or approval.
         g. Scheduled date of fabrication.
         h. Scheduled dates for purchasing.
         i. Scheduled dates for installation.
         j. Activity or event number.
1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. All Submittals shall be prepared by qualified personnel within the continental United States (no exceptions). Construction Manager shall require all shop drawings and submittals to be prepared by individuals and firms located within the Continental United States. Submittals provided by individuals and firms located outside the United States will not be reviewed by the Design Team and will be returned for resubmittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Construction Manager when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow another 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 30 days for initial review of each submittal.
   5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 21 days for review of each submittal. Submittal will be returned to Architect before being returned to Construction Manager.

D. Electronic Submittals: Submit submittals, except samples, only via Newforma or agreed upon project management software in PDF electronic formatted file. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file. Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
   2. Name file with submittal number or other unique identifier, including revision identifier.
      a. File name shall use project identifier and Specification Section number followed by a hyphen and revision number. (ex. 063000-01r1, 063000-01r2)
   3. Provide means for insertion to permanently record Construction Manager's review and approval markings and action taken by Architect.
   4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect, containing the following information:
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name of Construction Manager.
      e. Name of firm or entity that prepared submittal.
      f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. **Metadata**: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

E. **Options**: Identify options requiring selection by Architect.

F. **Deviations and Additional Information**: On an attached separate sheet, prepared on Construction Manager's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. **Resubmittals**: Make resubmittals in same form as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. **Use for Construction**: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

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**PART 2 - PRODUCTS**

2.1 **SUBMITTAL PROCEDURES**

A. **General Submittal Procedure Requirements**: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

   1. **Post electronic submittals as PDF electronic files directly to Newforma or approved Project Web site specifically established for Project**.
   2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity and shown in color.
   3. Schedule submittals to expedite Project in accordance with approved Construction Schedules and in such sequence as to cause no delay in the Work or in the activities of Owner.
   4. **Do not submit bulk or large numbers of submittals at one time, if so submitted, the review time will be extended to length of time required by Architect to properly review bulk submittals**.
   5. **Submit related groups of work components such as interior finishes, mechanical, electrical, structural steel, rebar, and concrete together for cross coordination**.
   6. **Submittals will be returned without processing if, in the opinion of the Architect**:
      a. Submittals were not prepared within the continental United States.
b. Construction Manager has not thoroughly reviewed and coordinated submittal.
c. Submittals have not been stamped by Construction Manager for coordination of the Work and conformance with the Drawings and Specifications prior to submission to Architect.
d. Submittals are not initialed or signed by authorized person.
e. Submittals are not dated.
f. Submittals are not provided in related groups.
g. Large and multiple submittals are submitted to the A/E not allowing adequate time to review them all with the prescribed time limits.
h. Items to be used are not specifically marked as being the selected product.

7. Do not perform Work on any element of the Work requiring submittal and review of shop drawings, product data, samples, or other similar submittals until respective submittal has been approved by Architect (No Exceptions!).

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each submittal to show which specific products and options are being submitted for use on this project.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted on a signed licensing agreement and $25.00 transfer fee has been provided.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of dimensions established by field measurement.
   e. Relationship and attachment to adjoining construction clearly indicated.
   f. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Where samples and final products are required to match Architect's sample, obtain sample from Architect prior to matching and selecting of final vendor.
2. Transmit Samples that contain multiple, related components such as accessories
together in one submittal package.

3. **Identification**: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. **Number and title of applicable Specification Section**.
   e. Specification paragraph number and generic name of each item.

4. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Construction Manager.

6. **Samples for Initial Selection**: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. **Number of Samples**: Submit at least three full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

7. **Samples for Verification**: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. **Number of Samples**: Submit at least three sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. **Coordination Drawing Submittals**: Comply with requirements specified in Section 013100 "Project Management and Coordination."

F. **Construction Manager's Construction Schedule**: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. **Application for Payment and Schedule of Values**: Comply with requirements specified in Section 012900 "Payment Procedures."

H. **Test and Inspection Reports and Schedule of Tests and Inspections Submittals**: Comply with requirements specified in Section 014000 "Quality Requirements."

I. **Closeout Submittals and Maintenance Material Submittals**: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. **Maintenance Data**: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

K. **Qualification Data**: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
L. **Welding Certificates:** Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. **Installer Certificates:** Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. **Product Test Reports:** Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

T. **Preconstruction Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. **Compatibility Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. **Field Test Reports:** Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. **Design Data:** Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 **DELEGATED-DESIGN SERVICES**

A. **Performance and Design Criteria:** Where professional design services or certifications by a design professional are specifically required of Construction Manager by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. **Delegated-Design Services Certification:** In addition to Shop Drawings, Product Data, and
other required submittals, submit digitally signed PDF electronic file of certificate, signed in color and sealed by the responsible design professional, for each product and system specifically assigned to Construction Manager to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONSTRUCTION MANAGER'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Construction Manager's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

1. Submittals stamped **"No Exception Taken"**: No corrections or resubmittal required; fabrication may proceed.

2. Submittals stamped **"Make Corrections Noted"**: Comply with noted corrections and modifications; and proceed with the Work. If for any reason noted corrections and modifications cannot be fully complied with, resubmit for review requesting clarification; do not proceed with fabrication. When submittals are returned with "Make Corrections Noted" stamp, do not resubmit the noted corrections for re-review unless the original submittal contains additional information, revisions, or the original noted corrections cannot be incorporated.

3. Submittals stamped **"Rejected"** or **"Revise and Resubmit"**: Revise and resubmit for review; do not proceed with fabrication. Clearly indicate revisions, including corrections, to previous submittal. Disapproved submittals will not be considered valid cause for construction delay.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Catalog cuts or product selection pages that are not fully marked as to the exact model, size, color, or other information specific to the item being used on this project will be returned as incomplete.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION
SECTION 042000
UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section Includes:
      1. Concrete masonry units and burnished units.
      2. Face brick and special shapes.
      3. Thin brick and backup panels.
      4. Mortar and grout.
      5. Steel reinforcing bars.
      7. Ties and anchors.
      8. Embedded flashing.
      9. Miscellaneous masonry accessories.

1.3 DEFINITIONS
   A. CMU(s): Concrete masonry unit(s).
   B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Verification: For each type and color of the following:
      1. Face brick.
      2. Special brick shapes and solid brick units.
      3. Thin brick.
      4. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used
         on Project.
      5. Weep holes and vents.
      6. Accessories embedded in masonry.
   C. Qualification Data: For testing agency.
   D. Material Certificates: For each type and size of the following:
      1. Masonry units:
         a. Include data on material properties.
         b. For brick, include size-variation data verifying that actual range of sizes falls within
            specified tolerances.
         c. For exposed brick, include test report for efflorescence according to ASTM C 67.
         d. For masonry units, include data and calculations establishing average net-area
            compressive strength of units.
      2. Cementitious materials. Include brand, type, and name of manufacturer.
      3. Pre-blended, dry mortar mixes. Include description of type and proportions of
         ingredients.
      4. Grout mixes. Include description of type and proportions of ingredients.
      5. Reinforcing bars.
      7. Anchors, ties, and metal accessories.
   E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type
      and mortar type, provide statement of average net-area compressive strength of masonry units,
mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

G. Shop drawings showing size, placement, and location of reinforcing steel.

1.5 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

D. Mockups: Refer to mockup requirements in Section 014000. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Construct masonry in mock-up with correct substrate backup, mortar, special shapes, solid units, bonding, joint work, reinforcement, grouting, mortar colors, expansion and control joints, window, and accessories specified in the Contract Documents for the project.

2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.

3. **Clean only one-half of exposed faces** of mockups with masonry cleaner as specified for Architect's initial approval. Then clean remainder.

4. Protect accepted mockups from the elements with weather-resistant membrane.

5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.

   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect, in writing.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
1.7 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
   2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface by covering wall surfaces below with plastic or other appropriate materials.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.


PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

C. Burnished CMU: Not used.

D. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
1. **Integral Water Repellent**: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

   a. **Products**: Subject to compliance with requirements, provide one of the following:
      1) ACM Chemistries; RainBloc.
      2) BASF Aktiengesellschaft; Rheopel Plus.
      3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

E. **CMUs**: ASTM C 90.

   1. **Unit Compressive Strength**: Provide units with minimum average net-area compressive strength of 2150 psi.
   2. **Density Classification**: Lightweight.
   3. **Size (Width)**: Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. **Exposed Faces**: Provide color and texture matching the range represented by Architect's sample.

2.3 **CONCRETE AND BURNISHED CMU BLOCK LINTELS**

A. **General**: Provide one of the following:

B. **Concrete Lintels**: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMUs.

C. **Masonry Lintels**: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 **BRICK**

A. **General**: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   3. Steel shelf angles as specified in Section 055000.
   4. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
   5. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
   6. **Provide solid brick units where brick coursing is corbeled or offset from courses above and below.**

B. **Face Brick**: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

   1. **Products**: Refer to Section 008900 – Finish Selection Summary.
   2. **Grade**: Refer to Section 008900 – Finish Selection Summary.
   3. **Type**: Refer to Section 008900 – Finish Selection Summary.
   4. **Unit Compressive Strength**: Provide units with minimum average net-area compressive strength of 3350 psi.
   5. **Initial Rate of Absorption**: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
   6. **Efflorescence**: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
   7. **Size**: Refer to Section 008900 – Finish Selection Summary.
8. **Application**: Use where brick is exposed unless otherwise indicated.

9. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

10. **Color and Texture**: Refer to 008900 – Finish Selection Summary.

11. **Special Shapes**: Provide shelf angle units at continuous shelf angle locations.

**C. Thin Brick**:
1. **Thin Brick**: Refer to Section 008900 – Finish Selection Summary.
2. **Mounting System**: TABS Wall Systems, LLC; TABS II.

### 2.5 MORTAR AND GROUT MATERIALS

**A. Regional Materials**: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

**B. Portland Cement**: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

**C. Hydrated Lime**: ASTM C 207, Type S.

**D. Portland Cement-Lime Mix**: Packaged blend of portland cement and hydrated lime containing no other ingredients.

**E. Masonry Cement**: ASTM C 91.

**F. Mortar Pigments**: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. **Acceptable Product**: To be selected by Architect from any manufacturer’s full and complete lines of products, including custom colors.

**G. Aggregate for Mortar**: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

**H. Aggregate for Grout**: ASTM C 404.

**I. Water-Repellent Admixture**: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.

**J. Water**: Potable.

### 2.6 REINFORCEMENT

**A. Uncoated Steel Reinforcing Bars**: ASTM A 615 or ASTM A 996, Grade 60.

**B. Masonry Joint Reinforcement, General**: ASTM A 951.

1. **Interior Walls**: Hot-dip galvanized, carbon steel.
2. **Exterior Walls**: Hot-dip galvanized, carbon steel.
3. **Wire Size for Side Rods**: 0.187-inch diameter.
4. **Wire Size for Cross Rods**: 0.187-inch diameter.
5. **Wire Size for Veneer Ties**: 0.187-inch diameter.
6. **Spacing of Cross Rods, Tabs, and Cross Ties**: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

**C. Masonry Joint Reinforcement for Single-Wythe Masonry**: Either ladder or truss type with single pair of side rods.

### 2.7 TIES AND ANCHORS

**A. Materials**: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. **Hot-Dip Galvanized, Carbon-Steel Wire**: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. **Galvanized Steel Sheet**: ASTM A 653, Commercial Steel, G60 Z180 zinc coating.
3. **Steel Sheet, Galvanized after Fabrication**: ASTM A 1008, Commercial Steel, with ASTM A 153, Class B coating.
4. **Steel Plates, Shapes, and Bars:** ASTM A 36.

B. **Wire Ties, General:** Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. **Individual Wire Ties:** Rectangular units with closed ends and not less than 4 inches wide.
   1. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
   2. **Wire:** Fabricate from 3/16-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

D. **Partition Top Anchors:** 0.105-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. **Rigid Anchors:** Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated bent to configuration indicated.

F. **Adjustable Masonry-Veneer Anchors:**
   1. **General:** Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
      a. **Structural Performance Characteristics:** Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
   2. **Screw-Attached, Masonry-Veneer Anchors:** Units consisting of a wire tie and a metal anchor section.
      a. **Acceptable Products:** Subject to compliance with requirements, provide one of the following:
         1) Hohmann & Barnard, Inc.; HB-213-2X with X-Seal Tape beneath anchors.
      b. **Anchor Section:** Gasketed sheet metal anchor section, 1-1/4 inches (32 mm) wide by 6 inches (152 mm) long, with screw holes top and bottom; top and bottom ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch (16 mm) wide by 6 inches (152 mm) long, stamped into center to provide a slot between strap and base for inserting wire tie. Self-adhering, modified bituminous tape fits behind anchor plate and extends beyond pronged legs.
      c. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch-thick, steel sheet, galvanized after fabrication.
      d. **Wire Ties:** Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch diameter, hot-dip galvanized steel wire.
   3. **Polymer-Coated, Steel Drill Screws for Steel Studs:** ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
      a. **Acceptable Products:** Subject to compliance with requirements, provide one of the following:
         1) ITW Buildex; Teks Maxiseal with Climaseal finish.
         2) Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

2.8 **EMBEDDED FLASHING MATERIALS**

A. **Refer to Section 076210, Flexible Flashing.**

B. **Rubberized Asphalt Flashing:**
   1. **Basis of Design:** Henry Blueskin TWF.
   2. **Other Acceptable Manufacturers:**
      a. GBP.
b. Polyguard.
c. Protectowrap.
3. Sheet Membrane: Rubberized asphaltic sheet laminated to a polypropylene film, 32 mil minimum total thickness, width as required for joints and flashing conditions.
4. Primer: Rubber based solvent type recommended by membrane manufacturer.
5. Mastic: Rubberized asphaltic type recommended by membrane manufacturer.
6. Liquid Membrane: Two component elastomeric, mastic grade.

2.9 MISCELLANEOUS MASONRY ACCESSORIES
A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
D. Weep/Vent Products: Use one of the following unless otherwise indicated:
   1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
      a. Acceptable Products: Subject to compliance with requirements, provide one of the following:
         1) Advanced Building Products Inc.; Mortar Maze weep vent.
         2) Blok-Lok Limited; Cell-Vent.
         3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
         4) Heckmann Building Products Inc.; No. 85 Cell Vent.
         5) Hohmann & Barnard, Inc.; Quadro-Vent.
         6) Wire-Bond; Cell Vent.
E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
      a. Advanced Building Products Inc.; Mortar Break.
      b. Archovations, Inc.; CavClear Masonry Mat.
      c. Mortar Net USA, Ltd.; Mortar Net.
   2. Provide one of the following configurations:
      a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
      b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
      c. Sheets or strips full depth of cavity and installed to full height of cavity.
      d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.
F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
   1. Acceptable Products: Subject to compliance with requirements, provide one of the following:
      a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.10 MASONRY CLEANERS
A. Proprietary Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
2. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.
3. Do not use muratic acid under any circumstances!

2.11 MORTAR AND GROUT MIXES
A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime masonry cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime masonry cement mortar.
4. For reinforced masonry, use portland cement-lime masonry cement mortar.
B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement by weight.
3. Mix to match Architect's sample.
4. Application: Use pigmented mortar for exposed mortar joints with the following units:
   a. Face brick.
E. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL
A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
B. Build chases and recesses to accommodate items specified in this and other Sections.
C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Do not allow discernible patterns such as chevrons to occur.
F. Mix units from several pallets or cubes as they are placed.
G. Matching Existing Masonry: Where called for on Drawings or Section 008900 Finish Selection Summary match coursing, bonding, color, and texture of existing masonry where applicable.
H. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES
A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation: Do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan: Do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation: Do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls: Do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals: Do not vary from level by more than 1/4 inch in 20 feet, or 1/2 inch maximum.
   3. For vertical lines and surfaces: Do not vary from plumb by more than 3/8 inch in 20 feet, or 1/2 inch maximum.
   4. For conspicuous vertical lines: Such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, or 1/2 inch maximum.
   5. For lines and surfaces: Do not vary from straight by more than 3/8 inch in 20 feet, or 1/2 inch maximum.
   6. For vertical alignment of exposed head joints: Do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. **For faces of adjacent exposed masonry units:** Do not vary from flush alignment by more than $\frac{1}{16}$ inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. **Joints:**
   1. **For bed joints:** Do not vary from thickness indicated by more than plus or minus $\frac{1}{8}$ inch, with a maximum thickness limited to $\frac{3}{8}$ inch.
   2. **For exposed bed joints:** Do not vary from bed-joint thickness of adjacent courses by more than $\frac{1}{8}$ inch with a maximum thickness limited to $\frac{3}{8}$ inch.
   3. **For head and collar joints:** Do not vary from thickness indicated by more than plus $\frac{3}{8}$ inch or minus $\frac{1}{4}$ inch.
   4. **For exposed head joints:** Do not vary from thickness indicated by more than plus or minus $\frac{1}{8}$ inch with a maximum thickness of $\frac{3}{8}$ inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than $\frac{1}{8}$ inch.
   5. **For exposed bed joints and head joints of stacked bond:** Do not vary from a straight line by more than $\frac{1}{16}$ inch from one masonry unit to the next.

3.4 **LAYING MASONRY WALLS**

A. Mortar joints shall not exceed $\frac{3}{8}$” in width or height.

B. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

C. **Bond Pattern for Exposed Masonry:** Refer to Section 008900 – Finish Selection Summary; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

E. **Stopping and Resuming Work:** Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

F. **Built-in Work:** As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

G. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

I. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated. Install compressible filler in joint between top of partition and underside of structure above.

   1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
   2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

K. **Install brick units consisting of blended units such that patterning is not visible.** Any distinct patterns such as chevrons or heavy groupings of one or more colors shall be removed and reinstalled to eliminate patterns.

L. **Use of Solid Masonry Units:** Use solid bricks shapes at rustication (recessed) courses, corners and corbelled courses. Solid units shall match typical units in appearance.
3.5 MORTAR BEDDING AND JOINTING
A. Lay hollow brick and CMUs as follows:
1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or sluice head joints.
C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
D. Joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 ANCHORING MASONRY VENEERS
A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners per anchor unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing unless shown otherwise on Drawings.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally (or 12 inches on center vertically and 32 inches on center horizontally) with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.7 CONTROL AND EXPANSION JOINTS
A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
B. Form control joints in concrete masonry using one of the following methods:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
C. Form expansion joints in brick as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."
D. Provide horizontal, pressure-relieving joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch (larger where indicated).
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

E. Vertical control joints shall be installed not more than 20 ft. O.C. and as recommended by BIA standards whichever it more restrictive. Coordinate final locations with Architect prior to installation of masonry.

3.8 LINTELS AND SHELF ANGLES
A. Install steel lintels where indicated and as otherwise required by structural engineer, and per best practices.
B. Provide concrete masonry lintels where shown and as required where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.
D. Provide continuous steel shelf angles at 30’ maximum above first floor slab and at each floor above that height. Provide whether or not shown on Drawings.

3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE
A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper, air barrier, or building wrap, lapping at least 4 inches.
   3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
   4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
   5. Install metal drip edges and sealant stops where required, with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
   6. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent products to form weep holes.
   2. Space weep holes 24 inches o.c. unless otherwise indicated.
F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.10 INSTALLING THIN BRICK MOUNTING PANEL

A. Backup Panels:
   1. Attach to wall substrate with screws into metal studs.
   2. Attach the anchors near the pocket edges so that prongs are visible with thin brick units in place.
   3. Apply adhesive beads over the adhesive locks.

B. Thin Brick Units: Place thin brick on the brick supports and push adhesive through the backup panel.

C. Work Pattern: Begin work at bottom of wall and proceed up according to manufacturer’s instructions.

D. Joints:
   1. Using a grout bag, fill joints with mortar.
   2. Finish joints that will remain exposed with a tool slightly larger than joint width to form a concave profile. Tool joints after mortar has taken its initial set and in such a manner as to squeeze mortar back into joint.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in ACI 530.1 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Mortar and Grout Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING
A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
   7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
   8. Clean stone trim to comply with stone supplier's written instructions.
   9. Do not used muratic acid. No exceptions!

3.14 MASONRY WASTE DISPOSAL
A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.
SECTION 05 21 00

STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish all labor and materials required to fabricate, deliver, and erect steel joists and joist girders, including all bridging, ceiling extensions, bearing plates, side wall anchors, and extended ends.

B. This Section includes the following:

1. Long-span steel joists.

C. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.

1.3 DEFINITIONS

A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

B. Design special joists to withstand design loads with live load deflections no greater than the following:

1. Roof Joists: Vertical deflection of 1/360 of the span.

1.5 SUBMITTALS

A. Submit in accordance with Division 1 Section “Submittals.”

B. Submittals for Review:
1. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, camber, coatings, material properties, configuration, joist accessories; splice and connection locations and details; and attachments to other construction.

C. Submittals for Information:

1. Design calculations for all joists for which the standard load tables are not applicable. Submit prior to, or with the shop drawings. Calculations shall bear the seal of a Registered Professional Engineer, licensed in the State of Texas. Shop drawings submitted without corresponding calculations will be returned unchecked as an incomplete submittal. Calculations will be retained for the Architect's file and will not be approved or returned.

2. Welders Certificates: Submit certificates to Owner's Testing Laboratory, certifying that welders to be employed on the project have passed AWS qualification tests within the previous 12 months. If recertification of welders is required, recertification shall be contractor's responsibility.

3. Product Data: For each type of joist, accessory, and product indicated.
   a. Indicate locations and details of bearing plates to be embedded in other construction.

4. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.

5. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.

6. Field quality-control test and inspection reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists, including headers and other supplemental framing, complying with applicable standard specifications and load tables of SJI "Specifications." Manufacturer shall have a minimum of five years documented experience in the design and fabrication of open-web joists and joist girders.

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.
1.8 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and/or masonry construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Any iron or steel product produced through a manufacturing process shall be produced in the United States.

B. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.

C. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36, minimum

D. Steel Bearing Plates: ASTM A 36/A 36M.

E. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

    1. Finish: Plain, uncoated.

F. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

    1. Finish: Plain.

G. Welding Electrodes: Comply with AWS standards.

2.2 PRIMERS

A. Primer: SSPC-Paint 15, Type 1 red oxide, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:

    2. End Arrangement: Underslung.
    3. Top-Chord Arrangement: As indicated.

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work. Refer to Section 2.7 C. for additional welding requirements.
C. Camber long-span steel joists according to SJI's "Specifications." Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

C. Steel bearing plates with integral anchorages are specified in Division 5 Section "Metal Fabrications."

D. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

E. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 FABRICATION

A. Splices: Shop splices may occur in chord or web members. Members containing a butt weld splice shall develop an ultimate tensile force of at least 57,000 psi times the full design area of the chord or web.

B. Holes shall not be made or enlarged by burning with a torch.

C. Welds shall meet the following criteria for acceptance:
   1. Remove slag from welds prior to inspection.
   2. Cracked welds are not acceptable and must be repaired.
   3. Thorough fusion shall exist between the weld and base metal, as determined by visual inspection.
   4. Unfilled weld craters shall not be included in the design length of the weld.
   5. Undercut shall not exceed 1/16" provided that it is oriented parallel to the principal stress.
   6. The sum of surface (piping) porosity diameters shall not exceed 1/16" in any 1" of design weld length.
   7. Weld spatter that does not interfere with paint coverage is acceptable.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Minimum bearings and anchorage shall conform to referenced SJI standards and the Drawings.
4. Allow for erection loads. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction. Construction loads shall not be applied until joists are permanently fastened to supports and all bridging has been installed.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using ASTM A 307 carbon-steel bolts.

E. Bridging shall conform to SJI standards and the shop drawings. Provide and install extra bridging, where indicated or where required due to loading, in addition to the minimum SJI requirements. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Field welds will be visually inspected according to AWS D1.1/D1.1M.

C. In addition to visual inspection, field welds will be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:

4. Liquid Penetrant Inspection: ASTM E 165.

D. Bolted connections will be visually inspected.

E. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."

F. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

G. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00
SECTION 05 31 00

STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof deck.
   2. Composite floor deck.

B. Work Included
   1. Furnish all labor and materials required to fabricate, deliver and install steel roof deck and accessories including formed steel cant strips, eave strips, valley strips, sump pans, edge closures, pour stops, reinforcing plates and related accessories.
   2. Furnish all labor and materials required to fabricate, deliver and install steel floor deck and accessories including formed steel end closures, edge forms, flashings, and reinforcing plates, headed shear studs, and related accessories.

C. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for structural concrete fill over steel deck.
   2. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
   3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Division 9 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
   2. Product Data: For each type of deck, accessory, and product indicated. Provide deck dimensions, sectional properties, uplift resistance and diaphragm capacity for specified fastener layout and support spacing, and finishes.

B. Submittals for Information:
   1. Product Certificates: For each type of steel deck, signed by product manufacturer. Certify that products comply with SDI, UL and ICBO standards as specified.
2. Manufacturer’s installation instructions.
3. Welding certificates: For each welder employed on the Work.
4. Field quality-control test and inspection reports.
5. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   a. Power-actuated mechanical fasteners.
   b. Acoustical roof deck.
6. ICBO Research/Evaluation Reports: Deck units shall be approved by the International Conference of Building Officials and shall have a corresponding report from ICBO
7. Deck units shall be classified by Underwriter's Laboratory, Inc. and shall be labeled and marked as required by UL, indicating manufacturer testing and inspection.

1.4 QUALITY ASSURANCE

A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. Comply with applicable provisions of the following specifications and documents.

1. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
3. SDI (Steel Deck Institute) - Design Manual for Composite Decks, Form Decks, Roof Decks.
4. SSPC (Steel Structures Painting Council) - Painting Manual.
5. UL - Fire Resistance Directory.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:
   a. ASC Profiles, Inc.
   c. Consolidated Systems, Inc.
   d. DACS, Inc.
   e. D-Mac Industries Inc.
   f. Epic Metals Corporation.
   g. Marilyn Steel Decks, Inc.
   h. New Millennium Building Systems, LLC.
   i. Nucor Corp.; Vulcraft Division.
   j. Roof Deck, Inc.
   k. United Steel Deck, Inc.
   l. Valley Joist; Division of EBSCO Industries, Inc.
   m. Verco Manufacturing Co.
   n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

A. Any iron or steel product produced through a manufacturing process shall be produced in the United States.

B. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 or 40, G60 zinc coating.
2. Deck Profile: As indicated
3. Profile Depth: As indicated
4. Design Uncoated-Steel Thickness: As indicated.
5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
6. Span Condition: As indicated.
7. Side Laps: Overlapped.
2.3 COMPOSITE FLOOR DECK

A. Any iron or steel product produced through a manufacturing process shall be produced in the United States.

B. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
   1. Galvanized Steel Sheet: ASTM A 653/A, Structural Steel (SS), Grade 33, G30 zinc coating.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: As indicated.

2.4 ACCESSORIES

A. Any iron or steel product produced through a manufacturing process shall be produced in the United States.

B. General: Provide manufacturer’s standard accessory materials for deck that comply with requirements indicated.

C. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
   1. Mechanical Fasteners: Galvanized hardened steel, self tapping “Teks” screws, manufactured by Illinois Tool Works, Inc., Buildex Division, or equal. Size shall be #10 minimum, unless noted otherwise.
   2. Powder Actuated Fasteners: Zinc coated fastener with .145 inch shank diameter and 1 1/4 inch shank length. X-DNI pin as manufacturer by Hilti, or equal.

D. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

E. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

F. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

G. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

H. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and sloped recessed pans of 1-1/2-inch minimum depth, sealed watertight. For drains, cut holes in the field.
J. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, sealed watertight. For drains, cut holes in the field.


L. Repair Paint: Manufacturer’s standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer’s written instructions, and requirements in this Section.

B. Locate deck bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

H. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer’s written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: As indicated.
2. **Weld Spacing:** Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

3. **Weld Washers:** Install weld washers at each weld location.

**B. Side-Lap and Perimeter Edge Fastening:** Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch-long welds.

**C. End Bearing:** Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. **End Joints:** Lapped 2 inches minimum.

**D. Roof Sump Pans and Sump Plates:** Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space connections not more than 12 inches apart with at least one connection at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

**E. Miscellaneous Roof-Deck Accessories:** Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer’s written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

**F. Flexible Closure Strips:** Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer’s written instructions to ensure complete closure.

**G. Architectural finishes and mechanical, electrical, and plumbing equipment shall not be hung directly from the metal deck.**

**3.4 FIELD QUALITY CONTROL**

**A. Testing Agency:** Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

**B. Field welds will be subject to inspection.**

**C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.**

**D. Remove and replace work that does not comply with specified requirements.**

**E. Additional inspecting, at Contractor’s expense, will be performed to determine compliance of corrected work with specified requirements.**
3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00
SECTION 061600
SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Wall sheathing.
   2. Roof sheathing: Composite nail based insulated roof sheathing for use under asphalt shingle roofs.
   3. Primed sheathing board for back of parapet walls.
   4. Exterior grade plywood sheathing.
   5. Sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 QUALITY ASSURANCE
A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.2 WOOD PANEL PRODUCTS
A. Oriented Strand Board: DOC PS 2.
B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
C. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING
A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177, moisture resistant type; 1/2 and 5/8 inch thick, maximum permissible length; ends square cut, book or tongue and grooved edges.
1. **Acceptable Products**: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Sheathing.
   c. Temple-Inland Inc.; GreenGlass
   d. United States Gypsum Co.; Securock.

2. **Type and Thickness**: Type X, 1/2 and 5/8 inch thick.

3. **Substitutions**: Refer to Section 012500.

B. **Primed Sheathing Board for Back of Parapet Walls**: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 1/2 inch thick, factory primed.
   1. **Basis of Design**: Dens Deck Prime by Georgia Pacific.
   2. **Substitutions**: Refer to Section 012500.

2.4 **ROOF SHEATHING**

A. Plywood Sheathing: DOC PS 1, Exterior, Structural I sheathing; fire treated.
   1. Nominal Thickness: Not less than 3/4 inch.
   2. **Location**: Provide as substrate under all clay roof tiles.
   3. Provide IT clips as required by manufacturer.

2.5 **EXTERIOR GRADE PLYWOOD SHEATHING (NOT USED)**

A. Plywood Sheathing: DOC PS 1, Exterior, Exposure 1, CDX plywood.

2.6 **STRUCTURAL INSULATING PANELS**

A. UL certified EPS core with Perform Guard treatment, minimum of 0.95pcf complying with ASTM C578 Type I and having ICC ES recognition of termite resistance. Insulation manufacturer shall provide Third Party UL certificate. ICC ES Report shall be provided for recognition of termite resistance in compliance with ICC AC239.

B. OSB identified with APA or TECO performance mark with Exposure I durability rating and performance in accordance with DOC PS-2 span rating 24/16 or greater.

C. Adhesives shall be in conformance with ICC ES AC05 – Acceptance Criteria for Sandwich Panel Adhesives.

D. Treatment for mold, mildew, and termite resistance meeting the following requirements:
   1. Registered with EPA.
   2. Mold growth: 0 rating, tested to ASTM D3273 for 8 weeks at 77 degrees F and 100 percent relative humidity.
   3. Termite resistance: Minimum rating of 7.0, tested to AWPA E-1.
   4. Corrosion potential for metals in contact with treated wood: Maximum 2 mils per year, tested to AWPA E12 for minimum of 60 days on aluminum 2024, carbon steel, hot-dip galvanized steel, and G90 galvanized steel.
   5. Equivalent lateral resistance and tooth holding capacity as untreated wood.

2.7 **FASTENERS**

A. **General**: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. **For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.**

B. **Power-Driven Fasteners**: NES NER-272.

C. **Wood Screws**: ASME B18.6.1.

**PART 3 - EXECUTION**

3.1 **INSTALLATION, GENERAL**

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
C. Securely attach to substrate by fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION
B. Fastening Methods: Fasten panels as indicated below:
   1. Wall and Roof Sheathing:
      a. Screw to cold-formed metal framing.
      b. Space panels 1/8 inch apart at edges and ends.
   2. Install over continuous waterproof membrane such as Ice and Water Shield by W.R. Grace, or approved equal.

3.3 GYPSUM SHEATHING INSTALLATION
A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing or studs with screws.
   2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
   3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
   1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
   2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

END OF SECTION
SECTION 084113
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY
A. Related Documents: General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and Drawings are applicable to this Section.
B. Section Includes:
   1. Aluminum storefront for use at weather protected recessed exterior openings, entrances, and interior uses only
   2. Anchors, brackets, and attachments.
   3. Aluminum door hardware.

1.2 SYSTEM DESCRIPTION AND PERFORMANCE
A. Architectural Requirements
   1. Drawings are diagrammatic and do not purport to identify or solve problems of thermal or structural movement, glazing or anchorage.
   2. Requirements shown by details are intended to establish basic dimensions of units, sightlines and profiles of members.
   3. Provide concealed fastening only. No exceptions.
B. Structural Requirements
   1. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 F degrees without causing detrimental effects to system or components.
   2. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with building code, and measured in accordance with ANSI/ASTM E 330.
   3. Limit mullion deflection to L/200, or flexure limit of glass with full recovery of glazing materials, whichever is less.
   4. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.
   5. Storefront manufacturer shall be responsible for design and engineering of storefront systems, including water drainage system and necessary modifications to meet specified requirements and maintaining visual design concepts.
   6. Attachment methods of frame at rough opening to be designed and engineered by storefront manufacturer’s licensed engineer registered in the state in which the project is located. Consideration shall take into account site peculiarities, deflection of structure above storefront, and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
   7. Design anchors, fasteners and braces to be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
   8. Engineer storefront and entrances to be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.
C. Environmental Requirements
   1. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior. No water leakage shall occur in wall when tested in accordance with ASTM E 331 at test pressure of 6.24 pounds per square foot.
   2. Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of assembly surface area, measured at a reference differential pressure across assembly of 6.24 lbs/sq ft. as measured in accordance with ANSI/ASTM E 283.
3. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

1.3 SUBMITTALS

A. **Submit shop drawings and product data** under provisions of Section 013300.
B. Include system and component dimensions; literature on components; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.
C. Submit manufacturer's installation instructions under provisions of Section 013300.
D. Submit samples under provisions of Section 013300.
E. Submit samples illustrating:
   1. (4) Pre-finished aluminum surface samples (4 by 4 inches).
   2. (1) Storefront section with specified glass (12 by 12 inches).
   3. (1) 8 x 8 inch door corner section with specified glass.

1.4 QUALITY ASSURANCE

B. Conform to requirements of ANSI A117.1, TAS, ADA and local accessibility amendments.
C. Testing: Vacuum Chamber Water Pressure Testing shall be performed by the Owner's certified testing company on two door units and 10 percent of exterior window units or as otherwise determined by the Architect. Hose stream tests may be performed by the Architect with the assistance of the Contractor at additional locations as requested by the Architect. Testing for water infiltration will be conducted on the storefront system, storefront windows and doors, and entrance doors after installation of window/door, exterior veneer, and sealant have been completed. Leave interior side of drywall finishes off for a distance of 4 inches around frames for observation until testing has been satisfactorily completed.
D. In addition, Architect and Contractor shall conduct a water dam test at storefront window sills. The purpose shall be to observe for water loss through joints between windows and adjacent finishes. Leave interior side finishes open for a distance of 6 inches around the entire water dam and sill for observation until testing has been satisfactorily completed.

1.5 QUALIFICATIONS

A. **Manufacturer and Installer**: Company specializing in manufacturing aluminum glazing systems with **minimum 10 years documented experience**.

1.6 PRE-INSTALLATION CONFERENCE

A. **Convene for a Pre-installation conference** one week prior to commencing work of this Section, under provisions of Section 013100.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle system components under provisions of Section 016000.
B. Store and protect system components under provisions of Section 016000.
C. Provide wrapping to protect prefinished aluminum surfaces.

1.8 COORDINATION

A. Manufacturer shall be responsible for details and dimensions not controlled by job conditions and shall show on his shop drawings required field measurements beyond his control.
B. Coordinate with responsible trades to establish, verify and maintain field dimensions and job conditions.

1.9 ENVIRONMENTAL CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.
1.10 WARRANTY
A. Provide 5 year warranty jointly signed by manufacturer and installer under provisions of Section 017839.
B. Warranty: Cover complete system for failure to meet specified requirements and finish.

1.11 FIELD MEASUREMENTS
A. Verify that field measurements are as indicated on shop drawings and as instructed by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following: Basis of Design for Aluminum Fixed Windows: EFCO Corporation
   1. EFCO Corporation.
   2. Kawneer North America; an Alcoa company.
   3. Oldcastle BuildingEnvelope.

2.2 MATERIALS
A. Extruded Aluminum: ANSI/ASTM B 221; 6060-T5 alloy, temper.
B. Sheet Aluminum: ASTM B 209; 5005-H16 alloy, temper.
C. Sheet Steel: ANSI/ASTM A 446; hot-dipped galvanized.
D. Steel Sections: ANSI/ASTM A 36; shapes to suit mullion sections.
E. Primer and Touch-Up Primer for Galvanized Surfaces: FS TT-P-645.
F. Fasteners: Stainless steel.

2.3 FABRICATED COMPONENTS
A. General: Form section true to details with clean, straight, sharply defined profiles, free from defects impairing strength or durability.
B. SF-1 Exterior Storefront System: 2-1/4–inch by 4-1/2-inch profile as indicated on Drawings, 1 inch glazing, thermally broken, exterior pressure glazed (EPDM gasket), steel reinforced for entrances.
   1. Basis of Design: EFCO Corp; Series 403-I TS with aluminum back plate and top closure caps.
C. SF-2 Interior Storefront System: 2 inch by 4-1/2 inch profile as indicated on Drawings. 1 inch glazing non-thermal broken with sound sealed gasket;
D. Medium Stile Heavy Duty Reinforced Entrance Doors: 3/16-inch thick walls with 1-3/4” thick x 3-1/2-inch wide vertical rails, 5-inch inch wide top rail, 10-inch wide bottom rail; welded corners; square glazing stops for insulated glass units; beveled glazing stops for single glazed units.
   1. Basis of Design: EFCO Corp; D300 Medium Stile Doors.
   2. Horizontal rails to be wide enough to contain panic hardware.
   3. Vertical stiles to be wide enough to contain vertical panic hardware release rods in double doors.
E. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil canning".
F. High Performance Pan Sill Flashing: Install manufacturer’s high performance sill flashing at all storefront window locations whether or not called for on the Drawings.

2.4 GLASS AND GLAZING MATERIALS
A. Glass and Glazing Materials: As specified in Section 088000.
2.5 SEALANT MATERIALS
A. Sealant and Backing Materials: As specified in Section 079200 of types described below

2.6 HARDWARE
A. Refer Section 087100.
B. Provide continuous geared hinges and recessed closers at all doors. Coordinate panic hardware with door locations.

2.7 FABRICATION
A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
B. Rigidly fit and secure joints and corners with internal reinforcement, except that door corners will be welded. Make joints and connections flush, hairline, and weatherproof.
C. Provide only products with internal drainage systems directing all moisture to the exterior of the system and wall. System provided shall allow no water to deposit in the wall system or cavity wall adjacent to the installation.
D. Prepare components to receive anchor devices. Fabricate anchorage items.
E. Arrange fasteners, attachments, and jointing to ensure concealment from view.
F. Prepare components with internal reinforcement for door hardware.
G. Reinforce framing members for imposed loads and as required for wind loads.
H. Fabricate window units with “end dams” at the sill and other locations as required to collect and direct water to the exterior of the system.
I. Use of double vertical mullions at splayed windows is not permitted.

2.8 FINISHES
A. Refer to 008900 for finish as selected from the following:
   1. Clear Anodic Finish: AAMA 611, AA-M12C22A21, Class I, 0.018 mm or thicker.
   2. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
      a. Color: Refer to 008900.
   3. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Color: Refer to 008900.
B. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq ft.
C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
B. Verify dimensions, tolerances, and method of attachment with other work.
C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION
A. Install wall system, doors, and glazing in accordance with manufacturer's instructions and AAMA Procedural Guide for Certification of Window and Door Assemblies.
B. Use anchorage devices to attach securely frame assembly to structure.
C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
D. Install manufacturer's high performance pan sill flashing at all locations. Provide end dams and ensure water is directed to the exterior of the system.
E. Coordinate attachment and seal of air and vapor barrier materials.
F. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
G. Install hardware using templates provided. Refer to Section 087100 for installation requirements.
H. Install glass in accordance with Section 088000, using exterior dry method of glazing.
I. Install perimeter polyurethane type sealant (Designation U-SC), backing materials, and installation requirements in accordance with Section 079200.
   1. Where installing aluminum window systems adjacent to rough surface clean and force float sealant into rough surface. Allow sealant to set per manufacturer’s recommendations, then install aluminum window system and seal between aluminum window systems and smooth sealant surface.
J. Adjust operating hardware for smooth operation.
K. Use only concealed fasteners. No exposed screws or other types of fasteners will be allowed under any circumstances. Any storefront installed with exposed fasteners shall be removed and replaced at the Contractor’s expense.

3.3 TOLERANCES
A. Maximum Variation from Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING
A. Adjust work under provisions of Section 017700.
B. Adjust operating hardware for smooth operation.

3.5 CLEANING/REPAIRING/REPLACEMENT
A. Remove protective material from pre-finished aluminum surfaces.
B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
D. Replace scratched, cracked, chipped or otherwise damaged glass and framing.

3.6 PROTECTION OF FINISHED WORK
A. Protect finished work under provisions of Section 015000.
B. Protect finished work from damage.

3.7 SCHEDULE
A. **SF-1 Exterior Storefront System**: Provide at exterior building entrances doors and door frames with 1” insulated glass units to match those used in curtainwall.
B. **SF-2 Interior Storefront System**: Provide at east 4 story Atrium at interior glazed walls with 1” insulated acoustical glazed units.

END OF SECTION
SECTION 084229
AUTOMATIC SLIDING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section Includes: Automatic aluminum sliding glass door assemblies for use at West Lobby Entrances.

1.3 SUBMITTALS
A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for entrance doors.
B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other Work.
C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   1. Size: 12 inch long sections of extrusions or formed shapes.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: An experienced installer who is an authorized representative of the entrance door manufacturer for both installation and maintenance of units required for this Project with a minimum of 10 years' experience installing specified products.
B. Air Infiltration: According to ASTM E283-91:
   1. Standard Test Pressure @ 1.57 psf, measured 0.462 cfm/ft² (ASTM Allowable 1.20 cfm/ft²).
   2. Additional Test Pressure @ 6.24 psf, measured 1.052 cfm/ft².
C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 PROJECT CONDITIONS
A. Field Measurements: Verify entrance door openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY
A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of the entrance door system that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Lateral deflection of glass lite edges in excess of 1/175 of their length or 3/4 inch (75
mm), whichever is less.

2. Faulty operation of hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal use.

B. **Warranty Period:** Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 **MANUFACTURERS**

A. **Basis of Design:**
1. Manufacturer: Horton Automatics, a division of Overhead Door Corporation.

B. **Other Acceptable Manufacturers:** Subject to compliance with requirements, provide product by one of the manufacturers listed below:
1. Besam Entrance Solutions.
2. Dorma USA, Inc.

2.2 **SLIDING AUTOMATIC DOORS**

A. **General:** Manufactured door units shall include operator, header with roller track, carrier assemblies, framing jambs, sliding door panel(s), sidelite(s), activation, safety devices and accessories required for complete installation.
1. **Configuration:** SO-SX-SX-SO.
2. **Mounting Type:** Between jambs.
3. **Floor Track Configuration:** No track across sliding-door opening and at sidelites (trackless).
4. **Stile Design:** Medium stile; 3-1/2 inch nominal width.
5. **Rail Design:** 5 inch nominal height.
6. **Glazing Stops and Gaskets:** Beveled.
7. **Glazing:** Clear tempered.
8. **Finish:** Finish framing, door, sidelite, and header with Class II, clear anodic finish.

B. **Operator:** The operator shall be mounted and concealed within the header.
1. **Operating force** shall be accomplished through a 1/8 HP DC permanent magnet motor with worm gear transmission and 1800 RPM working with drive belt, attached door hangers, and idler pulley. Drive belt to be steel reinforced nylon, 1/2" (13 mm) wide. Idler pulley to be reinforced, metallic material.
2. **Master Control** shall be 16 bit microprocessor controller with dual on-board seven-segment alphanumeric diagnostic display and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. The control shall have minimum of 28 programmable parameters including the following functions as required by ANSI A156.10:
   a. Adjustable opening and closing speeds.
   b. Adjustable back-check and latching.
   c. Adjustable braking.
   d. Adjustable hold-open time between 1 to 30 seconds.
   e. Adjustable Reversing Circuit will reopen door unit if closing path is obstructed.
   f. Separate day and night modes of operation with security over-ride.
3. **Finger Safety:** When unit slides open, strike rail of sliding panel will stop short of adjacent sidelite; resulting opening is net slide.
4. **On/Off Switch** shall be supplied. When switched OFF, unit reverts to free manual operation (likewise during electrical power failure).

C. **Security and Safety Power Fail Options:**
1. **Automatic lock:** Automatically locks slide function of door when in closed position. Additional power supply for autolock not acceptable.
   a. **Autolock Fail Safe:** If power fails the lock disengages.
2. Monitored Power Fail (battery back-up):
   a. Software Selectable Power Fail Open: If power fails the door slides open.

D. Header: Shall be slim 4" (102mm) deep by 6" (152mm) high aluminum construction with extruded z-profile reinforcement for dead load and lateral strength. Header shall have removable face plate for service and adjustment of operator and controls. Header mounts flush to 4" framing jambs.

E. Carrier Assemblies and Header Roller Track: Carrier assemblies shall support door panels with minimum four rollers per panel. Rollers will be steel, high quality ball bearing wheels 1-1/4" (32 mm) diameter. Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel. Overhead header roller track shall be continuous aluminum, nylon covered, and replaceable.

F. Hardware: ANSI A156.5, Grade 1, 2-Point Locking provided and installed in strike rail shall include:
   1. Hookbolt Latch, 5/8" laminated stainless steel, latching into jamb or adjacent strike rail.
   2. 3/8" hex-bolt into breakout carrier frame.
   3. Keyed 1 5/32" (29 mm) Cylinder mounted on exterior side with 31/32" (25 mm) backset.
   4. Thumbturn mounted on interior side.
   5. Hardware Options:
      a. Lock Position Indicator.
      b. Cylinder Guard.
      c. Cylinder Escutcheon.

G. Activation Sensors: Microwave or active infrared sensor shall be header-mounted each side of door unit for detection of traffic from each direction.

H. Presence Sensors:
   1. Header mounted sensors shall provide active infrared presence detection on each side of the door unit and shall remain active throughout the entire door opening and closing cycle.
   2. Hold-open beams: Two pulsed infrared photoelectric beams to be mounted in vertical rails of sidelite or in jambs. Sender/receiver arrangement parallels door opening.

2.3 RELATED WORK REQUIREMENTS

A. Electrical: 120 VAC, 50/60 cycle, single phase, dedicated 20 amp circuit per operator. Non-North American voltages can be 240 VAC 50/60 cycle (operator must have 240 volt power supply).

B. Operator Construction: Electromechanical, modular type construction.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
   3. Welding Rods and Bare Electrodes: AWS A5.10.

B. Glazing: As specified in Division 8 Section "Glazing."

C. Sealants and Joint Fillers: Refer to Division 7 Section "Joint Sealants" for joints at perimeter of entrance system.

D. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, non-corrosive, non-staining grout; complying with ASTM C 1107; of consistency suitable for application.

E. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

2.5 DOOR ASSEMBLIES

A. General: Provide manufacturer's standard door assembly, complete with doors, sidelite framing, and accessories as indicated. Comply with the following:
   1. Number of Doors: As indicated.
2. **Emergency Breakaway Capability:** Door only.

3. **Floor Track Configuration:** Trackless across door opening and recessed, pin-guide track system at sidelites.

B. Opening Force: Provide entrance doors that require no more than 5 lbf (22.2 N) to stop door movement.

### 2.6 COMPONENTS

**A. Doors:** Provide manufacturer's standard 1-3/4-inch- (44.5-mm-) thick glazed doors with minimum 0.125-inch- (3.2-mm-) thick, extruded tubular stile and rail members. Fabricate corners with mechanically fastened reinforcing brackets or by welding. Incorporate concealed tie-rods that span full length of top and bottom rails.

1. **Glazing Stops and Gaskets:** Provide manufacturer's standard snap-on, extruded-aluminum, square glazing stops and preformed resilient glazing gaskets.

2. **Stile and Rail Design:** Match profile sizes and locations for the storefront entrances. Include 10 inch high bottom rail required for accessibility requirements.

**B. Framing Members:** Fabricated from extruded-aluminum or formed-aluminum sheet or plate.

1. **Main Extrusions:** Minimum wall thickness of 0.125 inch (3.2 mm).

2. **Extruded Glazing Stops and Applied Trim:** Minimum wall thickness of 0.062 inch (1.6 mm).

**C. Headers:** Fabricated from minimum 0.125-inch- (3.2-mm-) thick, extruded aluminum or formed-aluminum sheet or plate. Conceal roller track in header, providing access by means of hinged or removable access panel to permit service and adjustment. Secure panel to prevent unauthorized access.

1. **Concealed:** Fabricate header to match depth of framing and to extend full width of door opening.

2. **Capacity:** Capable of supporting doors up to 100 lb (45 kg) per leaf.

**D. Carrier Assembly and Overhead Roller Track:** Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

1. **Rollers:** Minimum of two ball-bearing roller wheels and two anti-rise rollers for each active leaf.

**E. Brackets and Reinforcements:** Manufacturer's standard; compatible with adjacent materials. Provide non-staining, nonferrous shims for aligning system components.

**F. Fasteners and Accessories:** Manufacturer's standard corrosion-resistant, non-staining, non-bleeding; compatible with adjacent materials.

1. **Reinforcement:** Reinforce members as required to retain fastener threads.

2. **Exposed Fasteners:** Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

### 2.7 HARDWARE

**A. General:** Refer to Division 8 Section "Door Hardware" for requirements for hardware items other than those indicated to be provided by entrance door manufacturer.

**B. Heavy-Duty Hardware:** Provide units as indicated in sizes, number, and type recommended by manufacturer for entrances required. Finish exposed parts to match door finish, unless otherwise indicated.

**C. Emergency Breakaway Hardware:** Provide release hardware that allows panel to swing out in the direction of egress to a full 90 degrees from sliding mode as indicated. Maximum force to open panel shall be 50 lbf (222 N).

1. **Release Position:** Doors in any position.

**D. Surface Pulls:** 1-1/2 inch diameter by 60 inch vertical stainless steel pulls on 2 inch standoffs; #4 brushed stainless steel. Confirm with manufacturer.

**E. Compression Weather Stripping:** Manufacturer's standard replaceable, compressible
gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287. Include bumper-type gaskets at door stops and laps.

F. **Sweep Weather Stripping**: Manufacturer's standard replaceable weather stripping of wool, polypropylene, or nylon woven pile, with nylon-fabric or aluminum-strip backing, complying with AAMA 701. Sweep weather stripping includes stripping at jamb, head, and meeting rails where there is no stop or lap to receive compression weather stripping.

### 2.8 FABRICATION

#### A. General
Fabricate entrance door assembly components to designs, sizes, and thicknesses specified and to comply with indicated standards.

#### B. Prefabrication
Provide entrance doors as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.

1. Do not drill and tap for surface-mounted hardware items until time of installation at Project site.
2. Perform fabrication operations, including cutting, fitting, forming, drilling, and grinding of metalwork in manner that prevents damage to exposed finish surfaces. For hardware, perform these operations before applying finishes.
3. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
4. Prepare components to receive concealed fasteners and anchor and connection devices.
5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

#### C. Welding
Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

#### D. Glazing Channels
Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual."

#### E. Metal Protection
Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

#### F. Hardware
Install hardware, except surface-mounted hardware, at fabrication plant. Remove only as required for final finishing operation and for delivery to and installation at Project site.

#### G. Doors
Fabricate doors in profiles indicated. Reinforce as required to support imposed loads and for installing hardware. Factory assemble door and frame units.

#### H. Framing
Fabricate tubular and channel frame assemblies in configuration indicated, with welded or mechanical joints according to manufacturer's standards. Provide sub-frames and reinforcement of types indicated or, if not indicated, as required for a complete system to support required loads.

#### I. Electrical Grounding
Fabricate entrance doors to be internally grounded, complying with requirements of authorities having jurisdiction.

### 2.9 ALUMINUM FINISHES

#### A. Comply
Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

#### B. Finish Designations
Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

#### C. Clear Anodic Finish
AAMA 611, AA-M12C22A21, Class I, 0.018 mm or thicker.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of entrance doors.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary for coordinating entrance door installation.

3.3 INSTALLATION
A. General: Comply with entrance door manufacturer's written installation instructions, unless more stringent requirements are indicated. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
C. Entrances: Install entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place. Lubricate operating hardware and other moving parts.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set tracks, header assemblies, operating brackets, and guides level and true to location with anchorage for permanent support.
D. Glazing: Comply with installation requirements in Division 8 Section "Glazing," unless otherwise indicated.
E. Sealants: Comply with requirements in Division 7 Section "Joint Sealants" for installing sealants, fillers, and gaskets.
   1. Set continuous floor tracks and flashing in a full sealant bed, unless otherwise indicated.
   2. Seal frame perimeter with sealant, unless otherwise indicated.

3.4 ADJUSTING
A. Adjust door hardware for smooth and safe operation.
B. Readjust doors after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware and other moving parts.
C. Test grounding system for compliance with requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION
A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
   1. Comply with requirements in Division 8 Section "Glazing" for cleaning and maintaining glass.
B. Provide final protection and maintain conditions, including limiting construction traffic, that ensure entrance doors are without damage or deterioration at time of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section includes manually operated intensive care unit/critical care unit ICU entrances for individual special-care rooms and in Simulation labs.

1.3 SUBMITTALS
A. **Product Data:** For each configuration of ICU entrance indicated.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. **Shop Drawings:** For each ICU entrance installation.
   1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
C. **Samples for Verification:** For each type of exposed finish required, in manufacturer's standard sizes.
D. **Sample Warranties:** For manufacturer's warranties.

1.4 QUALITY ASSURANCE
A. **Installer Qualifications:** An entity that employs installers and supervisors who are trained and approved by manufacturer with a minimum of 10 years' experience installing specified products.

1.5 FIELD CONDITIONS
A. **Field Measurements:** Verify actual dimensions of openings to receive ICU entrances by field measurements before fabrication.

1.6 WARRANTY
A. **Special Warranty:** Manufacturer agrees to repair or replace components of ICU entrances that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Faulty operation of hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. **Warranty Period:** Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER
A. **Basis of Design:**
   1. Manufacturer: Horton Automatics, a division of Overhead Door Corporation.
   2. Product: Profiler-ICU; Type 310T.
B. **Other Acceptable Manufacturers:** Subject to compliance with requirements, provide product by one of the manufacturers listed below:
   1. Besam Entrance Solutions.
   2. Dorma USA, Inc.

2.2 PERFORMANCE REQUIREMENTS
   A. Opening Force: Not more than 5 lbf to fully open door.

2.3 SLIDING ICU ENTRANCE ASSEMBLIES
   A. General: Provide manufacturer's standard factory-glazed ICU entrances including door leaves, sidelonge, framing, headers, carrier assemblies, roller tracks, and accessories required for a complete installation as indicated.
   B. Breakaway Hardware: Release hardware that allows indicated panels to swing out in direction of egress to full 90 degrees from closed door position.
      1. Maximum Force to Open Panel: 50 lbf.
   C. Sliding ICU Entrance:
      1. Configuration: Telescoping SO-SX-SX.
      3. Floor Track Configuration: No track across sliding-door opening and at sidelonge (trackless).
      4. Stile Design: Medium stile; 3-1/2 inch nominal width.
      5. Rail Design: 5 inch nominal height.

2.4 COMPONENTS
   A. Framing Members: Extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
      1. Nominal Size: 1-3/4 by 4-1/2 inches.
      2. Extruded Glazing Stops and Applied Trim: Minimum 0.062 inch wall thickness.
   B. Stile and Rail Doors: 1-3/4 inch thick glazed doors with minimum 0.125 inch thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie rods that span full length of top and bottom rails.
      1. Glazing Stops and Gaskets: Snap-on, extruded-aluminum stops and preformed gaskets for glazing indicated.
   C. Sidelonges: 1-3/4 inch deep sidelonges with minimum 0.125 inch thick, extruded-aluminum tubular stile and rail members matching door design and finish.
      1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door.
   D. Glazing: As specified in Section 088000 Glazing from full range of manufacturer's products.
   E. Headers: Fabricated from minimum 0.125 inch thick extruded aluminum, and extending full width of ICU entrance units to conceal carrier assemblies and roller tracks. Provide hinged or removable access panels for service and adjustment. Secure panels to prevent unauthorized access.
   F. Carrier Assemblies and Overhead Roller Tracks: Assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track or of ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly. Provide minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.
   G. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.
   H. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
2.5 HARDWARE
A. General: Provide units in sizes and types recommended by ICU entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.
B. Pulls: Recessed units on both sides of each operable door.

2.6 FABRICATION
A. General: Factory fabricate ICU entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
1. Fabricate aluminum components before finishing.
2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
3. **Use concealed fasteners to greatest extent possible.** Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match framing.
   a. Where fasteners are subject to loosening or turning out from structural movements or vibration, use self-locking devices.
   b. Reinforce members as required to receive fastener threads.
4. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
B. Framing: Provide ICU entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
1. Fabricate tubular and channel frame assemblies with welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support required loads.
2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
3. Form profiles that are straight and free of defects or deformations.
4. Provide components with concealed fasteners and anchor and connection devices.
5. Fabricate components with accurately fitted joints, with ends coped or mitered to produce hairline joints free of burrs and distortion.
6. Provide anchorage and alignment brackets for concealed support of assembly from the building structure.
C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
D. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
E. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.

2.7 MATERIALS
A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   2. Sheet and Plate: ASTM B 209.
B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
C. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."

2.8 GENERAL FINISH REQUIREMENTS
A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. **Clear Anodic Finish**: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

**PART 3 - EXECUTION**

3.1 **EXAMINATION**
   A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **INSTALLATION**
   A. General: Install automatic entrances according to manufacturer's written instructions.
      1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
   B. Install ICU entrances plumb, true in alignment with established lines and grades, and without warp or rack of framing members and doors. Anchor securely in place.
      1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
      2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
   C. Sealants: Comply with requirements in Section 079200 "Joint Sealants" for installing sealants, fillers, and gaskets.
      1. Set framing members, floor tracks, and flashings in full sealant bed.
      2. Seal perimeter of framing members with sealant.

3.3 **ADJUSTING**
   A. Adjust operating hardware and moving parts to function smoothly; lubricate as recommended by manufacturer.
   B. Adjust force to open door panels.

3.4 **CLEANING AND PROTECTION**
   A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

END OF SECTION
SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established within General and Supplementary Conditions of the Contract, Division 01 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section includes:
   1. Conventionally glazed drainable aluminum curtain walls installed as stick systems.
   2. Reference Section 012100 Allowances for Window Testing.

1.3 PERFORMANCE REQUIREMENTS
A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:
   1. Structural loads.
   2. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
   3. Dimensional tolerances of building frame and other adjacent construction.
   4. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferred to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
      d. Glass breakage.
      e. Noise or vibration created by wind and thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Drainage within the system allowed to deposit moisture within the exterior wall system.
   5. Ballistic resistant system and glazing.
B. Structural Loads:
   1. Wind Loads: As indicated on Structural Drawings, but not less than 90 mph.
C. Structural-Test Performance: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.
   1. Submit reports of tests performed on manufacturer's standard assemblies.
   2. Test Pressure: 150 percent of positive and negative wind-load design pressures.
   3. Test Duration: As required by design wind velocity but not less than 10 seconds.
D. Deflection of Framing Members:
   1. Deflection under design load shall not exceed L/175 for spans less than 13'-6".
   2. Deflection under design load shall not exceed L/240 +1/4" for spans greater than 13'-6".
   3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.
E. Thermal Movements: Provide glazed aluminum curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface conditions:

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Health Science & Human Services Center
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temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. **Temperature Change (Range):** 120 deg F, ambient; 180 deg F, material surfaces.

2. **Test Performance:** No buckling, stress on glass, glazing-edge seal failure, sealant failure, excess stress on curtain-wall framing, anchors and fasteners, or reduction of performance when tested according to AAMA 501.5.
   a. Test Ambient Temperature Range: 0 to 180 deg F.

F. **Air Infiltration:** Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.

G. **Water Penetration Under Static Pressure:** Provide aluminum glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 15 lbf/sq. ft.

H. **Water Penetration Under Dynamic Pressure:** Provide glazed aluminum curtain-wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive design wind load, but not less than 15 lbf/sq. ft.

1. **Maximum Water Leakage:** According to AAMA 501.1 No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

I. **Condensation Resistance:** Provide glazed aluminum curtain-wall systems with condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.

J. **Average Thermal Conductance:** Provide glazed aluminum curtain-wall systems with average U-factor of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

K. **Sound Transmission:** Provide glazed aluminum curtain-wall systems with minimum STC 32 according to ASTM E 413 and an OITC 26 according to ASTM E 1332, as determined by testing according to ASTM E 90.

L. **Structural-Sealant Joints:**
   1. Designed to carry gravity loads of glazing.
   2. Designed to produce tensile or shear stress of less than 20 psi.

M. **Structural Sealant:** Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1.4 **SUBMITTALS**

A. **Product Data:** Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. **Shop Drawings:** Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of glazed aluminum curtain-wall systems.
   1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. **Samples for Initial Selection:** Provide one set of manufacturer's full array of standard and special finishes on actual aluminum sample panels for initial selection. Provide two 8 inch by 8 inch aluminum panels in final finish selected by Architect.

D. **Maintenance Data for Structural Sealant:** For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

E. **Qualification Data:** For Installer.

F. **Field quality-control test reports.**

G. **Warranties:** Special warranties specified in this Section.

1.5 **QUALITY ASSURANCE**
A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer with a minimum of 10 years successful experience installing specified systems.

1. Engineering Responsibility: Preparation of data for glazed aluminum curtain-wall systems including the following:
   a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated. Also, refer to testing requirements in this section and in Section 012100, Allowances for Window Testing.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code-Aluminum."

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:

1. Review structural load limitations.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing, inspecting, and certifying procedures.

F. Testing: Refer to Allowances Section 012100 for testing allowance. Vacuum Chamber Testing shall be performed at 20% of exterior glazed units. Hose stream and other types of tests may be performed by the Owner's certified Testing Agent or the Architect with assistance by the Contractor. Testing for water infiltration will be conducted around the curtain wall system after installation of window, exterior veneer, and exterior sealant have been completed. Leave interior drywall and final finishes 4 inches clear from window rough opening until water test has been performed and results are approved by the Architect.

G. Prepare water dam test at 20% of window sills on the project. Observe for water loss through joints between windows and adjacent finishes. Leave interior side openings around entire water dam for a space of 4 inches clear for observation during testing.

H. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain wall assemblies.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating glazed aluminum curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain-wall systems that do
not comply with requirements herein or that deteriorate as defined in this Section within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Deterioration of metals and other materials beyond normal weathering.
   d. Water leakage.
   e. Air leakage.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. EFCO Corporation.
      2. Arcadia Group
      4. Oldcastle Building Envelope.

2.2 ACCEPTABLE PRODUCTS
   A. Curtain Wall Systems:
      1. Typical Curtain Wall Basis of Design: EFCO 5600 Series, thermally broken as required by wind loads. If sizes are not shown on the drawings provide 2-1/2-inch wide x 7-1/2-inch depth or as required for wind loading and structural requirements. Confirm final sizes with Architect.
         a. CW-1: 2-1/2" W x 6" D.
         b. CW-2: 2-1/2" W x 7-1/4" D.
         c. CW-3: 2-1/2" W x 10-1/4" D.
         d. SGCW-1: 2-1/2" W x 6" D.
         e. SGCW-2: 2-1/2" W x 7-1/4" D.
         f. SGCW-3: 2-1/2" W x 10-1/4" D.
      2. Ribbon Wall Basis of Design: EFCO 600 RLT.
         a. CWR-1: 2-1/4" W x 6" D.
         b. Provide hinged windows at roof access glazed panels.
      3. When designated as ballistic resistant applications, include 1/4 inch thick steel bar in the mullions.
      4. Substitutions: As approved by Architect from listed manufacturers.

2.3 FRAMING SYSTEMS
   A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
      4. Welding Rods and Bare Electrodes: AWS A5.10.
   B. Frame:
      1. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions.
      2. Curtain wall system is able to accommodate separate interior and exterior finishes and colors.
      3. Exterior color includes scroll profile as indicated on the Drawings.
      4. Face width and system depths as indicated on the Drawings.
   C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment.
Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36.
2. Cold-Rolled Sheet and Strip: ASTM A 611.

D. Brackets and Reinforcements: Manufacturer’s standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

E. Fasteners and Accessories: Manufacturer’s concealed, standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
2. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
3. Reinforce members as required to receive fastener threads.
4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

F. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

G. Concealed Flashing: Dead-soft, 0.018 inch thick stainless steel, ASTM A 240 of type recommended by manufacturer.

H. Framing Gaskets: As recommended by manufacturer for joint type.

I. Framing Sealants: As recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section “Glazing.”

B. Glazing Gaskets: Manufacturer’s standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants for use in typical curtain wall applications: As recommended by manufacturer for joint type.

D. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.

1. Color: As selected by Architect from manufacturer’s full range of colors.

E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.


2.5 ACCESSORY MATERIALS

A. Shading Fins: (Not Used).

B. Insulating Materials: Specified in Division 7 Section “Building Insulation.”

C. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or “oil canning”.

D. High Performance Pan Sill Flashing: Install manufacturer’s high performance sill flashing at all windows whether or not called for on drawings.

E. Wind Braces: Manufacturer’s standard wind bracing to be installed where needed to conform to performance requirements.

F. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.
2.6 FABRICATION
   A. Form aluminum shapes before finishing.
   B. **Construction:** Thermally broken.
   C. **Fabricate components that, when assembled, have the following characteristics:**
      1. Sharp profiles, straight and free of defects or deformations.
      2. Accurately fitted joints with ends coped or mitered.
      3. **Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.**
      4. Physical and thermal isolation of glazing from framing members.
      5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
      6. **Provisions for re-glazing from exterior.**
   D. Fabricate with drainage system directing all moisture to the exterior of the system and wall. Allow for no water to deposit in the wall system or cavity.
   E. **Weld in concealed locations to greatest extent possible** to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
   F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
   G. **Fabricate Members with welded “end dams” at the sill and other locations as required to collect and direct water to the exterior of the system.**
   H. Double vertical mullions are not permitted. Splayed mullions only allowed with Architect’s specific permission. Splayed mullions, if approved, shall have flat exterior trim cap unless otherwise specifically approved by the Architect.
   I. At curved or segmented glazed areas (if any), provide splayed millions (with Architect’s approval) as required to accommodate radius required without double mullions.

2.7 ALUMINUM FINISHES
   A. General: Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
   C. **Mica-Metallic High-Performance Organic Finish:** Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers’ written instructions.
      1. **Color:** Refer to Document 008900 - Finish Selection Summary.
   D. **Clear Anodic Finish:** AAMA 611, AA-M12C22A21, Class I, 0.018 mm or thicker.
   E. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.8 SOURCE QUALITY CONTROL
   A. **Structural Sealant:** Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
      1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal joints watertight, unless otherwise indicated.
7. **Use only concealed fasteners. Any curtainwall installed with exposed fasteners shall be removed and replaced at the contractor's expense.**

B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. **Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to the exterior.**

D. Install components plumb and true in alignment with established lines and grades.

E. **Install manufacturer's high performance pan sill flashing at all locations. Provide welded end dams and ensure water is directed to the exterior of the system.**

F. Coordinate attachment and seal of air and vapor barrier materials.

G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

H. **Install glazing as specified Division 8 Section "Glazing."**
1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

I. **Install sealants as specified in Division 7 Section "Joint Sealants."**
1. Where installing aluminum window systems adjacent to rough surfaces clean and force float sealant into rough surface. Allow sealant to set per manufacturer's recommendations, then install aluminum window system and seal between aluminum window systems and smooth sealant surface.

J. Install insulation materials as specified in Division 7 Section "Building Insulation."

K. **Erection Tolerances:** Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:
1. **Plumb:** 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. **Level:** 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. **Alignment:**
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.
4. **Location:** Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 FIELD QUALITY CONTROL

A. **Testing Agency:** Notify and coordinate with Owner’s independent testing agency or Architect to water test in-place system. **Refer to Section 012100 Allowances for Window Testing.**
1. Test a minimum of 20 percent of the windows on the project utilizing vacuum chamber testing method by a certified window testing consultant. Additional hose stream testing may be performed by the Architect with the assistance of the Contractor.

2. Test 20 percent of the end dam installations on the project.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspection, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. **Structural-Sealant Adhesion**: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
   1. Test a minimum of four areas on each building facade.
   2. Repair installation areas damaged by testing.

E. **Require manufacturer to inspect the project three times during the installation of system to include:**
   1. Review of substrate prior to installation to ensure acceptance.
   2. During course of system installation.
   3. At final completion of system installation.
   4. Provide written report of inspection to Architect within three days of inspections as a prerequisite for Contractor's Application for Payment that month.

END OF SECTION
SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Door Hardware Schedule”.
   2. Division 08 Section “Hollow Metal Doors and Frames”.
   3. Division 08 Section “Flush Wood Doors”.
   4. Division 08 Section “Access Control Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies
1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Ten years for mortise locks and latches.
   2. Twenty five years for manual surface door closer bodies.
   3. Ten years for heavy duty floor closers.
   4. Two years for shallow depth floor closers.
   5. Five years for motorized electric latch retraction exit devices.
   6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:
   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Acceptable Manufacturers:
   a. Hager Companies (HA).
   b. McKinney Products (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge, with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to
template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:
   a. Hager Companies (HA).
   b. Pemko Manufacturing (PE).

C. Floor Closers: ANSI/BHMA A156.4 certified floor closers. Provide independent and adjustable valves for closing speed, latch speed, and backcheck with built-in dead stop and hold open features as specified. Provide finished cover plates or thresholds as indicated in door Hardware Sets.

1. Acceptable Manufacturers:
   a. Rixson Door Controls (RF).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:
   a. McKinney Products (MK) - QC (# wires) Option.

B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12” removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:
   a. McKinney Products (MK) - SER-QC (# wires) Option.
   b. Pemko Manufacturing (PE) - SER-QC (# wires) Option.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
b. McKinney Products (MK) - Connector Hand Tool: QC-R003.

2. Acceptable Manufacturers:
   

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
   
   1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
   2. Furnish dust proof strikes for bottom bolts.
   3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
   4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
   
   5. Acceptable Manufacturers:
      
a. Rockwood Manufacturing (RO).
   b. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   
   1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
   2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
   3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
   4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
   
   5. Acceptable Manufacturers:
      
a. Rockwood Manufacturing (RO).
   b. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
C. Cylinders: Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
   1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers’ cylinders.
   2. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small or large format) as specified in Hardware Sets.

E. Keying System: Each type of lock and cylinders to be factory keyed.
   1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. Existing System: Key locks to Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Two (2)
   2. Master Keys (per Master Key Level/Group): Five (5).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
   1. Acceptable Manufacturers:
      a. Lund Equipment (LU).
      b. MMF Industries (MM).
      c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
   1. Acceptable Manufacturers:
b. No Substitution.

**B. Narrow Stile Interconnected Locksets:**

1. Interconnected locksets designed with a mortise case which contains both a latchbolt and deadbolt and allows simultaneous retraction of both the latchbolt and deadbolt with a single motion turning of the lever handle.

2. Locksets to be non-handed and available with a 1 1/8” or 1 1/2” standard backset.

3. Latchbolt and deadbolt shall be fabricated of wrought brass and bronze with a minimum 3/4” latchbolt throw and 1” deadbolt throw.

4. Acceptable Manufacturers:
   
a. Adams Rite (AD) – 2190/2290 Series.

**2.7 ELECTROMECHANICAL LOCKING DEVICES**

**A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty):** Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. Acceptable Manufacturers:
   
a. Corbin Russwin Hardware (RU) - ML20900 Series.

b. No Substitution.

**2.8 AUXILIARY LOCKS**

**A. Push-Pull Latches, Paddle Type, Mortise: ANSI/BHMA A156.13, Series 1000, Operational and Security Grade 1 mortise type push-pull locks and latches with ligature-resistant paddle trim capable of being mounted in vertical (up or down) and horizontal (sideways) positions. Locksets to be manufactured with a corrosion resistant, formed steel case and be non-handed, field-reversible for re-handing without disassembly of the lock body. Paddles and covers are manufactured from cast stainless steel or brass material. Provide optional lead-lining (lock body) and Torx® fasteners as specified in Hardware Sets.**

1. Acceptable Manufacturers:

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer’s standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer’s special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for “Panic Hardware” according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating “Fire Exit Hardware”. Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.


10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

   1. Acceptable Manufacturers:
      a. Von Duprin (VD) - 35A/98 XP Series.

2.11 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer’s written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) - DC8000 Series.
   b. No Substitution.

C. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 certified surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Acceptable Manufacturers:
   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. No Substitution.

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

   Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

2. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.

3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
   a. Stainless Steel: 300 grade, 050-inch thick.
4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

5. Acceptable Manufacturers:
   a. Rockwood Manufacturing (RO).

2.13 DOOR STOPs AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
   1. Acceptable Manufacturers:
      a. Rockwood Manufacturing (RO).
      b. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
   1. Acceptable Manufacturers:
      a. Rixson Door Controls (RF).
      b. Rockwood Manufacturing (RO).
      c. Sargent Manufacturing (SA).

2.14 ARCHITECTURAL SEALs

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:
   1. National Guard Products (NG).
   2. Pemko Manufacturing (PE).

2.15 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.
3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.


3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and readjustment of hardware units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to
operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS
**Hardware Set Abbreviation and Manufacturers**

1. MK - McKinney  
2. PE - Pemko  
3. RF - Rixson  
4. RO - Rockwood  
5. RU - Corbin Russwin  
6. AD - Adams Rite  
7. VD - Von Duprin  
8. HS - HES  
9. NO - Norton

**Hardware Sets**

**Set: 1.01**

Doors: 1VEST3B

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Notes: DOORS ON SCHEDULE THROUGH ACS.  
AUTHORIZED CARD PRESENTED AT READER RETRACTS LATCHBOLT FOR VALID ENTRY.  
FREE EGRESS AT ALL TIMES.  
REQUEST TO EXIT SWITCH IN TOUCHRAIL SHUNTS ALARM.  
FAIL SECURE.  
KEY RETRACTS LATCHBOLT

**Set: 1.01.SE**

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Notes: DOORS ON SCHEDULE THROUGH ACS. 
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FREE EGRESS AT ALL TIMES. 
REQUEST TO EXIT SWITCH IN TOUCHRAIL SHUNTS ALARM. 
FAIL SECURE. 
KEY RETRACTS LATCHBOLT. 
SMOKE EVAC SYSTEM. 

**Set: 1.01A.SE**

Doors: 1LOBB2B, 1LOBB2C, 1VEST2D, 1VEST2E

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Notes: DOORS ON SCHEDULE THROUGH ACS. 
AUTHORIZED CARD PRESENTED AT READER RETRACTS LATCHBOLT FOR VALID ENTRY. 
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REQUEST TO EXIT SWITCH IN TOUCHRAIL SHUNTS ALARM. 
FAIL SECURE. 
SMOKE EVAC SYSTEM.
### Set: 1.01B.SE

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Notes: DOORS ON SCHEDULE THROUGH ACS. AUTHORIZED CARD PRESENTED AT READER RETRACTS LATCHBOLT FOR VALID ENTRY. FREE EGRESS AT ALL TIMES. REQUEST TO EXIT SWITCH IN TOUCHRAIL SHUNTS ALARM. FAIL SECURE. KEY RETRACTS LATCHBOLT. SMOKE EVAC SYSTEM.

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</tr>
<tr>
<td>1 Closer (surface)</td>
<td>DC6210 A11</td>
<td>689</td>
<td>RU</td>
<td>087100</td>
</tr>
<tr>
<td>1 Threshold</td>
<td>171A</td>
<td>PE</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>1 Sweep</td>
<td>315CN</td>
<td>PE</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>1 Wire Harness</td>
<td>CON-12P</td>
<td>VD</td>
<td>087100</td>
<td></td>
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<tr>
<td>1 Wire Harness</td>
<td>CON-192P</td>
<td>VD</td>
<td>087100</td>
<td></td>
</tr>
<tr>
<td>1 Drop Plate</td>
<td>754F25</td>
<td>RU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Contact Switch</td>
<td>Furnished by Security Contractor</td>
<td>00</td>
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</tr>
<tr>
<td>1 Card Reader</td>
<td>Furnished by security Contractor</td>
<td>RU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Power Supply</td>
<td>Furnished by security Contractor</td>
<td>00</td>
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</tr>
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</table>

Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SECURE

Set: 1.03
Doors: 1CORR6B, 1ELEC1B, 1MECH1, 1STRW1B, 1STRW2B, 1STRW3, ST2-1

1 Continuous Hinge CFM_SLF-HD1 QC12 SER12 PE 087100
1 Rim Exit Device RX 98L LAT E 996L(Std) US32D VD 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Cylinder 3080-178- CT6R 626 RU 087100
1 Closer (surface) DC6210 A11 689 RU 087100
1 Threshold 171A PE 087100
1 Gasketing 332CS PE 087100
1 Rain Guard 346C PE 087100
1 Sweep 315CN PE 087100
1 Wire Harness CON-12P VD 087100
1 Wire Harness CON-192P VD 087100
1 Drop Plate 754F25 RU
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by security Contractor RU
1 Power Supply Furnished by security Contractor 00

Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SECURE

Set: 1.04
Doors: 1CORR3

3 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Hinge TA2714 QC12 4-1/2" x 4-1/2" US26D MK 087100
1 Rim Exit Device RX 98L LAT E 996L(Std) US32D VD 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Cylinder 3080-178- CT6R 626 RU 087100
1 Closer (surface) DC6210 A3 M54 689 RU 087100
1 Wall Stop 406 US26D RO 087100
1 Wire Harness CON-12P VD 087100
1 Wire Harness CON-192P VD 087100
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by security Contractor RU
## Power Supply

Furnished by security Contractor

#### Notes:

DOOR NORMALLY LOCKED AND SECURED

AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM

FREE EGRESS AT ALL TIMES.

REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.

FAIL SECURE

### Set: 1.05

Doors: 120

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<td>Continuous Hinge</td>
<td>CFM__SLF-HD1 QC12 SER12</td>
<td>PE 087100</td>
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<tr>
<td>Rim Exit Device</td>
<td>RX 98L LAT E 996L(Std)</td>
<td>US32D VD 087100</td>
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<td></td>
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<tr>
<td>Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU 087100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinder</td>
<td>3080-178- CT6R</td>
<td>626 RU 087100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Closer (surface)</td>
<td>DC6210 A3 M54</td>
<td>689 RU 087100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wall Stop</td>
<td>406</td>
<td>US26D RO 087100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wire Harness</td>
<td>CON-12P</td>
<td>VD 087100</td>
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<tr>
<td>Wire Harness</td>
<td>CON-192P</td>
<td>VD 087100</td>
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<tr>
<td>Drop Plate</td>
<td>754F25</td>
<td></td>
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<td></td>
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<tr>
<td>Contact Switch</td>
<td>Furnished by Security Contractor</td>
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<tr>
<td>Card Reader</td>
<td>Furnished by security Contractor</td>
<td>RU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>Furnished by security Contractor</td>
<td>00</td>
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</table>

#### Notes:

DOOR NORMALLY LOCKED AND SECURED

AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM

FREE EGRESS AT ALL TIMES.

REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.

FAIL SECURE

### Set: 1.06

Doors: 1COMM1, 204, 241, 2COMM1, 2COMM2, 3COMM1, 4COMM1

<table>
<thead>
<tr>
<th>Item</th>
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<th>Finish</th>
<th>Catalog Number</th>
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<tr>
<td>Hinge</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D MK 087100</td>
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<tr>
<td>Hinge</td>
<td>TA2714 QC12 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D MK 087100</td>
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<tr>
<td>Electrified Mortise Lock (fail secure, signal switch)</td>
<td>ML20906-SEC 102X M92 C6 CT6R</td>
<td>626 RU 087400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU 087100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closer (surface)</td>
<td>DC6200</td>
<td>689 RU 087100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Stop</td>
<td>406</td>
<td>US26D RO 087100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silencer</td>
<td>608-RKW</td>
<td>RO 087100</td>
<td></td>
<td></td>
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<tr>
<td>ElectroLynx Harness</td>
<td>QC-C1500P</td>
<td>MK 087100</td>
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<td></td>
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</tr>
<tr>
<td>ElectroLynx Harness</td>
<td>QC-C300P</td>
<td>MK 087100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Switch</td>
<td>Furnished by Security Contractor</td>
<td>00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 Card Reader  Furnished by security Contractor  RU
1 Power Supply  Furnished by security Contractor  00

Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

**Set: 1.07**

Doors: 1ELEC2, 2ELEC1, 3ELEC1, 4ELEC1

| Item | Description | Part Number | Finish | Code
|------|-------------|-------------|-------|-----
| 3 Hinge (heavy weight) | T4A3786 4-1/2" x 4-1/2" | US26D MK 087100
| 1 Hinge (heavy weight) | T4A3786 QC12 4-1/2" x 4-1/2" | US26D MK 087100
| 1 Electrified Mortise Lock (fail secure, signal switch) | ML20906-SEC 102X M92 C6 CT6R | RU 087400
| 1 Interchangeable Core | 8000 (N Keyway) | 626 RU 087100
| 1 Closer (surface) | DC6200 | 689 RU 087100
| 1 Wall Stop | 406 US26D RO 087100
| 3 Silencer | 608-RKW | RO 087100
| 1 ElectroLynx Harness | QC-C1500P | MK 087100
| 1 ElectroLynx Harness | QC-C300P | MK 087100
| 1 Contact Switch | Furnished by Security Contractor 00
| 1 Card Reader | Furnished by Security Contractor RU
| 1 Power Supply | Furnished by Security Contractor 00

Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

**Set: 1.08**

Doors: 104

| Item | Description | Part Number | Finish | Code
|------|-------------|-------------|-------|-----
| 3 Hinge | TA2714 4-1/2" x 4-1/2" | US26D MK 087100
| 1 Hinge | TA2714 QC12 4-1/2" x 4-1/2" | US26D MK 087100
| 1 Electrified Mortise Lock (fail safe, signal switch) | ML20932-SAF 102X M92 CT6R | RU 087400
| 2 Interchangeable Core | 8000 (N Keyway) | 626 RU 087100
| 1 Closer (surface) | DC6200 | 689 RU 087100
| 1 Wall Stop | 406 US26D RO 087100
| 3 Silencer | 608-RKW | RO 087100
| 1 ElectroLynx Harness | QC-C1500P | MK 087100
| 1 ElectroLynx Harness | QC-C300P | MK 087100
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Supplier</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Contact Switch</td>
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<tr>
<td>Card Reader</td>
<td>Furnished by Security Contractor</td>
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</tr>
<tr>
<td>Power Supply</td>
<td>Furnished by Security Contractor</td>
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</table>

Notes: DOOR NORMALLY LOCKED AND SECURED.  
AUTHORIZED CARD PRESENTED AT READER EITHER SIDE UNLOCKS LEVER TRIM, FAIL SAFE -

**Set: 1.09**

Doors: 1STRW2A

<table>
<thead>
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<th>Item</th>
<th>Description</th>
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<tbody>
<tr>
<td>Hinge</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D MK 087100</td>
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<tr>
<td>Electrified Mortise Lock</td>
<td>ML20906-SAF 102X M92 CT6R</td>
<td>RU 087400</td>
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<tr>
<td>Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>RU 087100</td>
<td></td>
</tr>
<tr>
<td>Closer (surface)</td>
<td>DC6200</td>
<td>RU 087100</td>
<td></td>
</tr>
<tr>
<td>Wall Stop</td>
<td>406</td>
<td>US26D RO 087100</td>
<td></td>
</tr>
<tr>
<td>Gasketing</td>
<td>S773D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ElectroLynx Harness</td>
<td>QC-C1500P</td>
<td>MK 087100</td>
<td></td>
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<tr>
<td>ElectroLynx Harness</td>
<td>QC-C300P</td>
<td>MK 087100</td>
<td></td>
</tr>
<tr>
<td>Contact Switch</td>
<td>Furnished by Security Contractor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Card Reader</td>
<td>Furnished by Security Contractor</td>
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<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>Furnished by Security Contractor</td>
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</table>

Notes: DOOR NORMALLY CLOSED AND SECURED  
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM  
FREE EGRESS AT ALL TIMES,  
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM  
FAIL SAFE

**Set: 1.10**

Doors: 142, 1COMP, 1FIRE1A, 5MECH1, 5STRW2B

<table>
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<th>Item</th>
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<th>Notes</th>
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<tr>
<td>Continuous Hinge</td>
<td>CFM__SLF-HD1 QC12 SER12</td>
<td>PE 087100</td>
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<tr>
<td>Mortise Lockset (storeroom)</td>
<td>ML2057 102X C6</td>
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<tr>
<td>Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU 087100</td>
<td></td>
</tr>
<tr>
<td>Closer (surface)</td>
<td>DC6210 A4 M54</td>
<td>689 RU 087100</td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>171A</td>
<td>PE 087100</td>
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</tr>
<tr>
<td>Gasketing</td>
<td>332CS</td>
<td>PE 087100</td>
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<td>Rain Guard</td>
<td>346C</td>
<td>PE 087100</td>
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<tr>
<td>Sweep</td>
<td>315CN</td>
<td>PE 087100</td>
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</tr>
<tr>
<td>Contact Switch</td>
<td>Furnished by Security Contractor</td>
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</tr>
</tbody>
</table>

Notes: DOOR CONTACT SWITCH ONLY TO MONITOR DOOR STATUS.
Set: 1.11

1 Continuous Hinge CFM__SLF-HD1 QC12 SER12 PE 087100
1 Rim Exit Device RX 98L LAT E 996L(Std) US32D VD 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Cylinder 3080-178- CT6R 626 RU 087100
1 Closer (surface) DC6210 A3 M54 689 RU 087100
1 Wall Stop 406 US26D RO 087100
1 Wire Harness CON-12P VD 087100
1 Wire Harness CON-192P VD 087100
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by security Contractor RU
1 Power Supply Furnished by security Contractor 00

Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SECURE

Set: 1.12

3 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Hinge TA2714 QC12 4-1/2" x 4-1/2" US26D MK 087100
1 Rim Exit Device RX 98L LAT E 996L(Std) US32D VD 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Cylinder 3080-178- CT6R 626 RU 087100
1 Closer (surface) DC6210 A4 M54 689 RU 087100
1 Wire Harness CON-12P VD 087100
1 Wire Harness CON-192P VD 087100
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by security Contractor RU
1 Power Supply Furnished by security Contractor 00

Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SECURE

Set: 1.13

Doors: 201
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<th>Model/Description</th>
<th>Finish</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Continuous Hinge</td>
<td>CFM__SLF-HD1 QC12 SER12</td>
<td>PE</td>
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<tr>
<td>Fire Rated Rim Exit</td>
<td>RX 98L-F LAT E 996L(Std)</td>
<td>US32D</td>
<td>VD 087100</td>
</tr>
<tr>
<td>Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626</td>
<td>RU 087100</td>
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<tr>
<td>Cylinder</td>
<td>3080-178- CT6R</td>
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<td>RU 087100</td>
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<tr>
<td>Closer (surface)</td>
<td>DC6210 A3 M54</td>
<td>689</td>
<td>RU 087100</td>
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<tr>
<td>Wall Stop</td>
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<td>US26D</td>
<td>RO 087100</td>
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<tr>
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</tr>
<tr>
<td>Contact Switch</td>
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<td>Power Supply</td>
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Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SECURE

**Set: 1.14**

Doors: 2STRW1

<table>
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<td>US26D</td>
<td>MK 087100</td>
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<tr>
<td>Fire Rated Rim Exit</td>
<td>TA2714 QC12 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D</td>
<td>MK 087100</td>
</tr>
<tr>
<td>Closer (surface)</td>
<td>RX 98L-F LAT E 996L-BE</td>
<td>US32D</td>
<td>VD 087100</td>
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<td>RU 087100</td>
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<td>Gasketing</td>
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<tr>
<td>Wire Harness</td>
<td>CON-12P</td>
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<tr>
<td>Contact Switch</td>
<td>Furnished by Security Contractor</td>
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Notes: DOOR CONTACT SWITCH ONLY TO MONITOR DOOR STATUS
REQUEST TO EXIT SWITCH IN TOUCH RAIL SHUNTS ALARM.

**Set: 1.15**

Doors: 2STRW3

<table>
<thead>
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<td>MK 087100</td>
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<tr>
<td>Fire Rated Rim Exit</td>
<td>TA2714 QC12 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D</td>
<td>MK 087100</td>
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<tr>
<td>Interchangeable Core</td>
<td>RX 98L-F LAT E 996L(Std)</td>
<td>US32D</td>
<td>VD 087100</td>
</tr>
<tr>
<td>Cylinder</td>
<td>8000 (N Keyway)</td>
<td>626</td>
<td>RU 087100</td>
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<tr>
<td>Closer (surface)</td>
<td>3080-178- CT6R</td>
<td>626</td>
<td>RU 087100</td>
</tr>
<tr>
<td></td>
<td>DC6210 A3 M54</td>
<td>689</td>
<td>RU 087100</td>
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</table>
1 Wall Stop 406 US26D RO 087100
1 Gasketing S773D PE 087100
1 Wire Harness CON-12P VD 087100
1 Wire Harness CON-192P VD 087100
1 Contact Switch Furnished by Security Contractor 00
1 Power Supply Furnished by Security Contractor 00

Notes: DOOR NORMALLY LOCKED AND SECURED
FREE EGRESS AT ALL TIMES.
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM.
FAIL SAFE, INTEGRATED WITH SMOKE/FIRE ALARM SYSTEM.

Set: 1.16
Doors: 310

3 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Hinge TA2714 QC12 4-1/2" x 4-1/2" US26D MK 087100
1 Electrified Mortise Lock (fail secure, signal switch) ML20906-SEC 102X M92 C6 CT6R 626 RU 087400
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Closer (surface) DC6210 A3 M54 689 RU 087100
1 ElectroLynx Harness QC-C1500P MK 087100
1 ElectroLynx Harness QC-C300P MK 087100
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by Security Contractor RU
1 Power Supply Furnished by Security Contractor 00

Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

Set: 1.17
Doors: 330, 410, 420

1 Continuous Hinge CFM__SLF-HD1 QC12 SER12 PE 087100
1 Mortise Lock 2290 1 2-Elect Ext Trim MD US32D AD 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Cylinder 1080-114- CT6R 626 RU 087100
1 Closer (surface) DC6210 A4 M54 689 RU 087100
1 Drop Plate 754F25 RU
1 Contact Switch Furnished by Security Contractor 00
1 Card Reader Furnished by Security Contractor RU

Midwestern State University
Health Science & Human Services Center
RSA Project No. 1612.00
087100 - 27
September 1, 2017 (REVISED 9/27/17)
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Reference</th>
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<tr>
<td>1 Power Supply</td>
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<tr>
<td>1 REX Switch Kit</td>
<td>RXK-4600</td>
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Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

**Set: 1.18**

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<td>1 Continuous Hinge</td>
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<td>PE 087100</td>
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<tr>
<td>1 Rim Exit Device</td>
<td>RX 98L LAT E 996L(Std)</td>
<td>US32D</td>
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<tr>
<td>1 Interchangeable Core</td>
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<td>626 RU</td>
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<tr>
<td>1 Cylinder</td>
<td>3080-178- CT6R</td>
<td>626 RU</td>
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<tr>
<td>1 Closer (surface)</td>
<td>DC6210 A3 M54</td>
<td>689 RU</td>
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<td>1 Wall Stop</td>
<td>406</td>
<td>US26D</td>
</tr>
<tr>
<td>3 Silencer</td>
<td>608-RKW</td>
<td>RO</td>
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<tr>
<td>1 Wire Harness</td>
<td>CON-12P</td>
<td>VD 087100</td>
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<tr>
<td>1 Wire Harness</td>
<td>CON-192P</td>
<td>VD 087100</td>
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<td>1 Contact Switch</td>
<td>Furnished by Security Contractor</td>
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<tr>
<td>1 Card Reader</td>
<td>Furnished by security Contractor</td>
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<tr>
<td>1 Power Supply</td>
<td>Furnished by security Contractor</td>
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Notes: DOOR NORMALLY LOCKED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

**Set: 1.19**

<table>
<thead>
<tr>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>1 Continuous Hinge</td>
<td>CFM__SLF-HD1 QC12 SER12</td>
<td>PE 087100</td>
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<tr>
<td>1 Electrified Mortise Lock (fail safe,</td>
<td>ML20906-SAF 102X M92 CT6R</td>
<td>626 RU</td>
</tr>
<tr>
<td>signal switch)</td>
<td></td>
<td>087400</td>
</tr>
<tr>
<td>1 Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU</td>
</tr>
<tr>
<td>1 Closer (surface)</td>
<td>DC6210 A11</td>
<td>689 RU</td>
</tr>
<tr>
<td>1 Threshold</td>
<td>171A</td>
<td>PE 087100</td>
</tr>
<tr>
<td>1 Gasketing</td>
<td>332CS</td>
<td>PE 087100</td>
</tr>
<tr>
<td>1 Rain Guard</td>
<td>346C</td>
<td>PE 087100</td>
</tr>
<tr>
<td>1 Sweep</td>
<td>315CN</td>
<td>PE 087100</td>
</tr>
<tr>
<td>1 ElectroLynx Harness</td>
<td>QC-C1500P</td>
<td>MK 087100</td>
</tr>
<tr>
<td>1 ElectroLynx Harness</td>
<td>QC-C300P</td>
<td>MK 087100</td>
</tr>
<tr>
<td>1 Contact Switch</td>
<td>Furnished by Security Contractor</td>
<td>00</td>
</tr>
</tbody>
</table>
1 Card Reader               Furnished by security Contractor  RU
1 Power Supply              Furnished by security Contractor  00

Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SAFE

Set: 1.20

1 Continuous Hinge             CFM__SLF-HD1 QC12 SER12       PE  087100
  1 Electrified Mortise Lock (fail secure, signal switch)
     ML20906-SEC 102X M92 C6 CT6R  626 RU  087400
1 Interchangeable Core         8000 (N Keyway)              626 RU  087100
1 Closer (surface)             DC8200 M54                 689 RU  087100
1 Threshold                    171A                      PE  087100
1 Gasketing                   332CS                      PE  087100
1 Rain Guard                   346C                      PE  087100
1 Sweep                       315CN                      PE  087100
1 ElectroLynx Harness          QC-C1500P                MK  087100
1 ElectroLynx Harness          QC-C300P                MK  087100
1 Contact Switch               Furnished by Security Contractor  00
1 Card Reader                  Furnished by security Contractor  RU
1 Power Supply                 Furnished by security Contractor  00

Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

Set: 1.21

1 Continuous Hinge             CFM__SLF-HD1
1 Continuous Hinge             CFM__SLF-HD1 QC12 SER12       PE  087100
1 Manual Flush Bolt            555                      US26D RO  087100
1 Flush Bolt                   555-24                    US26D RO  087100
  1 Electrified Mortise Lock (fail secure, signal switch)
     ML20906-SEC 102X M92 C6 CT6R  626 RU  087400
1 Interchangeable Core         8000 (N Keyway)              626 RU  087100
1 Closer (surface)             DC8210 A11                 689 RU  087100
1 Threshold                    171A                      PE  087100
1 Gasketing                   332CS                      PE  087100

Midwestern State University
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DOOR HARDWARE
100% CONSTRUCTION DOCUMENTS
September 1, 2017 (REVISED 9/27/17)
<table>
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<th>Item</th>
<th>Model/Type</th>
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<th>Notes</th>
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<tbody>
<tr>
<td>Rain Guard</td>
<td>346C</td>
<td>1</td>
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<tr>
<td>Astragal</td>
<td>305CS</td>
<td>1</td>
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<tr>
<td>Sweep</td>
<td>315CN</td>
<td>1</td>
<td></td>
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<tr>
<td>ElectroLynx Harness</td>
<td>QC-C1500P</td>
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<td></td>
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<tr>
<td>ElectroLynx Harness</td>
<td>QC-C300P</td>
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</tr>
<tr>
<td>Contact Switch</td>
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<tr>
<td>Card Reader</td>
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<tr>
<td>Power Supply</td>
<td>Funded by Security Contractor</td>
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Notes: DOOR NORMALLY CLOSED AND SECURED
AUTHORIZED CARD PRESENTED AT READER UNLOCKS LEVER TRIM
FREE EGRESS AT ALL TIMES,
REQUEST TO EXIT SWITCH IN LOCKSET SHUNTS ALARM
FAIL SECURE

**Set: 2.01**

Doors: 1VEST3A

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<th>Item</th>
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<tbody>
<tr>
<td>Continuous Hinge</td>
<td>CFM__SLF-HD1</td>
<td>2</td>
<td>PE 087100</td>
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<tr>
<td>Push Bar</td>
<td>RM3112 Mtg-Type 12XHD</td>
<td>as required</td>
<td>US32D RO 087100</td>
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<tr>
<td>Semi-Circular Pull</td>
<td>RM4506 Mtg-Type 12XHD</td>
<td>US32D</td>
<td>RO 087100</td>
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<tr>
<td>Closer (surface)</td>
<td>DC8210 A11</td>
<td>2</td>
<td>689 RU 087100</td>
</tr>
<tr>
<td>Drop Plate</td>
<td>754F25</td>
<td>2</td>
<td>RU</td>
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Notes: Security locks/unlocks deadbolt.

**Set: 2.01.SE**

Doors: 1VEST1A

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<tbody>
<tr>
<td>Continuous Hinge</td>
<td>CFM__SLF-HD1</td>
<td>2</td>
<td>PE 087100</td>
</tr>
<tr>
<td>Push Bar</td>
<td>RM3112 Mtg-Type 12XHD</td>
<td>as required</td>
<td>US32D RO 087100</td>
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<tr>
<td>Semi-Circular Pull</td>
<td>RM4506 Mtg-Type 12XHD</td>
<td>US32D</td>
<td>RO 087100</td>
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<tr>
<td>Door Operator (smoke evac system)</td>
<td>6330 as required</td>
<td>2</td>
<td>600 NO 087100</td>
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Notes: SMOKE EVAC SYSTEM.

**Set: 2.02.SE**

Doors: 1VEST2A, 1VEST2B, 1VEST2C

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<thead>
<tr>
<th>Item</th>
<th>Model/Type</th>
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<tr>
<td>Continuous Hinge</td>
<td>CFM__SLF-HD1</td>
<td>1</td>
<td>PE 087100</td>
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<tr>
<td>Push Bar</td>
<td>RM3112 Mtg-Type 12XHD</td>
<td>as required</td>
<td>US32D RO 087100</td>
</tr>
</tbody>
</table>
1 Semi-Circular Pull  RM4506 Mtg-Type 12XHD  US32D  RO  087100
1 Door Operator (smoke evac system)  6330 as required  600  NO  087100

Notes: SMOKE EVAC SYSTEM.

**Set: 2.03**

Doors: 1ILOBB2D

2 Continuous Hinge  CFM__SLF-HD1  PE  087100
1 Manual Flush Bolt  555  US26D  RO  087100
1 Flush Bolt  555-24  US26D  RO
1 Mortise Deadlock (al/gl dr)  1850S x as required  628  AD  087100
1 Interchangeable Core  8000 (N Keyway)  626  RU  087100
1 Cylinder  1080-114- C6R  626  RU  087100
2 Push Bar  RM3112 Mtg-Type 12XHD x width as required  US32D  RO  087100
2 Semi-Circular Pull  RM4506 Mtg-Type 12XHD  US32D  RO  087100
2 Closer (surface)  DC8210 A11  689  RU  087100
1 Drop Plate  754F25  RU

Notes: Security locks/unlocks deadbolt.

**Set: 3.01**

Doors: 106, 146E, 146F, 1CORR1, 1ILOBB2A, 1ILOBB2E, 1MECH2B, 201A, 201B, 201C, 201D, 201E, 201F, 201G, 201H, 206, 255A, 255B, 255C, 255D, 256A, 256B, 260B, 2CORR1B, 353, 3CORR1A, 3CORR1B, 4CORR1A

1 Specialty Door Assembly  All hardware by assembly manufacturer (non-keyed)  00

**Set: 4.01**


4 Hinge  TA2714 4-1/2" x 4-1/2"  US26D  MK  087100
1 Mortise Lockset (entrance/office, ADA thumb turn)  ML2054 102X M34 C6  626  RU  087100
1 Interchangeable Core  8000 (N Keyway)  626  RU  087100
1 Wall Stop  406  US26D  RO  087100

**Set: 4.02**

4. Hinge

1 Mortise Lockset (entrance/office, ADA thumb turn)

1 Interchangeable Core

1 Closer (surface)

1 Wall Stop

---

4 Hinge

1 Mortise Lockset (security entrance/classroom lock, ADA thumb turn)

1 Interchangeable Core

1 Closer (surface)

1 Wall Stop

---

Set: 5.01

Doors: 101D, 106D, 424A, 431, 4CORR4A, 4CORR4B

4 Hinge

1 Mortise Lockset (security entrance/classroom lock, ADA thumb turn)

1 Interchangeable Core

1 Closer (surface)

1 Wall Stop

---

Set: 5.02

Doors: 422

4 Hinge

1 Mortise Lockset (security entrance/classroom lock, ADA thumb turn)

1 Interchangeable Core

1 Closer (surface)

1 Wall Stop

---

Set: 5.03


4 Hinge

1 Mortise Lockset (security entrance/classroom lock, ADA thumb turn)

1 Interchangeable Core

1 Closer (surface)

1 Wall Stop

---

Set: 5.04

Doors: 207, 302, 303A, 304, 430, 440

1 Continuous Hinge

1 Mortise Lockset (security entrance/classroom lock, ADA thumb turn)
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<th>Description</th>
<th>Model/Spec</th>
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<td>4 Hinge (heavy weight)</td>
<td>T4A3786 4-1/2&quot; x 4-1/2&quot;</td>
<td>US26D MK</td>
<td>087100</td>
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<tr>
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<td>Mortise Lockset (security lock)</td>
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<tr>
<td></td>
<td>1 entrance/classroom lock, ADA thumb</td>
<td>ML2075 102X M34 C6</td>
<td>626 RU</td>
<td>087100</td>
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<td>1 Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU</td>
<td>087100</td>
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<td>1 Closer (surface)</td>
<td>DC6200</td>
<td>689 RU</td>
<td>087100</td>
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<td></td>
<td>1 Wall Stop</td>
<td>406 US26D RO</td>
<td>087100</td>
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<td>Mortise Lockset (security lock)</td>
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<tr>
<td></td>
<td>1 entrance/classroom lock, ADA thumb</td>
<td>ML2075 102X M34 C6</td>
<td>626 RU</td>
<td>087100</td>
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<tr>
<td></td>
<td>1 Interchangeable Core</td>
<td>8000 (N Keyway)</td>
<td>626 RU</td>
<td>087100</td>
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<td>1 Surface Overhead Stop</td>
<td>10-X36</td>
<td>630 RF</td>
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<td>1 Wall Stop</td>
<td>406 US26D RO</td>
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<td>4 Hinge</td>
<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
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<td>Mortise Lockset (security lock)</td>
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<td>1 entrance/classroom lock, ADA thumb</td>
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<td>1 Interchangeable Core</td>
<td>8000 (N Keyway)</td>
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<td>1 Closer (surface)</td>
<td>DC6200</td>
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<td>1 Wall Stop</td>
<td>406 US26D RO</td>
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<td>087100</td>
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<tr>
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<td>Mortise Lock (passage)</td>
<td>ML2010 102X</td>
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<tr>
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<thead>
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<td>US26D MK</td>
<td>087100</td>
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<tr>
<td></td>
<td>Mortise Lock (passage)</td>
<td>ML2010 102X</td>
<td>626 RU</td>
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<td></td>
<td>1 Wall Stop</td>
<td>406 US26D RO</td>
<td>087100</td>
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</table>
4 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Mortise Lock (passage) ML2010 102X 626 RU 087100
1 Surface Overhead Stop 10-X36 630 RF 087100

Set: 6.03

Doors: 231, 232, 233, 234, 235

1 Pivot Set L147x L180 626 RF 087100
1 Intermediate Pivot ML19 626 RF 087100
1 Mortise Lockset (passage, lead lined) ML2010 102X M29 626 RU 087100
1 Surface Closer (lead lined cover) DC8200 M73 M108 689 RU 087100
1 Heavy Duty Floor Stop 463-RKW US32D RO 087100

Notes: Lead lined assembly.

Set: 6.04

Doors: 1CORR6A, 424B

4 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Mortise Lock (passage) ML2010 102X 626 RU 087100
1 Closer (surface) DC6200 689 RU 087100
1 Wall Stop 406 US26D RO 087100

Set: 7.01

Doors: 102A, 102B, 103C, 110, 121B, 1CUST1, 2CUST1, 303B, 311, 312, 332, 362, 3CUST1, 423, 434, 448, 4CUST1

4 Hinge TA2714 4-1/2" x 4-1/2" US26D MK 087100
1 Mortise Lockset (storeroom) ML2057 102X C6 626 RU 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Wall Stop 406 US26D RO 087100

Set: 7.02

Doors: 101C, 236, 252, 253

1 Continuous Hinge CFM__SLF-HD1 PE 087100
1 Mortise Lockset (storeroom) ML2057 102X C6 626 RU 087100
1 Interchangeable Core 8000 (N Keyway) 626 RU 087100
1 Closer (surface) DC6210 A3 M54 689 RU 087100
1 Wall Stop 406 US26D RO 087100

Set: 7.03

Doors: 251, 432, 435
4 Hinge
1 Mortise Lockset (storeroom)
1 Interchangeable Core
1 Closer (surface)
1 Wall Stop

Set: 7.04

Doors: 341, 351

4 Hinge (heavy weight)
1 Mortise Lockset (storeroom)
1 Interchangeable Core
1 Closer (surface)
1 Wall Stop

Set: 7.05

Doors: 363

4 Hinge
1 Manual Flush Bolt
1 Flush Bolt
1 Mortise Lockset (storeroom)
1 Interchangeable Core
2 Wall Stop

Set: 7.06

Doors: 5MECH2, 5STRW2A

4 Hinge
1 Mortise Lockset (storeroom)
1 Interchangeable Core
1 Closer (surface)
1 Wall Stop
1 Gasketing

Set: 8.01

Doors: 1MRR1, 1WRR1, 1WRR2, 2MRR1, 2WRR1, 3WRR1, 3MRR1, 4MRR1, 4WRR1

4 Hinge
1 Push Plate
1 Pull Plate
1 Closer (surface)
1 Kick Plate
1 Wall Stop
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<td>TA2714 4-1/2&quot; x 4-1/2&quot;</td>
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<td>2 Hinge (spring)</td>
<td>1522 4-1/2&quot; x 4-1/2&quot;</td>
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<td>1 Mortise Lockset (privacy, occupancy indicator, ADA thumb turn)</td>
<td>ML2030 102X M34 M19V</td>
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<td>DC6200</td>
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<td>ML2075 HPSK M34 C6</td>
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<td>1 Interchangeable Core</td>
<td>8000 (N Keyway)</td>
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Doors: 1STRW1A, 250, 2CORR2, 2STRW2, 3CORR2, 4CORR6A, 4CORR6B

4 Hinge
1 Fire Rated Rim Exit
1 Interchangeable Core
1 Cylinder
1 Closer (surface)
1 Wall Stop

Set: 11.03
Doors: 230, 2CORR3B, 350, 360, 3STRW3, 4STRW1, 4STRW3

Set: 11.04
Doors: 3STRW1, 3STRW2, 4STRW2

Set: 11.05
Doors: 2CORR4

Notes: FAIL SAFE ELECTRIC STRIKE (NON RATED OPENING).
**Set: 13.01**

Doors: 146C

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END OF SECTION
SECTION 101103
VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SUMMARY
A. Section includes:
1. Tackboards.
2. Porcelain markerboards.
3. Glass markerboards.
4. Visual display wall coverings.
5. Glass display case.
6. Cabinet Whiteboards.
7. Glass dry erase markerboards.

1.3 SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
B. Samples for Verification: For each type of visual display unit indicated.
C. Sample Warranties: For special warranties.
D. Maintenance Data: For visual display units to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

1.5 WARRANTY
A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces become slick or shiny.
      c. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. 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.
2.2 MATERIALS, GENERAL
A. Porcelain-Enamel Face Sheet: Manufacturer’s standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.
   1. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.
B. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.
C. Vinyl Fabric: Mildew resistant, washable, complying with FS CCC-W-408D, Type II, burlap weave; weighing not less than 13 oz./sq. yd.; with surface-burning characteristics indicated.
D. Hardboard: AHA A135.4, tempered.
E. Particleboard: ANSI A208.1, Grade 1-M-1.
F. Fiberboard: ANSI A208.2, Grade MD.
G. Extruded Aluminum: ASTM B 221, Alloy 6063.
H. Laminating Adhesive: Manufacturer’s standard moisture-resistant thermoplastic type.

2.3 TACKBOARD ASSEMBLIES
A. Vinyl-Fabric-Faced Tackboard: 1/8-inch- (3-mm-) thick, vinyl-fabric-faced cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick fiberboard backing.
   1. Acceptable Manufacturers:
      a. Claridge Products & Equipment, Inc.
      b. Best-Rite Manufacturing.
      c. Egan Visual, Inc.
      d. PolyVision Corporation, a Steelcase Company.
   2. Basis of Design: Claridge; Series 3 Type A with concealed fasteners, top map rail and bottom chalk rail.
      a. Tackboard Color: As selected by Architect from manufacturer’s full line of products.
      b. Trim Color: Clear anodized.

2.4 PORCELAIN MARKERBOARD ASSEMBLIES
A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with high-gloss finish.
   1. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Best-Rite Manufacturing.
      b. Claridge Products and Equipment, Inc.
      c. PolyVision Corporation; a Steelcase company.
      d. Egan Visual Inc.
   2. Manufacturer’s Standard Core: Minimum 1/4 inch 6 mm thick, with manufacturer’s standard moisture-barrier backing.
   3. Laminating Adhesive: Manufacturer’s standard, moisture-resistant thermoplastic type.
   4. Basis of Design: Claridge; Series 3 Type A with concealed fasteners, top map rail and bottom chalk rail.

2.5 GLASS MARKERBOARD ASSEMBLIES
A. Basis of Design:
   1. Acceptable Manufacturer: Clarus.
   2. Product: Clarus Float.
   5. Accessories:
      a. One box marker holder for each board.
      b. Four hoop magnets for each boards.
2.6 VISUAL DISPLAY WALL COVERINGS
A. Visual Display Wall Covering: Intended for use with dry-erase markers and as a projection surface and consisting of low-gloss, plastic film bonded to fabric backing; not less than 0.020-mil (0.0005-mm) total thickness.
   1. Basis-of-Design: Walltalkers; a division of RJF International Corporation; Just Rite, JR48-00 with scrim backing or approved equal. Note: Submit samples of manufacturer's options of Visual Display Wall Coverings for Architect's review and selection.
B. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application, as recommended in writing by wall covering manufacturer.
C. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099000 and recommended in writing by wall covering manufacturer for intended substrate.
D. Install and adhere 20 gauge sheet metal to wall behind Visual Display Wall Covering and ensure flatness prior to installing Visual Display Wall Covering.

2.7 GLASS FRONT LOCKABLE DISPLAY CASE
A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products to be incorporated into the Work include, but are not limited to the following:
   1. Claridge
B. Size: 36 inches wide by 30 inches tall
C. Mounting: Recessed.
D. Finish: Clear anodized aluminum.
E. Basis-of-Design: Claridge; Contemporary Series.

2.8 CABINET WHITE BOARDS
A. Acceptable Manufacturers:
   1. Egan Visual
   2. Nucraft
B. Basis of Design:
   1. Egan Visual Wood Presentation Cabinet # CABW48 with bullnose edge and hardwood veneer. Veneer, stain and finish to be selected by Architect.
      a. Tackable interior on both side panels
      b. Full low glare whiteboard porcelain center section with marker tray below.
      c. Finishes to be selected by Architect from manufacturer's full and complete line of finishes.

2.9 VISUAL DISPLAY BOARD ACCESSORIES
A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-(1.57-mm)-thick, extruded aluminum; of size and shape indicated.
B. Chalktray: Manufacturer's standard, continuous, extruded aluminum, solid type with ribbed section and smoothly curved exposed ends.
C. Visual Display Rails: Manufacturer's standard, aluminum-framed, tackable fabric visual display surface fabricated into narrow rail shape and designed for displaying material.
   1. Provide continuous display rail along entire length of top of markerboards.

2.10 FABRICATION
A. Fabricate visual display surfaces to sizes indicated on Drawings.
B. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive. Color to be selected by Architect.
C. Visual Display Boards: Factory assemble visual display boards, unless otherwise indicated.
1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

D. **Factory-Assembled Visual Display Units**: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
   2. Provide manufacturer's standard vertical-joint spline or H-trim system between abutting sections of markerboards.
   3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.

E. **Aluminum Frames and Trim**: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.
   1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

F. **Aluminum Anodic Finish**: Class II, anodic coating complying with AAMA 611. Refer to Document 008900 and Finish Selection Summary Spreadsheet for colors.

**PART 3 - EXECUTION**

3.1 **INSTALLATION**

A. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

B. Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. **Visual Display Boards**: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.
   a. Attach chalktrays to boards with fasteners at not more than 12 inches (300 mm) o.c.

D. **Visual Display Wall Coverings**: Comply with visual display wall covering manufacturers' written installation instructions.
   1. After installation, clean visual display wall covering according to manufacturer's written instructions. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

E. Attach one cleaning label to visual display surface in each room. Cover and protect visual display surfaces after installation and cleaning.

3.2 **SCHEDULE**

A. Deans Office: One Clarus Glassboard, 6’ x 4’.

B. Porcelain Markerboards:
   1. Classroom 101: Two 8’ x 4’.
   2. Classroom 103A: Two 8’ x 4’.
   3. Classroom 103B: Two 8’ x 4’.
   4. Nursing Debriefing: One 8’ x 4’.
   5. Classroom 204: One 8’ x 4’.
   6. Classroom 302: Two 8’ x 4’.
   7. Classroom 304: One 8’ x 4’.
   8. Classroom 340: Two 8’ x 4’.
   9. Classroom 446: One 8’ x 4’.

C. Conference Room 411: One 4’ x 4’ cabinet.
SECTION 102813

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Provisions established in General and Supplementary Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.

1.2 SECTION INCLUDES
A. Toilet accessories
B. Attachment hardware and related trim

1.3 SUBMITTALS
A. Product Data: Submit manufacturer's catalog cut sheets, data sheets, installation instructions, maintenance data, and operating instructions.

1.4 QUALITY ASSURANCE
A. Regulatory Requirements
1. Conform to ANSI A117.1, Texas Accessibility Standards, and Americans With Disabilities Act (or local code if more stringent requirement is applicable) for installing work for accessibility to the disabled.

1.5 SEQUENCING AND SCHEDULING
A. Coordinate work with placement of wall reinforcement and reinforcement/fabrication of toilet partitions to receive anchor attachments. Supply rough-in data in sufficient time to be built into other work.
B. Do not install accessories until room finishes are completed.
C. Provide all necessary wood blocking and/or steel structure to support toilet accessories as part of this scope of work.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Sheet Steel: ASTM A 366, commercial quality.
B. Zinc Coating: ASTM A 123.
C. Chrome Plating: ASTM B 456, Type SC2.
D. Stainless Steel Sheet: ASTM A 167.
E. Stainless Steel Tubing: ASTM A 269, stainless steel.
F. Fasteners, Screws, and Bolts: Hot dip galvanized ASTM A386 where concealed; finish to match device where exposed.
G. Expansion Shields: Type as recommended by accessory manufacturer for component and substrate.

2.2 BASIS OF DESIGN
B. Paper Towel Dispenser: Wausau Paper; Opti-Serv Hybrid, 77510.
C. Soap Dispenser: Gojo; LTX12, black, and integral mounted Gojo drip tray.
2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Bobrick Washroom Equipment, Inc.

B. Toilet Tissue (Roll) Dispenser (TA-1) at Multi-Fixture Restrooms: (OFCI)
   2. Description: Double roll dispenser without controlled delivery; lockable spindles.
   3. Accessible: Yes.
   5. Capacity: Two rolls of up to 6 inch diameter.

C. Toilet Tissue Dispenser (TA-2) at Gypsum Board Walls of Individual Restrooms and Stalls:
   3. Description: Double roll dispenser.
   4. Accessible: Yes.
   5. Operation: Non-controlled delivery.
   6. Capacity: Two rolls of up to 5 inch diameter.

D. Touchless Soap Dispenser (TA-3): (OFCI)
   1. Basis of Design: Bobrick B-826.18 with 826.20 power adapter and one case of 4 bottles.
   2. Power: 120v.
   3. Provide all electrical circuiting back to electrical panel for these units whether or not shown on Drawings.

E. Grab Bar, One-Piece (TA-4):
   1. Basis-of-Design: Bobrick; B-6897 42” x 54” x 1-1/2”.
   3. Material: Type 304 Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4, satin finish.
   5. Configuration and Length: 42 x 54 inches, one-piece construction.

F. Sanitary-Napkin Disposal Unit (TA-5):
   1. Basis-of-Design: Bobrick; B-353 (recessed type at tiled wall conditions); B-254 (surface mounted type at toilet partition conditions)
   2. Mounting:
      a. Recessed type: At tiled wall locations.
      b. Partition mounted: At toilet partition locations.
   3. Door or Cover: Self-closing disposal-opening cover and hinged face panel with tumbler lockset.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Waste Receptacle (TA-6): (DELETED FROM PROJECT - REPLACE WITH Opti-Serve Hybrid paper towel dispenser (OFCI))
   1. Basis-of-Design: Bobrick; B-369 with optional 369-130 Towelmate (recessed type) for single user toilets.
   2. Mounting: Recessed 4 inches into cavity.
   3. Capacity: 2 gallons.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).
   6. 350 C-Fold Towels or 475 Multi-Fold Towels.
H. Combination Paper Towel Dispenser and Waste Receptacle (TA-7) for Public Toilets: (DELETED FROM PROJECT - REPLACE WITH Opti-Serve Hybrid paper towel dispenser (OFCl))

1. **Basis of Design**: Bobrick B-3947 with optional 369-130 Towelmate.
2. **Mounting**: Recessed type. Note unit requires 4 inch into cavity.
3. **Capacity**:
   b. Towels: 600 C-fold or 800 multi-fold.
4. **Stainless steel No.4 finish (satin)**.

I. **Air Dryers (TA08): (Not Used)**

1. **Basis-of-Design**: Dyson; Airblade dB AB14.
2. **Case**: Polycarbonate ABS plastic with antimicrobial coating.
3. **Touch-free operation**.
4. **Electrical Characteristics**: 120-127V 50 & 60 Hz.
5. **Motor Speed**: 92,000 RPM.
6. **Color**: As selected by Architect.

2.4 **OTHER BATHROOM ACCESSORIES**

A. **Acceptable Manufacturers**: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ameror.
2. Bobrick Washroom Equipment, Inc.
3. American Specialties, Inc.
4. Basco.
5. Bradley Corporation.
6. Harneu Hardware.
7. Taymor.
8. Freedom Showers
9. Danze
10. KR Specialities
11. Accessible Environments

B. **Toilet Tissue (Roll) Dispenser (TA-9): (Not Used)**

1. **Basis of Design**: Taymor 01.2608 Satin Stainless Steel.

C. **Shower Curtain Rod (TA-10): (Not Used)**

1. **Basis-of-Design**: Bobrick; B-207.
2. **Outside Diameter**: 1-1/4 inch (32 mm).
3. **Mounting**: Flanges with concealed fasteners.
4. **Rod Material and Finish**: Stainless steel, No. 4 finish (satin).
5. **Flange Material and Finish**: Stainless steel, No. 4 finish (satin).
6. **Accessories**: Integral chrome-plated brass glide hooks.

D. **Double 18" Towel Bar (TA-11): (Not Used)**

1. **Basis-of-Design**: Danze Sirrius 18" (3 ½" x 22") Satin Stainless Steel.

E. **Robe Hook (TA-12): (Not Used)**

1. **Basis-of-Design**: Bobrick; B-6727.
2. **Description**: Double-prong unit.
3. **Material and Finish**: Stainless steel, No. 4 finish (satin).

F. **Single 24" Towel Bar (TA-13): (Not Used)**

1. **Basis of Design**: Taymor 01.2624.
2. **Description**: 3/4-inch-(19-mm-) square tube with rectangular end brackets.
3. **Mounting**: Flanges with concealed fasteners.
4. **Length**: 24 inches.
5. **Material and Finish**: Stainless steel, No. 4 finish (satin).

G. **Folding Shower Seat (TA-14): (Not Used)**
1. **Basis-of-Design** Product: Freedom Showers/Accessible Professionals Folding Shower Seat APCSSB-30015PWS White (30” x 15”).
2. Configuration: L-shaped seat, designed for wheelchair access.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.
5. Dimensions: 30 inches wide by 15 inches deep.

H. **Shower Curtain and Hooks (TA-15): (Not Used)**
   1. Shower Curtain Material: Opaque, matte white vinyl 008” (0.2mm) thick.
      a. **Basis-of-Design:** Bobrick; B-204-2.
      a. **Basis-of-Design:** Bobrick; B-204-1.
      1) Substitutions: In accordance with the requirements of Section 012500.

I. **Baby Changing Station (TA-16): (Not Used)**
   1. **Basis-of-Design:** Koala Kare; KB110-SSRE.
   3. Orientation: Horizontal.

J. **Double 24" Towel Bar (TA-17): (Not Used)**
   1. **Basis-of-Design:** Danze Sirrius 24” (7” x 24”) Satin Stainless Steel.
   3. Length: 24 inches.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).

K. **12" Grab Bar (TA-18): (Not Used)**
   1. **Basis of Design:** Taymor 01.C220012 Satin Stainless Steel.

L. **24" Grab Bar (TA-19): (Not Used)**
   1. **Basis of Design:** Taymor 01.C220024 Satin Stainless Steel.

M. **36" Grab Bar (TA-20): (Not Used)**
   1. **Basis of Design:** Taymor 01.C220036 Satin Stainless Steel.

N. **42" Grab Bar (TA-21): (Not Used)**
   1. **Basis of Design:** Taymor 01.C220042 Satin Stainless Steel.

O. **Fold Up Tub Seat (TA-22): (Not Used)**
   1. **Basis of Design:** CD Sparling FTB-28; 28”; white.

P. **Weighted Shower Curtain for Accessible Showers (TA-23):** Accessible Environments # CURT0005-66W x 74H x 72" for 60" shower. Provide with collapsible water dam by KR Specialties model # New Generation 66” with end caps.

2.5 **UNDERLAVATORY GUARDS**

A. **Acceptable Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Plumberex Specialty Products, Inc.
   2. Truebro, Inc.

B. **Underlavatory Guard (TA-24): Provide at all exposed hot water piping and drains whether or not indicated on Drawings.**
   1. **Basis-of-Design:** Plumberex; Handy-Shield Maxx.
   2. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
2.6 **CUSTODIAL ACCESSORIES**

A. **Acceptable Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.

B. **Mop Holder with Shelf (TA-25):**

1. **Basis-of-Design:** Bobrick; B-224x 36
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches (914 mm).
4. **Hooks:** Three.
5. **Mop/Broom Holders:** Four, spring-loaded, rubber hat, cam type.
   a. **Shelf:** Not less than nominal 0.05-inch (1.3-mm) thick stainless steel.
   b. **Rod:** Approximately 1/4-inch (6-mm) diameter stainless steel.

2.7 **MIRRORS**

A. **Acceptable Manufacturers:** Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.

B. **24 inch wide by 36 inch high (TA-26):**

1. **Basis of Design:** Bobrick B165 2436.
2. Description: Stainless steel channel frame with 1/4 inch thick glass.
3. Set at height meeting ADA requirements.

2.8 **FABRICATION**

A. Weld and grind smooth joints of fabricated components.
B. Form exposed surfaces from single sheet of stock, free of joints.
C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
D. Back paint components where contact is made with building finishes to prevent electrolysis.
E. Shop assemble components and package complete with anchors and fittings.
F. Provide steel anchor plates, adapters, and anchor components for installation.
G. Manufacturer’s identification tags or marks are not acceptable on surfaces that will remain exposed to view after installation.
   1. Evidence of “patching” after removal of tags or marks is not acceptable.

2.9 **FACTORY FINISHING**

A. Galvanizing: ASTM A 123 to 1.25 ounces per square foot.
B. Chrome/Nickel Plating: ASTM B 456, Type SC 2 polished finish.
C. **Stainless Steel:** No. 4 satin luster finish.

**PART 3 - EXECUTION**

3.1 **EXAMINATION**

A. Examine site conditions to ensure that required blocking, wall thicknesses, and supports are provided prior to ordering units. If wall thicknesses are not sufficient, notify Architect for instruction prior to ordering units. Proceed with Work in accordance with Section 014300.

B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and instructed by the manufacturer.

C. Check openings for plumbness of blocking and frames.

D. Beginning of installation means acceptance of existing conditions.
3.2 PREPARATION
A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
B. Provide templates and rough-in measurements as required.
C. Verify exact location of accessories for installation.
D. Protect adjacent or adjoining finished surfaces and work from damage during installation.

3.3 INSTALLATION
A. Install using skilled workmen in accordance with manufacturers' printed instructions.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Locate accessories in order that they do not interfere with door swings or use of fixtures.
   Install recessed accessories after wall finishes have been completed.
D. Anchor accessories with bolts, plates, and approved type fasteners. Take down any loose items and repair damaged wall surfaces.
E. Mount surface mounted accessories to backup material with toggle bolts, plumb and align.
F. Anchor grab bars to drywall with concealed 16 gage steel anchor plates.

3.4 SCHEDULE (refer to Drawings for additional requirements and locations of toilet accessories)
A. Public Restrooms: Provide the following at each Public Restroom:
   1. One TA-1 double toilet tissue dispenser at each toilet.
   2. One TA-3 touchless soap dispenser at each lavatory.
   3. One TA-4 grab bar at each handicapped toilet.
   4. One TA-5 sanitary napkin disposal unit for each female toilet.
   5. One TA-7 combination paper towel and waste receptacle.
   6. One TA-24 undercounter lavatory guard at each lavatory.
   7. One trash receptacle adjacent to entry door. Material only allowance of $80.00 each.
B. Individual and Private Restrooms: Provide the following at each Individual or Private Restroom:
   1. One TA-4 grab bar.
   2. One TA-3 touchless soap dispenser.
   3. One TA-2 toilet tissue dispenser.
   4. One TA-7 combination paper towel and waste receptacle.
   5. One TA-24 undercounter lavatory guard.
   6. One TA-26 24 by 36 inch framed mirror set at an accessible height unless a lighted mirror is called for on RCP's.
   7. One trash receptacle adjacent to entry door. Material only allowance of $80.00 each.
C. Janitor Rooms: Provide two TA-25 mop holders at each Janitor Closet. Place one over mop sink. Refer to drawings for other locations.
D. Underlavatory Guards: Provide TA-24 underlavatory guards at all exposed water pipes and drains below accessible lavatories and sinks.

END OF SECTION
SECTION 271100
COMMUNICATIONS ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes basic communications and equipment room design requirements and fittings including:

1. Equipment cabinets, racks, frames and enclosures
2. Cable management and ladder racks
3. Telecommunications service entrance pathways
4. Rack mounted power protection and power strips

B. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 270528 Pathways for Communications
5. Section 270810 Fiber Optic Testing and Measurements
6. Section 271300 Communications Backbone Cabling
7. Section 271500 Communications Horizontal Cabling
8. Section 274100 Audio-Visual Systems
9. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer’s instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts

1. Refer to section 270000.

D. Codes and Standards (Most recent editions or as required in contract)

1. Refer to section 270000.

E. Communications rooms must be dedicated to designated equipment and services:

1. Space shall not be used for storage of equipment not related to designated equipment and services.
2. Hazardous or corrosive materials shall not be stored in the space.
3. Piping, ductwork and distribution of power, not related to designated equipment and services shall not pass through or be located within the space.
   a) Foreign piping such as water pipes, steam pipes, soil pipes, sanitary drains, storm drains, A/C ducts, and other unrelated systems utilized for or containing liquids, or gases shall not be installed or pass through communication rooms.
   b) With the exception of fire sprinklers, all water pipes shall be routed around communications room.

F. Each communication room shall be equipped with fire detection, fire-extinguishing system and prevention devices. Connect detection devices to base building fire alarm system. A minimum of one (1) smoke detector shall be installed in each communications room.

G. Walls shall be covered with 0’-¾” X 4’-0” X 8’-0” AC-grade plywood backboard 1’-0” AFF (smooth side to interior of room mounted vertically), capable of supporting mounted hardware and equipment.
   1. Plywood shall be affixed to the studs in the walls with screws that penetrate the studs a minimum of 0’-1”, are spaced not greater than 1’-6” (18") apart in each stud, and with screws 0’-0” from the top and bottom of plywood.
   2. Plywood shall be sealed against the wall and painted on all exposed sides with two coats of flat white non-reflective paint.
   3. If applicable fire-treatment verification stamps on plywood shall be left unpainted to be readable.

H. Communications room walls shall extend from floor slab to ceiling deck, with no drop ceilings installed.

I. Cable tray or ladder rack should be used to distribute cables between rooms through finished wall penetrations.

J. Cable ladder rack should be used to distribute cables within rooms, complete with cable bend limiters (drop outs).

K. To reduce static, floors should not have carpet, but be sealed concrete to prevent concrete dust from forming.

L. Communications rooms shall have only one lockable entrance door, a minimum of 3’-0” wide and 7’-0” high, that opens towards the outside of the room, and does not open into another room.
   1. Doors shall be provided with a lockset for the appropriate technology key with pinned hinges and anti-pry guards.
   2. Doors should have no windows or door seals.
   3. Communications rooms should have no exterior identifying markings.

M. Mechanical
   1. Install monitoring sensors with dedicated environmental controls operating 24 hours a day, 365 days a year in the communications rooms.
   2. Provide ventilation in the communications rooms to dissipate heat generated by active devices.
   3. Temperature and Humidity requirements:
a) Maintain communication rooms at an average of 60°F to 70°F, with a relative non-condensing humidity of 30% to 50%.
b) The temperature range should be maintained within ± 9°

N. Plumbing
1. If “wet” fire suppression is used, install wire cages on sprinkler heads to prevent accidental operation.
2. Do not place sprinkler heads over equipment or cabling. In the event of a leak this will protect the equipment and cabling.
3. Drainage troughs are also recommended for leakage protection.

O. Electrical
1. One manufacturer’s product is recommended for each type of installation. The mixing of different manufacturer products for one item is not acceptable.
2. No electrical feeders/branch circuits shall be placed in or run through any communications room except as required to service those rooms.
3. The Contractor shall install a slot (a UL-approved fire-rated assembly) to accommodate cable runway entry from corridor and a fire-retardant system (bricks, boards, mechanical, etc). The formed slot shall have no burrs or sharp edges. This opening in the wall will be used to pass data and voice cabling from the corridor cable tray into the communications room.
4. The Contractor shall provide uniform illumination of at least 50 foot-candles (fc) 3'-0” AFF for communications rooms located a minimum of 8'-0” AFF.
   a) Light fixtures in communications rooms are to be positioned for maximum lighting. Do not install over cable tray, ladder rack, or 1'-7" (19") standing racks.
   b) Provide enough power receptacles to support equipment and service. Coordinate power requirements of active equipment with electrical designer.

P. Relay Racks
1. 1'-7" (19") X 7'-0” relay racks are to be used for mounting and termination of inter-building and intra-building fiber optic/ copper cables and components.
   a) The racks shall have adequate horizontal and vertical cable management for the 8P8C patch panels and switches.
   b) Racks with active electronics shall have rack mounted power strips.

1.3 SUBMITTALS
A. Refer to section 270000.

1.4 QUALITY ASSURANCE
A. Refer to section 270000.
B. Product Standards
1. Equipment and materials shall be standard products of a manufacturer regularly engaged in the manufacture of telecommunications cabling products and shall be the manufacturer’s latest standard design in satisfactory use for at least one year prior to bid opening.

2. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to section 270000.

B. Coordinate layout and installation of equipment with owner’s communications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1.6 PROJECT/SITE CONDITIONS

A. Refer to section 270000.

1.7 WARRANTY

A. Refer to section 270000.

B. At the start of the project, contractor shall register the project with the manufacturer to help insure and facilitate manufacturer’s warranty process.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. 1’-7” (19”) Floor-Mounted Equipment Racks with Vertical Managers

   1. Siemon – RS3-07-S
   2. Owner approved alternate

B. Horizontal Rack-Mount Cable Management

   1. Siemon RS3-RWM4-2
   2. Siemon RS3-RWM-2
   3. Owner approved alternate

C. Equipment Cabinet, Floor-Mounted (42U with doors and sides)

   1. APC NetShelter
   2. Owner approved alternate

D. Labeling

   1. Refer to section 270000.

E. Firestopping
1. Refer to section 270000.

2.2 ACCESSORIES

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Refer to Section 270000.

3.2 PREPARATION
   A. Refer to section 270000.
   B. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
   C. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
   D. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

3.3 INSTALLATION
   A. Refer to section 270000.

3.4 FIELD QUALITY CONTROL
   A. Refer to section 270000.

3.5 CLEANING
   A. Refer to section 270000.

3.6 ACCEPTANCE
   A. Refer to section 270000.

END OF SECTION
SECTION 271300

COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the backbone cabling portion of a structured cabling system including:

1. Fiber backbone cabling
2. Splicing
3. Termination and patch cables

B. Provide all backbone cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in Communications rooms.

C. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 270528 Pathways for Communications
5. Section 270810 Optical Fiber Testing and Measurements
6. Section 271100 Communications Equipment Room Fittings
7. Section 271500 Communications Horizontal Cabling
8. Section 274100 Audio-Visual Systems
9. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer’s instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts

1. Refer to section 270000.

D. Codes and Standards (Most recent editions or as required in contract)

1. Refer to section 270000.

1.3 SUBMITTALS

A. Refer to section 270000.
B. Cable Pulling Plan
   1. The contractor shall submit a cable pulling plan prior to installation.
   2. Submittal requirements:
      a) Indicate the installed backbone conduit layout in schematic format, including junction boxes and distances between junction boxes.
      b) Indicate contents of each conduit.
      c) Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.
      d) Include detail and schedule showing the construction sequence of communications rooms.
      e) Installation of cabling shall not commence prior to approval of the pulling plan and calculations by the engineer.

C. Splice Plan
   1. The contractor shall submit shop drawings indicating the intended cable splice points, mounting method and equipment list prior to installation.

D. Cable Testing Plan
   1. Refer to Section 270000.

E. Cable Testing Reports
   1. Refer to Section 270000.

1.4 QUALITY ASSURANCE
   A. Refer to section 270000.
   B. Cable splicing personnel shall have a minimum of five years splicing experience and shall have completed a minimum of five major splicing projects.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Refer to section 270000.
   B. Storage temperature range: -40°F to 149°F (-40°C to 65°C)
   C. Fiber cables shall be shipped on reels in lengths as specified with a minimum overage of 10%:
      1. The cable shall be wound on the reel so that unwinding can be done without kinking the cable.
      2. Two meters of cable at both ends of the cable shall be accessible for testing.
         a) All fiber shall be tested on the reel for continuity and distance compliance before installation.
      3. Each reel shall have a permanent label attached showing length, cable identification number, cable size, cable type, attenuation, bandwidth, and date of manufacture.
a) Labels shall be water resistant and the writing on the labels shall be indelible.

1.6 PROJECT/SITE CONDITIONS

A. Refer to section 270000.

1.7 WARRANTY

A. Refer to section 270000.

1.8 MAINTENANCE AND SUPPORT

A. Refer to section 270000.

PART 2 - PRODUCTS

2.1 ACCEPTABLE FIBER CABLE MANUFACTURERS

A. Armored OSP (Outside Plant) cable with rodent resistant insulation
   1. Corning
   2. Owner approved alternate

B. Backbone Armored Plenum Rated (Riser) cable (24-Strand Single Mode)
   3. Corning – 12 Strand 62.5um Multi Mode 012K88-33130-29
   4. Corning – 24 Strand 62.5um Multi Mode 024K88-33130-29
   5. Owner approved alternate

2.2 ACCEPTABLE COMPONENT MANUFACTURERS

A. Fiber Connectors, (SC)
   1. Corning
   2. Owner approved alternate

B. Fiber Duplex Patch Cables (Type SM)
   1. Leviton
   2. CommScope
   3. Berk-tek
   4. Corning
   5. Panduit
   6. Owner approved alternate

C. Fiber adapter panels (6-Port)
1. OCC Part 6012DSC
2. Owner approved alternate

D. Fiber adapter panels (12-Port)
   1. OCC – 12F SM FAP 6112SMDSC
   2. OCC – 12F MM FAP 6112MMDSC
   3. OCC – FAP Blank 600
   4. Owner approved alternate

E. Fiber Termination Shelf (Rack-Mounted)
   1. OCC – RTC2U-6APB (2RU enclosure)
   2. OCC – RTC4U-12APB (4RU enclosure)
   3. Owner approved alternate

F. Labeling
   1. Refer to section 270000.

G. Firestopping
   1. Refer to section 270000.

2.3 FIBER BACKBONE CABLING

A. Fiber General Requirements
   1. Fiber shall be certified to meet all parts of TIA-455 and comply with TIA-492, ANSI/ICEA S-83-596 and ANSI/ICEA S-83-640 and the NEC.
   2. Fibers shall have D-LUX coating or approved equivalent to ensure color retention, minimize micro bending losses and improve handling. The coating shall be mechanically strippable.
   3. Cable installed in plenums or air-handling spaces shall meet UL 910 and shall be marked OFNP (optical fiber non-conductive plenum) in accordance with the NEC.
      a) Plenum Fiber rated cable consisting of multiple fibers shall have a Plenum PVC outer jacket.
         1) Each group of fibers shall have a color-coded Low Smoke PVC buffer.
         2) The buffered fibers are organized in subunits of fibers, reinforced with aramid yarn for extra strength and surrounded with a color-coded low smoke tube.
      b) Within the premises, all fiber shall be placed in plenum rated innerduct the entire length of the cable for protection. Use manufacturer plenum rated couplings for all connections.
   4. Riser cable shall meet UL 1666 and be marked OFNR (optical fiber nonconductive riser) in accordance with the NEC.
      a) Non-plenum, riser rated cable consisting of multiple fibers, shall have an orange, Polyvinyl Chloride (PVC) outer jacket.
   5. OSP (Outside Plant) Fiber
a) Stranded loose tube dielectric fiber cable shall be utilized for underground conduit, direct buried, or aerial applications.
b) Underground cable, including cable installed in conduits or duct banks, shall contain an additional moisture barrier in the form of a flooding compound.
c) All OSP fiber strength members shall be dielectric without any metallic elements.

6. Fiber conductors shall follow standard color code schemes. Fiber numbers and binders shall correspond to the following color codes:

a) Fiber/Binder No. 1 – blue
b) Fiber/Binder No. 2 – orange
c) Fiber/Binder No. 3 – green
d) Fiber/Binder No. 4 – brown
e) Fiber/Binder No. 5 – slate
f) Fiber/Binder No. 6 – white
g) Fiber/Binder No. 7 – red
h) Fiber/Binder No. 8 – black
i) Fiber/Binder No. 9 – yellow
j) Fiber/Binder No. 10 – violet
k) Fiber/Binder No. 11 – rose
l) Fiber/Binder No. 12 – aqua

7. Cable Minimum Bending Radius:

a) During Installation: 20X cable diameter
b) After Installation: 10X cable diameter

8. Operating temperature range: -76°F to 185°F (-60°C to 85°C)

B. Single Mode Fiber Requirements

1. Fibers shall have dual wavelength capability, transmitting at 1310 and 1550 nm ranges.
2. 8.3 µm core
3. 125 µm ± 1 µm cladding diameter
4. Cladding non-circularity: = 1%
5. Core/cladding concentricity error: = .5 µm
6. Colored fiber diameter: 254 µm ± 7 µm
7. Maximum Attenuation: 1.0 dB/km at 1310 and 1550 nm (inside premises) and 0.5 dB/km at 1310 and 1550 nm (OSP)
8. Minimum Bandwidth: 20 GHz
9. The mechanical and environmental specifications for OSP fiber cable shall be in accordance with ANSI/ICEA S-87-640. OSP fiber cables shall be of a water-block construction and meet the requirements for compound flow and water penetration as established by ANSI/ICEA S-87-640. Outdoor cable shall have minimum pull strength of 2670 N (600 lbf).

2.4 COPPER PATCH CABLES

A. Refer to Section 271500.

2.5 FIBER PATCH CABLES
A. Verify exact quantities and lengths with Owner prior to purchase

B. Provide the appropriately-rated (matched to the installed cable plant) Modular Patch Cords for the appropriate location and equipment.

C. Single Mode patch cables shall be a stepped-index 8.3 µm core with a 125 µm cladding.

D. Duplex SC connectors shall meet the following specifications:
   1. Made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.
   2. Patch cords shall be in original packaging when presented to the Owner.

E. Aramid yarn and a jacket of flame-retardant PVC shall cover the fiber cladding.

F. Single Mode patch cable additional requirements:
   1. Return Loss: -50 dB maximum
   2. Mated Connector Loss: μ = 0.35 dB, σ = 0.2 dB
   3. Connection Repeatability: 0.20 dB maximum changes per 200 re-connects.

G. The Single Mode connector (visible portion) and adapter/outlet shall be identified by the color blue.

2.6 LABELING

A. Refer to Section 271500.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Refer to Section 270000.

B. Verify the following before proceeding:
   1. Conduits, cable trays and pull boxes are properly installed following section 270528
   2. Backboards in communications rooms are properly installed following section 271100
   3. Grounding system is properly installed and tested following section 270526
   4. Liquid-carrying pipes are not installed in or above voice and data system communications rooms.
      a) Do not proceed with installation in affected areas until removed.

3.2 PREPARATION

A. Refer to section 270000.

B. OSP Cable
1. The Contractor shall verify pulling material (pull rope, mule tape, etc.) average breaking strength based on cable type and size, pulling distance and pathway, and other pertinent factors.

### 3.3 FIBER INSTALLATION

#### A. Fiber Cable Installation

1. Fiber cable shall be installed in innerduct from near end termination point to far end termination point.
   a) Only UL-approved plenum-rated innerduct shall be installed in all plenum areas.
   b) Metallic conduit may be used in lieu of innerduct in plenum-rated ceilings if it is bonded and grounded correctly.

2. Only technicians certified by the product manufacturer shall perform terminations.
   a) Terminations shall be made in a controlled environment.
   b) Cables may be assembled off-site, although testing must be completed with the cable in its final installed condition.
   c) Test optical fiber on the reel for distance and continuity verification before installation.

3. At each location where fiber cable is exposed to human intrusion, it shall be marked with warning tags.
   a) These tags shall be yellow or orange in color, and shall contain the warning "CAUTION FIBER OPTIC CABLE".
   b) The text shall be permanent, black, block characters, and at least 0\'-.1875\" high.
   c) A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than 5\'-0".
   d) Any section of exposed cable that is less than 5\'-0" in length shall have at least one warning tag affixed to it.

#### B. Fiber Distribution Center

1. Contractor shall provide sufficient spare adapter plates to fill the appropriate-sized FDC.

### 3.4 FIBER TERMINATION AND SPLICING

#### A. Interconnect Units and Distribution Shelves

1. Modular in design and used in fiber interconnection, cross-connection, and splicing applications
2. 1\'-7" (19") rack-mountable
3. Accept 12-strand, 24-strand, 48-strand or 72-strand terminations
4. Owner approved industry standard connector

#### B. Splicing and closures

1. Fiber splice modules shall be utilized for all OSP terminations.
2. The link shall consist of:
a) Fiber cable  
b) Splice  
c) Splice tray holder/closure  
d) Fiber panel/coupler  
e) Pre-manufactured fiber pigtail with pre-polished fiber connector  
f) Fiber jumper to connect the pigtail-coupled link to the appropriate electronic switch

C. Fiber Fusion Splice

1. Fusion splices shall be mounted in protective trays within the closure.  
2. Fusion splices shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA-455-34, Method a (factory testing) or ANSI/TIA-455-59 (field testing).

   a) Fiber splices shall have a minimum return loss of 26 dB for Single Mode  

      1) Minimum Single Mode return loss for broadband analog video (CATV) applications is 55 dB.

3.5 INSTALLATION REQUIREMENTS

A. All installation shall be done in conformance with ANSI/TIA-568-B standards, BICSI methods, and industry standard installation guidelines.  

   1. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities.  
   2. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation.  
   3. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

B. The Contractor shall provide service loops for cables terminating in the communications rooms.  

   1. A 10'-0" service loop shall be provided and secured in a neat and standards-compliant manner above the equipment racks or cable trays unless specified otherwise.  
   2. This allows for future changes or expansion without installing new cables.

C. Documentation  

   1. All cable inventory data documentation shall be submitted in format coordinated with and approved by owner so that data can be incorporated into existing databases.  
   2. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.  
   3. Complete cross connect documentation is required. It shall include detailed documentation of each pair of all copper backbone cable and strand of fiber.

3.6 FIELD QUALITY CONTROL

A. Refer to section 270000.
3.7 COPPER POST-INSTALLATION TESTING

A. Contractor shall test each pair or strand of every cable prior to acceptance.

B. Refer to Sections 270000 and 271500.

C. Copper Test Documentation
   1. Refer to Section 271500.

3.8 FIBER POST-INSTALLATION TESTING

A. Provide all labor, materials, tools, field-test instruments and equipment required for the complete and proper test measurements of the installed fiber cabling.

B. Contractor shall have successfully attended a fiber testing training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof.

C. All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing.
   1. Any testing performed on incomplete systems shall be redone on completion of the work.

D. Dust caps shall be placed on fiber endfaces or adapters for each optical fiber link after all testing is complete on the fiber link.

E. Pre-test Submittals
   1. Manufacturers catalog sheets and specifications for the fiber cable field-test instruments including
      a) OLTS (Optical Loss Test Set)
      b) OTDR (Optical Time Domain Reflectometer)
   2. A schedule (list) of all fiber cables to be tested
   3. Fiber testing training program certificate
   4. Sample test reports

F. Fiber testing standards
   1. The Contractor shall meet or exceed the following standards and guidelines:
      a) ANSI/TIA-568-C.0 Optical Fiber Transmission/Test Requirements, and Annex E: Optical Fiber Field Test Guidelines (Tier 2)
         1) Tier 2 testing is a higher level of testing that provides qualitative measures of the installed condition and performance of the cabling system
      b) ANSI/TIA-568-B.3 Optical Fiber Cabling Components Standard
      c) TIA/TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
   2. Single Mode requirements
a) ANSI/TIA-526-7, Method A.1: Optical Power Loss Measurements of Installed Single Mode Fiber Cable Plant-OFSTP-7

3. The cable installers shall have a copy of these references in their possession and be familiar with the contents.

G. In order to conform to the overall project event schedule, the contractor shall survey and coordinate the optical fiber testing with other applicable trades.

H. In addition to the test regiment detailed in this document, the contractor shall notify the Owner of any additional tests that are deemed necessary to guarantee a fully functional system.

1. The contractor shall carry out and record any additional measurement results at no additional charge.

I. The contractor shall provide all test measurement results two (2) weeks prior to substantial completion in spreadsheet format and native file format from the test instrument.

1. Software shall also be provided to view the native results.

J. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.

1. A visible fault locator (VFL) normally uses a Class 2 or 3 light source and should not be directly viewed.
2. Safe usage of the tool requires indirect viewing of the light source by pointing the end of the fiber at an adjacent surface (or introducing another surface in front of a fixed mounted connector) until the presence of light is determined.

K. Link attenuation measurement and allowance calculation

1. The measured link attenuation shall be less than the link attenuation allowance. The link attenuation allowance is calculated as:

   a) Link Attenuation Allowance (dB) = Cable Attenuation Allowance (dB) + Connector Insertion Loss Allowance (dB) + Splice Insertion Loss Allowance (dB)

   1) Connector Insertion Loss Allowance (dB) = Number of Connector Pairs X 0.4dB
   2) Splice Insertion Loss Allowance (dB) = Number of Splices X 0.15dB
   3) Cable Attenuation Allowance (dB) = Maximum Cable Attenuation Coefficient (dB/km) X Length (km)

L. Fiber Testing Requirements

1. All installed fiber links shall be field-tested and pass the following tests:

   a) OLTS (Optical Loss Test Set) length and dual wavelength attenuation
   b) OTDR (Optical Time Domain Reflectometer) traces and event tables

2. OLTS (Optical Loss Test Set)

   a) The length and attenuation of each installed fiber link shall be measured and documented.
b) System loss measurements requirements:
   1) 850 and 1300 nanometers for Multi-mode
   2) 1310 and 1550 nanometers for Single Mode

c) Reflective events (connections) shall not exceed 0.75 dB.
d) Non-reflective events (splices) shall not exceed 0.3 dB.
e) The acceptable link attenuation for Multi-mode horizontal fiber is based on the maximum distance of 295'-0".
f) A horizontal link in a network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.
g) Optical sources shall be turned on for a minimum of 5 minutes prior to referencing.
h) Fiber links shall be measured and reported for attenuation in each direction and attenuation bi-directionally (averaged in both directions)
i) Polarity shall be verified for duplex connector systems
j) Mandrels
   1) Mandrels shall be used when testing attenuation of Multi-mode fiber cabling
   2) Where mandrels are used, secure the mandrel to the light source by some means such as a cable tie or tape.
   3) Care should be taken to ensure that the fiber jacket is not deformed or damaged when using a cable tie or tape.
   4) The light source shall be referenced to the meter a minimum of twice daily (i.e., in the morning and noon).

3. OTDR (Optical Time Domain Reflectometer)
   a) An OTDR trace shall be taken of each fiber link in one direction to ensure uniformity of cable attenuation and connector insertion loss
   b) Testing shall consist of a bi-directional end to end OTDR trace performed per TIA 455-61
   c) Individual connector, splice and fiber insertion loss shall be evaluated using the OTDR trace.
   d) Fibers shall be inspected at 250X for Multi-mode and 400X for Single Mode

4. Maximum Attenuation
   a) Single Mode ISP (inside) 1.0 dB/km at 1310 nm and 1550 nm
   b) Single Mode OSP (outside) 0.5 dB/km at 1310 nm and 1550 nm

5. Test Cords (Jumpers)
   a) Testing of the cabling shall be performed using high-quality test cords of the same fiber type and core size as the cabling under test.
      1) OLTS test cords shall be between 3'-3" (1m) and 16'-4" (5m).
      2) OTDR testing shall be approximately 328'-0" (100m) for the launch cable and at least 82'-0" (25m) for the receive cable.
   b) The test jumper, the adapters, and fiber under test shall be cleaned immediately prior to each fiber being tested.
1) After cleaning, cleaning solutions shall be given sufficient time to evaporate (approximately 30 seconds) prior to the mating of fiber test jumper to the fiber under test.

6. Test Failure
   a) Any fiber link that fails these requirements shall be diagnosed and corrected.
   b) Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link meets performance requirements

7. Acceptable Testers
   a) Fluke DTX CableAnalyzer
   b) Owner Approved equivalent

M. The Owner or the Owner’s representative shall be invited to witness, review or both witness and review field-testing.

1. The Owner or the Owner’s representative shall be notified of the testing start date, five (5) business days before testing commences.
2. The Owner or the Owner’s representative will select a random sample of 5% of the installed links and test that sample.
   a) The measured results obtained from the random sample shall be compared to the data provided by the contractor.
   b) If more than 2% of the sample results differ in terms of the pass/fail determination, the contractor under supervision of the Owner or Owner’s representative shall repeat 100% of the testing at no cost to the Owner.

N. Test Results

1. The detailed test results documentation data is to be provided in an electronic database for each tested fiber strand and shall contain the following information:

a) Identification of the customer site as specified by the end-user
b) Name of the test limit selected to execute the stored test results
c) Name of the personnel performing the test
d) Date and time the test results were saved
e) The manufacturer, model and serial number of the test instrument.
f) The version of the test software and the version of the test limit database held within the test instrument.
g) Fiber identification number
h) Length for each optical fiber
i) Index of refraction used for length calculation when using a length capable OLTS.
j) Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
k) Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
l) Length for each optical fiber as calculated by the OTDR
m) Overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements
n) Circuit IDs reported by the test instrument should match the specified label ID
3.9 CLEANING
   A. Refer to section 270000.

3.10 ACCEPTANCE
   A. Refer to Section 271500.

END OF SECTION
SECTION 271500
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This section of the horizontal cabling portion of a structured cabling system includes:

1. UTP Copper cabling
2. Termination and patch cables
3. Coaxial Cabling

B. Provide all horizontal cabling, terminating hardware, adapters, and cross-connecting hardware necessary to interconnect all system equipment including equipment located in communications rooms.

C. Related Sections

1. Section 260000 Electrical (including related sub-sections)
2. Section 270000 Communications
3. Section 270526 Grounding and Bonding for Communications Systems
4. Section 270528 Pathways for Communications
5. Section 270810 Fiber Optic Testing and Measurements
6. Section 271100 Communications Equipment Room Fittings
7. Section 271300 Communications Backbone Cabling
8. Section 274100 Audio-Visual Systems
9. Section 280000 Electronic Security (including related sub-sections)

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only.

B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer’s instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.

C. Conflicts

1. Refer to section 270000.

D. Codes and Standards

1. Refer to section 270000.

1.3 SUBMITTALS
A. Refer to sections 270000 and 271300.

1.4 QUALITY ASSURANCE
A. Refer to section 270000.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Refer to sections 270000 and 271300.
B. Storage temperature range: -40°F to 149°F (-40°C to 65°C)

1.6 PROJECT/SITE CONDITIONS
A. Refer to section 270000.

1.7 WARRANTY
A. Refer to section 270000.

1.8 MAINTENANCE AND SUPPORT
A. Refer to section 271300.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Labeling
   1. Refer to section 270000.

B. Firestopping
   1. Refer to section 270000.

2.2 ACCEPTABLE COPPER MANUFACTURERS
A. Category 6 UTP Plenum Rated Cable
   1. Siemon – 9C6P4-E2-06-RXA
   2. Owner approved alternate

B. Data/Voice Outlet Components
1. Siemon – MX6-02- (White) – MX6-20 (Ivory)
2. Siemon – 1 Port Faceplate MX-FP-S-01-02 (White) MX-FP-S-01-20 (Ivory)
3. Siemon – 2 Port Faceplate MX-FP-S-02-02 (White) MX-FP-S-02-20 (Ivory)
4. Siemon – 4 Port Faceplate MX-FP-S-04-02 (White) MX-FP-S-04-20 (Ivory)
5. Siemon – 6 Port Faceplate MX-FP-S-06-02 (White) MX-FP-S-06-20 (Ivory)
6. Siemon – 2 Port Surface Mount Box MX-SMZ2-02 (White) MX-SMZ2-20 (Ivory)
7. Siemon – Max Outlet Blanks MX-BL-02 (White) MX-BL-20 (Ivory)
8. Owner approved alternate

C. Data/Voice Outlet Components
1. Siemon MX6-F02 (White)
2. Siemon MX6-F25 (Ivory)
3. Owner approved alternate

D. 1 Port Faceplate
1. Siemon – 1 Port Faceplate MX-FP-S-01-02 (White) MX-FP-S-01-20 (Ivory)
2. Owner approved alternate

E. 2 Port Faceplate
1. Siemon MX-FP-S-02-02 (White)
2. Siemon MX-FP-S-02-20 (Ivory)
3. Owner approved alternate

F. 4 Port Faceplate
1. Siemon MX-FP-S-04-02 (White)
2. Siemon MX-FP-S-04-20 (Ivory)
3. Owner approved alternate

G. 6 Port Faceplate
1. Siemon MX-FP-S-06-02 (White)
2. Siemon MX-FP-S-06-20 (Ivory)
3. Owner approved alternate

H. Outlet Blanks
1. Siemon MX-BL-02 (White)
2. Siemon MX-BL-20 (Ivory)
3. Owner approved alternate

I. Patch Panels (24 port)
1. Siemon – HD6-24
2. Owner approved alternate

J. Patch Panels (48 port)
1. Siemon – HD6-48
2. Owner approved alternate
K. **Rack Blanks**

1. **Siemon – PNL-BLNK-2**

L. Copper Patch Cords

1. Siemon
2. Owner approved alternate

2.3 **ACCESSORIES**

A. Mount one laminated full-size hard copy in color of an as-built floor plan designating workstation locations, pathways, and communications room locations. Confirm hard copy size with Owner.

B. Provide clear plastic lamination serving each communication room.

C. Install the laminated drawings within a protective Plexiglas encasement on the wall of the servicing communications rooms. To ease accessibility the Plexiglas encasement shall be in either flip-down format or file folder format.

2.4 **HORIZONTAL COPPER CABLING**

A. Recognized cabling for providing the signal medium from the work area to the communications room shall include the following:

1. Category 6 UTP cable
2. 75 Ohm coaxial cable.

B. **Category 6 UTP Cable Requirements**

1. 23/24 AWG solid bare copper
2. Cable jacket shall comply with NEC Article 800 for use as a plenum cable and shall be UL and c (UL) Listed Type CMP (communications multipurpose plenum)
3. Cable shall terminate on an eight-pin modular jack at each outlet. All horizontal cabling shall meet or exceed the ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components
4. Cables shall be marked as UL verified with a minimum of Category 6 rating
5. The cable shall support Voice, Analog Base band Video/Audio, Fax, Modem, Switched-56, T-1, ISDN, RS-232, RS-422, RS-485, 10BASE-T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU Digital Audio, 270 Mbps Digital Video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, gigabit ATM, as well as all 77 channels (550 Mhz) of analog broadband video
6. The maximum horizontal cable length for Category 6 copper cable from the termination of the cable in the communications room to the outlet is 295'-0".
7. Cable shall meet or exceed the following electrical characteristics:
8. Cable shall be specified to 250 MHz and shall meet the manufacturer’s guaranteed electrical performance and physical specifications.

2.5 **TERMINATION HARDWARE**
A. Patch panels
   1. Patch panels shall be rated to match installed cable plant
   2. The wiring block shall accommodate #23 AWG cable conductors.
   3. All modular cross connect panels shall be UL-listed.

B. Work Area Outlet
   1. Universal eight-position jack pin/pair assignments

C. Work Area Outlet Faceplates:
   1. White or ivory to match electrical outlets.

2.6 PATCH CABLES

A. Verify exact quantities and lengths with Owner prior to purchase

B. Patch Cable requirements:
   1. Category 6, stranded UTP cable
   2. Standard modular non-keyed, 8-position 8-conductor plug
   3. 94V-0 rated
   4. UL listed
   5. Meets FCC Part 68

C. Provide 3'-0", 5'-0", 7'-0", and 10'-0" Patch Cords at the communications room for each installed port.
   1. Coordinate with Owner on the active equipment layout prior to purchase to ensure correct sizing of patch cords from patch panels to switching equipment.

D. Provide a 10'-0" Station Cord for each work area outlet port.

E. All cords shall conform to the requirements of ANSI/TIA-568-C.2 Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL LAN Certification and Follow-up Program.

F. Cords shall be equipped with an eight-pin modular connector on each end, wired straight through and shall be of appropriate length for application.

G. All rated patch cords shall be round, and consist of #23 AWG copper, stranded conductors, tightly twisted into individual pairs.

H. Patch cords shall be made and warranted by the manufacturer of the cabling system installed in this project and shall meet or exceed patch cord specifications as outlined in TIA standards.

2.7 IDENTIFICATION (LABELING) SYSTEM

A. Refer to sections 270000 and 271300.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Refer to Section 270000 and 271300.

3.2 PREPARATION
A. Refer to section 270000.
B. The Contractor shall check pathways, raceways, and other elements for compliance with space allocations, installation tolerances, debris, hazards to cable installation, and other conditions affecting installation prior to installation.

3.3 INSTALLATION REQUIREMENTS
A. Refer to section 270000.
B. All installation shall be done in conformance with ANSI/TIA-568-C standards, BICSI methods, industry standards and manufacturer’s installation guidelines.
   1. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities.
   2. Failure to follow the appropriate guidelines shall require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation.
   3. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.
C. Install cable using techniques, practices, and methods that are consistent with specified data cabling and the installed components and that ensure specified performance levels of completed and linked signal paths, end to end.
   1. Pull cables in smooth and regular motions using methods that prevent cable kinking.
   2. Pull cables simultaneously if more than one is being installed in the same raceway/pathway.
   3. If necessary, use approved cable pulling lubricant
   4. Use fish tape, cable, rope, basket weave wire/cable grips, and other tools that will ensure no damage to the media or raceway.
   5. Install open cabling parallel and perpendicular to surfaces or structural members following surface contours where possible.
   6. Do not bend cable greater than a bend radius of 0’-1”.
D. Provide a 10’-0” service loop at the communications room and shall provide a 3’-0” service loop above the access ceiling or cable trays unless specified otherwise.
   1. All service loops shall be a minimum of 1’-6” (18”) in diameter and be accessible for maintenance.
E. Coordinate loop placement and orientation with the technology consultant.
1. This allows for future changes or expansion without installing new cables.

F. Install cables in continuous “home run” lengths from work station outlet to specified patch panel.

1. No intermediate punch down blocks or splices may be installed or utilized between the communications rooms and the workstation outlet without written Owner permission.

G. All cable must be handled with care during installation so as not to change performance specifications.

1. Factory twists of each individual pair must be maintained up to the connection points at both ends of the cable.
2. There shall never be more than 0'-½” of unsheathed cable at either the wiring closet or the workstation termination locations.

H. All cabling and associated hardware shall be placed so as to make efficient use of available space.

1. All cabling and associated hardware shall be placed so as not to impair equipment's efficient use of their full capacity.

3.4 CABLELING METHODS

A. The Contractor shall provide cabling in accessible spaces, cable tray, (surface and/or enclosed raceway), conduits, and/or J-Hook cable support system.

1. Within consoles, racks, cabinets, desks, and counters, in accessible ceilings spaces and in gypsum board partitions where open cable method may be used.
2. Use UL or ETL listed plenum rated cable in all spaces.
3. Provide all necessary installation materials, hardware, tools and equipment to perform insulation displacement type terminations at all data outlets and patch panel materials.

B. Conceal raceway and cabling except in unfinished spaces as is practical.

C. Exposed Cable

1. All station cabling shall be installed inside walls or ceiling spaces whenever possible.
2. Exposed station cable will only be run where indicated on the drawings and will only be allowed when no other options exist.
   a) Owner must approve all exceptions.

D. The Contractor shall utilize conduits/cable tray as indicated on the drawings.

E. All cabling placed above drop ceilings must be supported by cable tray, J-hooks, caddy bags or conduit.

1. The Contractor shall permanently affix cable supports to the building structure or substrates and provide attachment hardware and anchors designed for the structure to which attached and are suitably sized to sustain the weight of the cables to be supported.
   a) Attaching cable to pipes or other mechanical items is not permitted.
   b) Cabling shall not be attached to ceiling grid wires.
2. Multiple cables are to be dressed every 5'-0" to 7'-0".
   a) Maximum cable sag between cable hooks is 3"-6".

F. The Contractor shall route data and voice cables separately in a neat and orderly fashion.

1. No cable ties or wraps shall be used to secure the cables in the runway outside of the communications rooms. Cable ties shall be rated for the environment.

G. Keep all items protected before and after installation with dust and moisture proof barrier materials/envelopes.

H. If wiring is terminated on patch panels, data, voice jacks prior to painting, carpet installation, and general finish clean up, these jacks shall be placed in a protective envelope to ensure dust, debris, moisture, and other foreign material do not settle onto jacks’ contacts.

   1. Envelope will be removed on final trim out after other trades have completed their finish work.
   2. It shall be the Contractor’s responsibility to ensure the integrity of these protective measures throughout the life/installation of the project.
      a) Cable bundles brought into the communications rooms shall be routed and dressed in such a manner that prior to termination the cables are not subject to damage and misuse such as installers walking on the bundles that are on the floor.
      b) Cable pulling force shall not exceed 25 lbs of pulling tension or cable manufacturer’s recommended pulling tensions.
      c) Do not leave cables on the floor unprotected or cable bundles hanging from the ceilings. Coil them up in a temporary manner and protect them from damage.

I. Communications room cables shall be combed and dressed in a manner as to prevent twists, “braiding” and crossed cables in the cable bundle from the communication room entrance to the termination point at the rear of the patch panel.

   1. Behind the patch panel, the cable bundle shall be attached to the rear cable support bar, and shall drop out each cable in a neat, cascading manner to prevent crossed and/or interwoven cables to each patch panel port termination point.
      a) Use Velcro wraps instead of cables ties for all bundling in the communications rooms.
      b) Plastic/nylon tie-wraps are not allowed to permanently secure cables inside the communications room.

3.5 CABLING SEPARATION

A. Comply with TIA rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.

B. Maintain a minimum spacing of 1'-6" (18") from electrical feeders and/or branch circuit wiring including, but not limited to, light fixtures, sources of heat and EMI sources.

C. Maintain a minimum spacing of 1'-0" from auxiliary systems cabling.
D. Maintain a 1'-0" separation where cables must pass perpendicularly to electrical, plumbing, or other wiring, conduit, or piping systems.

   1. Use non-conduit bushings, if necessary to maintain separation, which allow for the addition of a reasonable number of cables in the future.

E. Maintain communications pathways away from electrical apparatus such as motor driven equipment and transformers, minimum separation distance of 10'-0" is recommended.

3.6 CABLING TERMINATION

A. Terminate cables in consistent consecutive order.

B. Terminate cables onto 8P8C modular patch panels without damaging twisted pairs or jacket.

C. Arrange cables on patch panels in ascending order of room numbers and outlet numbers within rooms.

D. Provide a 10'-0" service loop for horizontal cables at each rack in communications rooms.

   1. Locate loop at ceiling deck or on bottom of cable runway in minimum 1'-6" (18") diameter.

E. Provide a 3'-6" service loop for horizontal cables at work area outlets. Locate service loop above or below data/voice outlet were vertical cable run transitions to horizontal run.

F. Maintain twists in cable pairs to within 0'-½" of termination.

G. Video Surveillance Systems Cabling (Electronic Safety and Security <ESS> devices)

   1. Video Cameras will require a field terminated plug on the end of a horizontal cable to be directly plugged into device.

      a) Follow TIA-862-A Building Automation Standard.
      b) Contractor shall use applicable equipment in testing solid conductor plug.

   2. Group all security systems cables in one group.

   3. Clearly label cable number and function, in the last positions on the horizontal cabling blocks in each communications room.

H. Building Systems Cabling (BAS, FA, elevator line, etc)

   1. Coordinate exact placement and connectivity requirements with applicable trade prior to installation.

   2. Group all building systems cables in one group.

   3. Clearly label cable number and function, in the last positions on the horizontal cabling blocks in each communications room.

I. Limit cable-bending radius to 20X the cable diameter during installation, and 15X the cable diameter after installation.

J. Start numbering at the left of the main door to the room and continue in a clockwise direction around the room.
1. The cables within the room will be terminated starting with the cables located to the left of the main door to the room and continue around the room in a clockwise direction.

3.7 TERMINATION HARDWARE

A. Station Hardware
   1. Flush mount jacks shall be mounted in a faceplate with back box.
   2. Outlets shall not be mounted on temporary, movable, or removable surfaces, doors, or access hatches without prior Owner approval.
   3. 8P8C Jack Pin Assignments for work area outlets shall match the T-568B wiring scheme.

B. Patch panels
   1. Copper cables shall be terminated in eight position/eight conductor (8P8C) modular patch panels.
   2. All Modular jack panels shall match the T-568B wiring scheme.

C. Work Area Outlet
   1. 8P8C non-keyed modular outlets for applications up to one Gbps and ANSI/TIA-568-C compliant for the specified transmission requirements

D. Work Area Outlet Faceplates:
   1. Furnish and install blank plates in all unused ports.

3.8 SPECIAL CIRCUITS

A. The Contractor shall coordinate with the Owner on the cable termination plan for special circuits, including cables to wireless access point locations, security, elevators, fire alarms, etc.

B. Wireless Access Points
   1. Install two (2) cable(s) from dedicated wireless patch panel(s) in communications room to outlets having 8P8C connectors within a secure metal enclosure.
   2. Enclosures shall be NEMA rated for the environment to which they are exposed.
   3. 30’-0” of cable slack shall be coiled and hung on a “J”-hook at the enclosure location.

3.9 IDENTIFICATION AND LABELING

A. Labeling system shall consist of a hand-held portable printer and labels appropriate to the application. Handwritten labels are not acceptable.

B. Fiber termination hardware (designation strip) shall have a 0’-3¼” x 0’-¼” thermal transfer printable label with a permanent acrylic adhesive

C. All labels shall be permanent and shall not fade, peel, or deteriorate due to environment or time.

D. The Contractor shall provide a copy of the finalized plan in writing to the Owner representative and DataCom Design Group for review and authorization to proceed.
1. Coordinate with Owner for specifications on labeling of all hardware, cabling, and related equipment prior to any testing.

E. Labeling requirements:

1. Label cable terminations on designation strips
2. Label all cable at each terminating point.
3. Label each port of the work area outlet.
4. Cable identification numbers shall not be duplicated.
5. Label patch panels in the communications rooms to match those on the corresponding voice and data outlets.

   a) The font shall be at least 0’-1/8” in height.

6. Where a wireless access point is installed above an acoustical ceiling, label the ceiling grid frame below the access point, displaying the data port number and, if applicable, the access point identification number. Coordinate labeling of grid with Owner and Architect prior to application of labels.

7. Label each distribution rack, block and other terminating equipment unit and field within that unit within 0’-4” from the block or patch panel termination. Keep labels in a neat and orderly lineup.

8. Label each connector and each discrete unit of cable-terminating and connecting hardware within connector fields, in wiring closets and equipment rooms.

   a) Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.

9. Post the cable schedule in a prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations.

F. Location and termination field description

1. Room location
2. Rack-mount or Wall mount
3. Termination field type

   a) Specific patch panel ports versus a separate dedicated patch panel

G. Unique identifiers

1. Segregation and position on equipment rack
2. Port color-coding
3. Unique labeling

H. Documentation

1. Provide electronic copy of final comprehensive schedules for project in software and format selected by Owner.

   a) All labels shall correspond to as-built drawings and to final test reports.

2. All cable inventory data documentation shall be submitted in format coordinated with and approved by Owner so that data can be incorporated into existing databases.
3. Documentation shall include cable identification number, source and destination, type of cable, length of cable and number of pairs or fibers.
4. Complete cross connect documentation is required.

3.10 FIELD QUALITY CONTROL

A. Refer to section 270000.

3.11 POST-INSTALLATION TESTING

A. Contractor shall test each pair or strand of every cable prior to acceptance. (100% PASS)
B. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.
C. Standards Compliance and Test Requirements:
   1. Cabling shall meet ANSI/TIA-568-C.2 Category 6 Horizontal cabling requirements.
   D. Attenuation, NEXT, PSNEXT, Return Loss, ELFEXT, and PSELFEXT data that indicate the worst case result, the frequency at which it occurs, the limit at that point, and the margin.
      1. These tests shall be performed in a swept frequency manner from 1 MHz to highest relevant frequency, using a swept frequency interval that is consistent with TIA and ISO requirements.
      2. Information shall be provided for all pairs or pair combinations and in both directions when required by the appropriate standards.
      3. Length, propagation delay, and delay skew relative to the relevant limit.
         a) Length, propagation delay, and delay skew shall be tested relative to the relevant limit.
         b) Test shall also include mutual capacitance and characteristic impedance.
            1) Any individual test that fails the relevant performance specification shall be marked as a 'FAIL'.
   E. Cable Test Documentation:
      1. Cable test documentation shall be submitted in hard copy and electronic formats.
         a) If proprietary software is used, disk or CD shall contain any necessary software application required to view test results.
         b) Electronic reports shall be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report.
         c) Certificate shall reference traceable circuit numbers that match the electronic record.
      2. Each test record shall contain the cable ID as follows:
         a) "MEDIA TYPE – SOURCE ROOM – DESTINATION ROOM – STRAND/PAIR #", e.g. MM-MC-HC23-001.
3. Test results saved within the field-test instrument shall be transferred into an accessible database utility that allows for the maintenance, inspection and archiving of the test records.

   a) These test records shall be uploaded to the PC unaltered, i.e., “as saved in the field-test instrument”.
   b) The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

4. Test reports shall include the following information for each cabling element:

   a) Wire map results that indicate that 100% of the cabling has been tested for shorts, opens, miss-wires, splits, polarity reversals, transpositions, presence of AC voltage and end-to-end connectivity.
   b) Length, propagation delay, and delay skew relative to the relevant limit. Any individual test that fails the relevant performance specification shall be marked as a FAIL.
   c) Cable manufacturer, cable model number/type, and NVP
   d) Tester make & model, serial number, hardware version, and software version.
   e) Cable ID and project name
   f) Auto-test specification used
   g) Overall pass/fail indication
   h) Date of test

F. Cable Test Equipment

1. Contractor shall supply all of the required test equipment used to conduct acceptance tests.
2. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers shall be ISO 9001 certified.
3. Testing equipment shall be UL-verified to meet Level III accuracy.

   a) The cable installers shall have a copy of this reference in their possession and be familiar with the contents.
4. Testing equipment shall be within the calibration period recommended by the manufacturer.
5. Testing equipment shall have the latest software and firmware installed.
6. Testing equipment of a given type shall be from the same manufacturer, and have compatible electronic results output.
7. Test adapter cables shall be approved by the manufacturer of the test equipment.

   a) Adapter cables from other sources are not acceptable.
   b) Adapter cables must be replaced after 1000 tests to ensure accuracy.
8. Test equipment must have a dynamic range of at least 100 dB to minimize measurement uncertainty.
9. Test equipment must be capable of storing full frequency sweep data for all tests and printing color graphical reports for all swept measurements.
10. Test equipment must include S-Band time domain diagnostics for NEXT and return loss (TDNXT and TDRL) for accurate and efficient troubleshooting.
11. Test equipment must be capable of running individual NEXT, return loss, etc measurements in addition to auto tests. Individual tests increase productivity when diagnosing faults.
12. Test equipment must include a library of cable types, sorted by major manufacturer.
13. Test equipment must be able to internally group auto tests and cables in project folders for good records management.
   a) Test equipment must store at least 1000 auto tests in internal memory.

14. Test equipment must include DSP technology for support of advanced measurements.
15. Test equipment must make swept frequency measurements in compliance with TIA standards.
16. The measurement reference plane of the test equipment shall start immediately at the output of the test equipment interface connector.
17. There shall not be a time domain dead zone of any distance that excludes any part of the link from the measurement.
18. Acceptable testers:
   a) Fluke DTX CableAnalyzer
   b) Owner approved equivalent

3.12 FIBER TESTING
A. Refer to Section 271300.

3.13 CLEANING
A. Refer to section 270000.

3.14 ACCEPTANCE
A. Once all work has been completed, test documentation has been submitted and approved, and the Owner is satisfied that all work has been completed in accordance with contract documents, the Owner will notify Contractor in writing of formal acceptance of the system.

B. Contractor's RCDD shall warrant in writing that 100% of the installation meets the requirements specified herein.

C. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and submittal and approval of full documentation as described above. Tests with the "* PASS" (asterisk) will not be acceptable.

1. These circuits must be repaired to meet “PASS”.

END OF SECTION
SECTION 27 41 13
ARCHITECTURALLY INTEGRATED AUDIOVISUAL INFRASTRUCTURE

PART 1 GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

A. Floor Boxes
B. Poke-Thru Devices
C. Flat Panel Display In-Wall Storage Boxes
D. Wall Junction Boxes
E. Pull Boxes
F. Plenum Ceiling Boxes
G. Projection Screens

1.3 RELATED SECTIONS

A. Division 09 – Flooring Systems
B. Division 26 – Electrical: Electrical Systems and Components
C. Division 27 – Communications: Communications Systems and Components
D. Division 28 – Electronic Safety and Security: Security Systems and Components

1.4 Submittals

A. Comply with requirements of Section 01 33 00 – Submittal Procedures.

1. Product Data: For the following AV Infrastructure System components:

a. Floor Boxes
b. Poke-Thru Devices
c. Flat Panel Display In-Wall Storage Boxes
d. Wall Junction Boxes
e. Pull Boxes
f. Plenum Ceiling Boxes
g. Projection Screens

2. Shop Drawings: For the following AV Infrastructure System components. Include plans, elevations, sections, details, and attachments to other work:

a. Floor Boxes
b. Poke-Thru Devices
c. Flat Panel Display In-Wall Storage Boxes
d. Wall Junction Boxes
e. Pull Boxes
f. Plenum Ceiling Boxes
g. Projection Screens
1.5 QUALITY ASSURANCE

A. General:

1. Floor Boxes provide the interface between power, audio-video (A/V), and communications cabling in concrete floors and decks at activation locations requiring power, audio-video, or communication device outlets.
   a. ADA Compliance: Flush-mounted floor device outlets shall not create tripping hazard.

2. Poke-thru devices provide the interface between power, communication and audio-video (A/V) cabling in an above grade concrete floor and the activation location where power communication and/or A/V device outlets are required. These poke-thru devices provide recessed device outlets that will not obstruct the floor area.
   a. ADA Compliance: Flush-mounted floor device outlets shall not create tripping hazard.

3. Flat Panel Display In-Wall Storage Boxes provide the interface between power, audio-video (A/V), and communications cabling in recessed cavity of wall behind flat panel displays where power, communication and/or A/V device outlets and/or device storage/mounting is required.

4. Wall Outlet Boxes provide the interface between power, audio-video (A/V) and communications cabling in walls at activation locations requiring power, audio-video, or communication device outlets.

5. Pull and Junction boxes provide an accessible pathway in a run of conduit to facilitate the pulling in of wires and cables.

B. Manufacturer Qualifications: Firms regularly engaged in manufacture of floor boxes, poke-thru devices and in-wall storage boxes of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide floor boxes, poke-thru devices, in-wall storage boxes, electrical junction boxes, pull boxes and plenum ceiling boxes that are produced by a manufacturer listed in this section.

C. Electrical Raceways and Components: Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to raceways and components. Listed and labeled in accordance with NFPA 70, Article 100.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver floor boxes, poke-thru devices, and in-wall storage boxes and associated fittings in factory labeled packages.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

PART 2 PRODUCTS

2.1 GUIDELINES

A. Floor Boxes, Poke-thru Devices, Wall Junction Boxes and Pull & Junction Boxes shall be furnished and installed by the Electrical Contractor selected by the Owner unless specifically excluded in these specifications or drawings.
1. Coordinate with AV Contractor regarding proper placement of duplex outlets for any AV designated floor box or Poke-thru Device. Electrical circuits should be connected (and outlets wired) to the designated AV circuit breaker panel (N.I.C.). Ensure that “Star” ground configuration is properly implemented. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other.

B. In-Wall Storage Boxes and Plenum Ceiling Boxes shall be furnished, and installed by the Electrical Contractor unless specifically excluded in these specifications or drawings.

1. Coordinate with AV Contractor regarding proper placement of duplex outlets for any AV designated Plenum Ceiling Box and/or In-Wall Storage Box.

C. Floor Box Inserts/Plate and Poke-thru Device Inserts/Plates shall be furnished and installed by the AV Contractor selected by the Owner unless specifically excluded in these specifications or drawings.

D. Condition - Provide and install products listed in this section in factory new condition, conforming to applicable provisions of American National Standards Institute.

2.2 ACCEPTABLE MANUFACTURER

A. Basis of Design Product:


3. The design for in-wall storage boxes and fittings is based on the PAC52* Series In-Wall Storage Box Series manufactured by Chief Manufacturing, 6436 City West Parkway, Eden Prairie, MN 55344, toll-free 800-582-6480, telephone 952-894-6280, fax 877-894-6918, Web Site: www.chiefmfg.com.

4. The design for wall junction boxes and fittings is based on products manufactured by RACO, 3902 West Sample Street, South Bend IN 46634-4002, telephone 800-722-6437, Web Site: www.hubbell-rtb.com. (OR: Garvin Industries, 3700 Sandra Street, Franklin Park, IL, telephone 847-455-0188, fax 847-455-0334; Web Site: www.garvinindustries.com).


B. Substitutions will be considered under provisions of Section 01 25 00.

2.3 FLOOR BOXES

A. Classification and Use: Floor boxes shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and/or UL514C and Canadian Standard C22.2, No. 18.1-04 and 18.2-06 and bear the U.S. and Canadian UL Listing Mark. Floor boxes shall also have been tested by Underwriters Laboratories Inc. and classified for fire resistance and bear the U.S. and Canadian UL Classification Mark. Devices shall be classified for use in 2-hour rated, unprotected reinforced concrete floors and 2-hour rated floors employing unprotected steel floor units and concrete toppings (D900 Series Designs) or concrete floors with suspended ceilings (fire resistive designs with suspended ceilings should have provisions for accessibility in the ceiling below the floor boxes). Floor boxes shall also conform to the standards set in Section 300-21 of the National Electrical Code. Floor boxes shall meet UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens. Floor boxes shall also have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, bare concrete, terrazzo, wood, and carpet covered floors. Floor boxes shall be suitable for use in air handling spaces in accordance with Section 300-22 (C) of the National Electrical Code.

B. Floor Boxes, General: FSR FL 500 Series Floor Boxes for use on on-grade and above grade concrete floors, raised floors or wood floors. Provide boxes with a component to permit installation in polished concrete or terrazzo floors. Boxes shall be compatible with complete line of Ortronics® workstation connectivity outlets and modular inserts.

1. Floor boxes provide the interface between power, communication and audio/video (A/V) cabling in above-grade floors, on-grade concrete floors, raised floors, wood floors, and fire-classified floors and the workstation or activation location where power and communication and/or A/V device outlets are required. Boxes shall provide recessed device outlets that will not obstruct the floor area. Refer to Drawings for size and types.

2. When installed in on-grade slab with dirt in-fill, provide with the pour pan accessory.

3. When installing in elevated concrete slabs on upper floors, Contractor must provide a fire-rated assembly of 2 hours. Contractor must follow manufacturer’s installation instructions to insure a 2-hour assembly.

4. Floor boxes shall permit all wiring to be completed at floor level. The FC models shall be used as defined by the UL Fire Resistance Directory at a minimum spacing of two (2) ft. [610mm] on center.

C. (FB TYPE 1) FL-500-6-P Floor Boxes: Manufactured from stamped steel with optional pour pan approved for use on-grade concrete floors. Boxes shall have the ability to accept a component that will allow the box to be installed in polished concrete or terrazzo floors. Provide boxes with three (3) independent wiring compartments configured in the 1-2 scenario. That allow for up to two (2) receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent
compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the three (3) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 6-15/16 in² [176mm²]. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate two (2) 20 amp straight blade, receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers.

D. (FB TYPE 2) FL-500P-6-FRK Floor Boxes: Manufactured from stamped steel approved for use above-grade concrete floors. Floor Box assembly to have a 2-hour fire rating. Boxes shall have the ability to accept a component that will allow the box to be installed in polished concrete or terrazzo floors. Provide boxes with three (3) independent wiring compartments that allow for up to two (2) receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the three (3) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation and moves, additions, and changes. The compartments shall be removable from the top and back of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. Provide boxes with removable knockout plates to allow for the maximum cable pass-through area. The cable pass-through area shall be a minimum of 6-15/16 in² [176mm²]. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate two (2) 20 amp straight blade, receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers.

2.4 FLOOR BOX COVERS

A. FSR FL Series Covers: Manufactured of stamped steel. Covers shall be available in surface mount and flush versions. Covers to be UL scrub water rated. Covers shall be available with a carpet recess area or a solid lid. Coordinate cover type with floor finish.

2.5 FLOOR BOX COMMUNICATION MODULES MOUNTING ACCESSORIES

2.6 POKE-THRU DEVICES

A. Manufacturer – The Evolution Poke-Thru Devices described shall be manufactured by Wiremold/Legrand. The poke-thru device shall be compatible with the complete line of Ortronics® workstation connectivity outlets and modular inserts, or the Pass & Seymour Network Wiring System. Poke-thru devices of other manufacturers may be considered, if equal in functionality and quality, by written approval of the specifying engineer and shall meet all the performance standards specified herein. The same manufacturer shall provide all poke-thru types for the project. In addition, the contractor shall have ten days prior to the date for receipt of bids to submit to the specifying engineer a working sample from any other manufacturer.
B. (PT TYPE 1) 6AT Poke-Thru Assembly – This assembly consists of an insert and an activation cover. Overall poke-thru assembly length shall be 16 3/4” [425mm].

1. Insert:

   a. The insert body shall recess the devices a minimum of 2 3/4” [69 mm] and have a polyester based backing enamel finished interior (ivory). There shall be the necessary channels to provide complete separation of power and communication services. There shall be three compartments that allow for up to three duplex receptacles that can be wired as a standard receptacle or isolated ground and/or twelve communication ports and/or ten of Extron® Electronics MAAP™ and/or two AAP™ devices.

   b. The body will consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab. The insert shall have retaining feature that will hold the poke-thru device in the floor slab without additional fasteners. The poke-thru insert shall also consist of a 3/4” trade size conduit stub that is connected to the insert body and a 24.5 cu. in. [402ml] stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground.

2. Activation Cover – The activation covers shall be manufactured of die-cast aluminum alloy and be available in powder-coated gray, black, or plated in brass, nickel or bronze finish. Two gaskets (one for carpet and one for tile) are provided to go under the trim flange to maintain scrub water tightness. The activation cover shall be 7 1/4” [184mm] in diameter. The activation covers shall be available in carpet and tile versions. The carpet covers shall be surface mounted and the tile covers shall be flush with the finished floor covering. The cover shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.

3. Communication Modules Mounting Accessories – The activation shall have three locations to mount communication connectors. Connectors shall be mounted using a mounting bracket. Mounting brackets shall be provided to mount up to twelve Ortronics TracJack Category 6 insert modules or TechChoice™ Category 6 discrete keystone connectors. The unit will also be supplied with two Category 6 keystone connectors and two Lucent® keystones. The unit shall also accommodate a mechanism to permit protection of communication cabling. This mechanism shall be stamped steel construction and accept both flexible and rigid conduit. This mechanism shall accept 3/4", 1-1/4" or 2" trade size conduits.

C. (PT TYPE 2) 8AT Poke-Thru Assembly – This assembly consists of an insert and an activation cover. Overall poke-thru assembly length shall be 16 3/4” [425mm].

1. Insert:

   a. The insert body shall recess the devices a minimum of 2 3/4” [69 mm] and have a polyester based backing enamel finished interior (ivory). There shall be the necessary channels to provide complete separation of power and communication services. There shall be five compartments that allow for up to five duplex receptacles that can be wired as a standard receptacle or isolated ground and/or twenty-two communication ports and/or sixteen of Extron® Electronics MAAP™ and/or four AAP™ devices.

   b. The body will consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab. The insert shall have
retaining feature that will hold the poke-thru device in the floor slab without additional fasteners. The poke-thru insert shall also consist of a 3/4” trade size conduit stub that is connected to the insert body and a 24.5 cu. in. [402ml] stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground.

2. Activation Cover – The activation covers shall be manufactured of die-cast aluminum alloy and be available in powder-coated gray, black, or plated in brass, nickel or bronze finish. Two gaskets (one for carpet and one for tile) are provided to go under of the trim flange to maintain scrub water tightness. The activation cover shall be 9 1/4” [235mm] in diameter. The activation covers shall be available in carpet and tile versions. The carpet covers shall be surface mounted and the tile covers shall be flush with the finished floor covering. The cover shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.

3. Communication Modules Mounting Accessories – The activation shall have three locations to mount communication connectors. Connectors shall be mounted using a mounting bracket. Mounting brackets shall be provided to mount up to twelve Ortronics TracJack Category 6 insert modules or TechChoice™ Category 6 discrete keystone connectors. The unit will also be supplied with two Category 6 keystone connectors and two Lucent® keystones. The unit shall also accommodate a mechanism to permit protection of communication cabling. This mechanism shall be stamped steel construction and accept both flexible and rigid conduit. This mechanism shall accept 3/4", 1-1/4" or 2" trade size conduits.

2.7 FLAT PANEL DISPLAY IN-WALL STORAGE BOX

A. Classification and Use: In-Wall Storage Boxes shall have shall have been tested by Underwriters Laboratories Inc. and classified for fire resistance and bear the U.S. UL Classification Mark. In-wall storage boxes shall be suitable for use in air handling spaces in accordance with Section 300-22 (C) of the National Electrical Code.

B. (FPD TYPE 1) Model PAC525FCW In-Wall Storage Box with Flange and Cover: Manufactured from stamped steel approved for use in standard 3.5” stud and 2.5” stud walls with the same product. Box shall have a finished interior, black in color. Boxes shall be 9” H x 14.25” W x 3.9” D [228.6mm x 361.95mm x 99.06mm]. Knockouts shall be provided for single gang outlets and 1-1/4” & ½” conduit. Box shall have universal zip tie anchor points. Box shall be provided with a paintable flange and cover. Cover shall include tamper proof security and include four knockouts for cable routing and ventilation.

1. Provide with Raco 560 3” x 2” box, 2-3/4” deep electrical box.

2. Provide with Raco 864 single duplex electrical box cover.

C. (FPD TYPE 2) Model PAC526FCW Large In-Wall Storage Box with Flange and Cover: Manufactured from stamped steel approved for use in standard 3.5” stud and 2.5” stud walls with the same product. Box shall have a finished interior, black in color. Boxes shall be 14.25” H x 14.25” W x 3.9” D [361.95mm x 361.95mm x 99.06mm]. Knockouts shall be provided for single gang outlets and 1-1/4” & ½” conduit. Box shall have universal zip tie anchor points. Box shall be provided with a paintable flange and cover. Cover shall include tamper proof security and include four knockouts for cable routing and ventilation.

1. Provide with Raco 560 3” x 2” box, 2-3/4” deep electrical box.

2. Provide with Raco 864 single duplex electrical box cover.

2.8 WALL JUNCTION BOXES
A. All device boxes for communications systems shall be extra-deep designation.

B. Sheet Metal Junction Boxes: NEMA OS 1, UL 514A, galvanized steel with stamped knockouts.

C. Wall mounted communication boxes concealed within the wall shall be a minimum 4-11/16" square with a minimum depth of 3" with reducer device plate per schedule.

D. Antenna Junction Box (A) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

E. AV Plate Junction Box (AVP TYPE 1) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

F. AV Plate Junction Box (AVP TYPE 2) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 818 two gang device cover.

G. AV Plate Junction Box (AVP TYPE 3) Raco Model 263 Electrical Junction Boxes shall be 3-1/2" Deep, 6" Square with (6) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" bottom knockouts. Box shall be provided with Raco 793 three gang device cover.

H. Camera Junction Box (CAM) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 818 two gang device cover.

I. Intercom Call Button (CB) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

J. Listening Assist Transmitter Junction Box (LA) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 818 two gang device cover.

K. Projector (PRJ) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 818 two gang device cover.

L. Paging Speaker (PS) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

M. Sound Reinforcement Speaker Junction Box (S) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

N. Switch Junction Box (SWT) Raco Model 471 Electrical Junction Boxes shall be 2-1/4" deep, 3" x 2" with one ½" conduit knockout.

O. Volume Control Junction Box (VC) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.
P. Wall Control Panel Junction Box (WCP TYPE 1) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 843 single gang device cover.

Q. Wall Control Panel Junction Box (WCP TYPE 2) Raco Model 260 Electrical Junction Boxes shall be 3-1/4" deep, 4-11/16" square with (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" side knockouts and (2) 1/2" & (2) 3/4"-1" bottom knockouts. Box shall be provided with Raco 818 two gang device cover.

R. Wall Control Panel Junction Box (WCP TYPE 3) Raco Model 263 Electrical Junction Boxes shall be 3-1/2" Deep, 6" Square with (6) 1/2"-3/4", (2) 3/4"-1" and (2) 1"-1-1/4" side knockouts and (2) 1/2"-3/4", (2) 3/4"-1" and (2) 1-1/4" bottom knockouts. Box shall be provided with Raco 793 three gang device cover.

S. Specific-use Wall Junction Boxes:

1. For situations where oversized conduit is used so a standard 4-11/16"x4-11/16" box is inadequate for the terminations required, use:
   a. Hubbell Recessed Wall Mounted Gang – WSCS-MMO-X per schedule, or approved equal.

2.9 PULL BOXES

A. Small Sheet Metal Pull Boxes: NEMA OS1; galvanized steel

B. Minimum size:
   1. 4” square by 2.125” deep for use with 1” conduit and smaller
   2. 4-11/16” square by 3” deep for use with 1-1/4” conduit and larger.

C. Maximum size:
   1. 24” square by 8” deep for collecting multiple 1” station conduit. Sheet metal boxes larger than 12” in any direction are required to have a hinged cover or a chain installed between box and cover.

D. Manufacturers: Hoffman Enclosures or approved equal. Field fabricated boxes are not allowed.

E. Floor Mounted Rack Pull Box (FRK) Hoffman Item #ASE16X14X4NK 16” x 14” x 4” deep square pull box. Box shall be provided with screw cover.

F. Millwork Mounted Rack Pull Box (MRK) HOFFMAN ASE8x9x3 8” x 9” x 3” NEMA 1 pull box. Box shall be provided with screw cover.

G. Wall Mounted Rack Pull Box (WRK) Hoffman Model ASE16X14X3 16” x 14” x 3” screw cover pull box at wall behind rack.

H. Paging Speaker Pull Box (PS) – Hoffman Model ASE4X4X3 4” x 4” x 3”.

I. Sound Reinforcement Loudspeaker (S) – Hoffman Model ASE4X4X3 4” x 4” x 3”

2.10 PLENUM CEILING BOXES

A. Projector Mount Plenum Ceiling Box (PRJ TYPE 1) FSR, Inc. Model CB-12P 1’ x 2’ plenum
rated ceiling box with projector pole adapter.

1. Provide with CB-THRD threaded rod mounting kit.

B. Projector Mount Plenum Ceiling Box (PRJ TYPE 2) FSR, Inc. Model CB-22P 2' x 2' plenum rated ceiling box with projector pole adapter.

1. Provide with CB-THRD threaded rod mounting kit.

C. Storage Ceiling Plenum Box (SCB TYPE 1) FSR, Inc. Model CB-12 1' x 2' plenum rated ceiling enclosure.

1. Provide with CB-THRD threaded rod mounting kit.

D. Storage Ceiling Plenum Box (SCB TYPE 2) FSR, Inc. Model CB-22 2' x 2' plenum rated ceiling enclosure.

1. Provide with CB-THRD threaded rod mounting kit.

2.11 MOTORIZED, CEILING RECESSED, FRONT PROJECTION SCREENS

A. Access//Series V: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 6-1/2 inches (182 mm) deep and 6-13/16 inches (182 mm) wide with white paint finish and stamped 13-gauge steel end caps. UL approved “Suitable for use in environmental air space.” Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. The Access case may be ordered in advance and the screen installed later to eliminate field damage. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside the top of the case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.

1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db and is UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

a. Single station control rated 115V AC, 60 Hz with 3-position rocker switch with cover plate to stop or reverse screen at any point.

b. Multiple station control rated 115V AC, 60 Hz with 3-position rocker switches with cover plates to stop or reverse screen at any point. Automatic override allows only one signal to reach the motor when operated simultaneously.

c. Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.

d. Low voltage 24V control unit with hand held RF remote three button control switch to
stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.

e. Key Operated power supply switch to control power to control system.

f. Locking switch cover plate for limited access to three position switch.

g. Key operated 3-position control switch rated 115V AC, 60 Hz to stop or reverse screen at any point.

h. Key operated 3-position low voltage control switch rated 24V to stop or reverse screen at any point.

i. Group low voltage control unit to control ___ motorized screens.

j. Video Interface Control for use with equipment with a 115V switched outlet.

k. Video Interface Control for use with equipment with a 12V switched outlet.

l. Video Interface Control for use with equipment with a 6V switched outlet.

m. Motor shall be right mounted.

n. Motor shall be left mounted.

3. Projection Viewing Surface

a. Matte White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing.

b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing.

c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Maximum size 9 feet by 12 feet (275 cm x 366 cm). Available with or without black backing.

d. Pearl White MH1500V - On Axis gain of 1.5. Matt white surface with reflective pearlescent coating with black backing. Maximum size 9 feet by 12 feet (275 cm x 366 cm).

e. ReAct MS1000V - On Axis gain of 1.0. 60 degree viewing cone. Silver/grey surface provides superior performance in ambient light conditions, offers excellent contrast, optimal color rendition, and is fully HD compliant. Maximum size 79 inches by 140 inches (201 cm x 356 cm).

f. ClearSound NanoPerf XT800V - On Axis gain of 0.8. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen.

g. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.
h. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 4K ready. Dark backing.

i. TecVision XT1100X White - On-Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 4K ready. Dark backing.

j. TecVision XH900X Grey - On Axis gain of 0.9. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 4K ready. Dark backing.

k. TecVision MS1000X Grey - On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 4K ready. Dark backing.

l. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 4K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.

m. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 4K ready. Dark backing.


p. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors.

q. CineFlex XT600V - On Axis gain of 0.6. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended.
r. CineFlex MH800V - On Axis gain of 0.8. 78 degree viewing cone. Low gain flexible rear material. Designed for use with high light output projectors and wide audience seating pattern.

4. Tab-Tensioning System

a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.

5. Viewing Area H x W

a. HDTV Format (16:9). Black masking borders standard:
   1) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).
   2) 161 inch (4089 mm) diagonal, 80 inches x 140 inches (2032 mm x 3556 mm).
   3) 184 inch (4674 mm) diagonal, 90 inches x 160 inches (2286 mm x 4064 mm).
   4) 193 inches (490 cm diagonal, 94 1/2 inches x 168 inches (240 cm x 427 cm).
   5) 220 inches (559 cm) diagonal, 108 inches x 192 inches (274 cm x 488 cm).

b. 16:10 Format. Black masking borders standard.
   1) 137 inch (3480) diagonal, 72-1/2 inches x 116 inches (1842 mm by 2946 mm).
   2) 165 inch (4191 mm) diagonal, 87-1/2 inches x 140 inches (2223 mm by 3556 mm).
   3) 189 inch (4800 mm) diagonal, 100 inches x 160 inches (2540 mm x 4064 mm).
   4) 198 inches (503 cm) diagonal, 105 inches x 168 inches (267 cm x 427 cm).
   5) 226 inches (574 cm) diagonal, 120 inches x 192 inches (305 cm x 488 cm).

6. Provide an extra screen drop with an overall screen drop of ___ feet (___ m) with top border matching viewing surface color.

7. Provide an extra screen drop with an overall screen drop of ___ feet (___ m) with a black masking top border.

B. Access Fit/Series V: Electric motor operated, steel case. Ceiling-recessed, 18-gauge steel headbox, 5-1/8 inches (130 mm) deep and 4-7/8 inches (124 mm) wide with white paint finish and stamped 13-gauge steel end caps. UL approved "Suitable for use in environmental air space." Bottom closure panel forms slot for passage of viewing surface and can be released to hang down or be removed for access to operating mechanism and viewing surface. Bottom perimeter flange provides support and trim for acoustical ceiling panels and trim for gypsum board ceiling. The Access Fit case may be ordered in advance and the screen installed later to eliminate field damage. Housing is symmetrical allowing for left and right hand motor locations and for viewing surface to unroll off front or back of roller. Steel mounting brackets slide in extruded aluminum mounting system along top of case. Brackets supporting roller/fabric assembly slide in tracks inside the top of the case, allowing viewing surface to be centered in case. Steel leveling brackets are attached to case to prevent deflection. Housing designed with
internal junction box and plug-in wiring connections to allow housing to be installed and connected to building power supply separately from motor and viewing surface.

1. Motor mounted inside screen roller on rubber isolation insulators. Motor UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

2. Quiet Motor mounted inside screen roller on rubber isolation insulators. Motor operates at 44db. UL certified, rated 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.

3. Motor Screen Controls, UL certified.
   a. Single station control rated 115V AC, 60 Hz with 3-position rocker switch with cover plate to stop or reverse screen at any point.
   b. Multiple station control rated 115V AC, 60 Hz with 3-position rocker switches with cover plates to stop or reverse screen at any point. Automatic override allows only one signal to reach the motor when operated simultaneously.
   c. Low voltage control unit with three button 24V switches and cover plate to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   d. Low voltage 24V control unit with hand held RF remote three button control switch to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   e. Low voltage 24V control unit with hand held IR remote three button control switch to stop or reverse screen at any point, built-in RF receiver, built-in Video Interface Control trigger for 3V-28V, RS232, and dry contact relays.
   f. Key Operated power supply switch to control power to control system.
   g. Locking switch cover plate for limited access to three position switch.
   h. Key operated 3-position control switch rated 115V AC, 60 Hz to stop or reverse screen at any point.
   i. 3-position low voltage control switch rated 24V to stop or reverse screen at any point.
   j. Video Interface Control for use with equipment with a 115V switched outlet.
   k. Video Interface Control for use with equipment with a 12V switched outlet.
   l. Video Interface Control for use with equipment with a 6V switched outlet.
   m. Motor shall be right mounted.
   n. Motor should be left mounted.

4. Projection Viewing Surface
   a. Matte White XT1000V - On Axis gain of 1.0. 180 degree viewing cone. GREENGUARD Gold certified. Available with or without black backing.
b. Pure White XT1300V - On Axis gain of 1.3. 180 degree viewing cone. For use in situations where lighting is well controlled and where enhanced brightness is needed due to limited projector brightness. Available with or without black backing.

c. Grey XH600V - On Axis gain of 0.6. Provides excellent contrast and color reproduction. GREENGUARD Gold certified. Maximum size 9 feet by 12 feet (275 cm x 366 cm). Available with or without black backing.

d. Pearl White MH1500V - On Axis gain of 1.5. Matt white surface with reflective pearlescent coating with black backing. Maximum size 9 feet by 12 feet (275 cm x 366 cm).

e. ReAct MS1000V - On Axis gain of 1.0. 60 degree viewing cone. Silver/grey surface provides superior performance in ambient light conditions, offers excellent contrast, optimal color rendition, and is fully HD compliant. Maximum size 79 inches by 140 inches (201 cm x 356 cm).

f. ClearSound NanoPerf XT800V - On Axis gain of 0.8. 180 degree viewing cone. Acoustically transparent white PVC fabric with microscopic perforations. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 10 feet (305 cm) from screen.

g. ClearSound Perf XT900V - On Axis gain of 1.0. 180 degree viewing cone. Acoustically transparent. Flexible matt white perforated surface. Reasonable control of ambient light is recommended. Not recommended for use in sizes less than 80 inches (203 cm) wide. Not recommended for viewing less than 20 feet (610 cm) from screen.

h. TecVision XH700X Grey - On Axis gain of 0.7. 180 degree viewing cone. Designed for blending applications on curved or flat screens where ambient light is present. Provides very good contrast and color reproduction. Imaging Science Foundation certified and 4K ready. Dark backing.

i. TecVision XT1100X White - On Axis gain of 1.1. 180 degree viewing cone. Designed for use when the projector brightness and size of screen require a minimal increase in gain. Imaging Science Foundation certified and 4K ready. Dark backing.

j. TecVision XH900X Grey - On Axis gain of 0.9. 180 degree viewing cone. Provides very good contrast and color reproduction. Imaging Science Foundation certified. 4K ready. Dark backing.

k. TecVision MS1000X Grey - On Axis gain of 1.0. 70 degree viewing cone. Provides excellent contrast and color reproduction. Performs well in ambient light. Imaging Science Foundation certified. 4K ready. Dark backing.

l. TecVision XT1000X White - On Axis gain of 1.0. 180 degree viewing cone. Imaging Science Foundation certified. 4K ready reference screen surface for blending applications, precise resolution, and color accuracy. Dark backing.

m. TecVision XT1300X White - On Axis gain of 1.3. 180 degree viewing cone. Imaging Science Foundation certified. 4K ready. Dark backing.


o. TecVision XT1800X White - On Axis gain of 1.8. 180 degree viewing cone. Imaging Science Foundation certified. Suited for active 3D or color combining passive 3D...
systems. 4K ready. Dark backing.

p. CineFlex CH1200V - On Axis gain of 1.2. 60 degree viewing cone. Neutral grey rear projection diffusing surface. Provides high resolution and excellent contrast, even in lighted rooms. Recommended for use with low to medium output projectors.

q. CineFlex XT600V - On Axis gain of 0.6. 180 degree viewing cone. White rear projection surface works well for edge matching or edge blending applications, and also for short throw rear projection. Reasonable control of ambient light is recommended.

r. CineFlex MH800V - On Axis gain of 0.8. 78 degree viewing cone. Low gain flexible rear material. Designed for use with high light output projectors and wide audience seating patterns.

5. Tab-Tensioning System:

a. Viewing surface with integrated tabs and cable on each side of fabric to provide tension and ensure flat viewing surface. Viewing surface and tabs CNC cut as a single piece. Tabs RF welded to the back of viewing surface to prevent tab separation. Tab adhesives are not acceptable. Viewing surface inserted into aluminum bottom dowel. Warranted for 5 years against tab separation.

6. Viewing Area H x W:

   1) 92 inch (2337 mm) diagonal, 45 inches x 80 inches (1143 mm x 2032 mm).
   2) 100 inch (2540 mm) diagonal, 49 inches x 87 inches (1245 mm x 2210 mm).
   3) 106 inch (2692 mm) diagonal, 52 inches x 92 inches (1321 mm x 2337 mm).
   4) 110 inch (2794 mm) diagonal, 54 inches x 96 inches (1372 mm x 2438 mm).
   5) 119 inch (3023 mm) diagonal, 58 inches x 104 inches (1473 mm x 2642 mm).
   6) 133 inch (3378 mm) diagonal, 65 inches x 116 inches (1651 mm x 2947 mm).

b. 16:10 Format. Black masking borders standard.
   1) 94 inch (2438 mm) diagonal, 50 inches x 80 inches (1270 mm x 2032 mm).
   2) 109 inch (2769 mm) diagonal, 57-1/2 inches x 92 inches (1461 mm x 2337 mm).
   3) 113 inch (2870 mm) diagonal, 60 inches x 96 inches (1524 mm x 2438 mm).
   4) 123 inch (3124 mm) diagonal, 65 inches x 104 inches (1351 mm x 2642 mm).

7. Provide an extra screen drop with an overall screen drop of ___ feet (___ m) with top border matching the viewing surface.

8. Provide an extra screen drop with an overall screen drop of ___ feet (___ m) with a black masking top border.

PART 3 EXECUTION
3.1 EXAMINATION

A. Examine conditions under which boxes, poke-thrus' fittings, and projection screens are to be installed and substrate that will support boxes. Notify the Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Do not begin installation until substrates have been properly prepared.

2. Verify rough-in openings are properly prepared.

3.2 DOCUMENT INTERPRETATION

A. The locations of the outlet symbols shown in the Drawings represent a close approximation of the exact location where the outlet shall be installed. This location may be shifted left or right eight inches to allow for stud alignment or coordination with electrical outlet locations. Approval by Owner is required for more extensive adjustments to outlet location.

B. Outlet Schedule

1. Refer to the outlet schedule contained [on the Drawings sheet XXX] for outlet mounting height, device box size, and station conduit size.

3.3 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.4 INSTALLATION

A. Strictly comply with manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.

B. Mechanical Security: Raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.

C. Accessories: Provide accessories as required for a complete installation, including insulated bushings and inserts where required by manufacturer.

D. Unused Openings: Close unused box openings using manufacturers recommended accessories.

E. Provide a minimum concrete pour depth of 3-7/16-inch [87mm] plus 1/16-inch [1.6mm] above the top of the box for the RFB4, RFB4-4DB, RFB2, and the RFB2-OG Series Boxes; 2-7/16-inch [62mm] plus 1/16-inch [1.6mm] for the RFB4-SS and RFB2-SS Series Boxes; and 3-7/16-inch [87mm] plus 13/16-inch [21mm] above the top of the box for the RFB4-CI-1, RFB6, and RFB6-OG Series Boxes; and 4-1/16-inch [103mm] above the top of the RFB4E and RFB4E-OG Series Boxes; and 4-inch [102mm] above the top of the RFB6E and RFB6E-OG Series Boxes. Provide the box with four (4) locations to accommodate leveling for pre-concrete pour adjustment and include four (4) leveling screws for the pre-pour adjustment.

F. The 6AT, and 6ATCFF units shall mount in a 6" [152mm] cored hole, actual 6 1/16" [154mm]
core hole. The 8AT units shall mount in an 8” [203mm] cored hole, actual 8 1/16” [205mm] core hole. Use is defined by the UL Fire Resistance Directory as a minimum spacing of “2 ft. [610mm] on center and not more than one device per each 65 sq. ft. [6m²] of floor area in each span”.

1. Installation shall be completed by pushing unit down into the cored hole. Prior to and during installation, refer to system layout and/or approval drawings. Installer shall comply with detailed manufacturer’s instruction sheet included with each device. The unit shall contain a retainer for securing the device in the slab, as well as the necessary intumescent material to seal the cored hole under fire conditions.

G. Outlet Box Mounting:

1. Station cable boxes shall be 4-11/16” square x 3” deep regardless of cable count or cable type.

2. Height: unless otherwise noted in the Outlet Schedule, all communication outlet boxes shall be installed at the same height as electrical outlets, except WCP outlets, which shall be installed at 48 inches AFF to center of box.

3. Install boxes to accommodate device indicated by symbol, in conformance with code requirements and consistent with type of construction.

4. Install the appropriate work cover on all outlet boxes.

5. Set front edge of device box flush with the finished surfaces except on walls of non-combustible materials where the boxes may have maximum set back of ¼”. Secure flush-mounted box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

6. Set outlet boxes parallel to construction and independently attached to same.

7. Do not install back-to-back and through-the-wall boxes. Install with a minimum 6” horizontal separation between closest edges of the boxes. Install with minimum 24” separation in acoustic rated walls.

8. Outlet boxes for audiovisual shall be in a separate box from electrical outlets.

H. Box Support:

1. Mount boxes straight and plumb.

2. Install stud support one side, with short piece of stud, for up to 2-Gang device boxes.

3. Do not support boxes with tie-wire.

4. For one- and two-gang box support, manufactured bracket supports shall be accepted alternate.

5. Support boxes independently of raceways.

6. Install adjustable steel channel fasteners for hung ceiling outlet boxes.

7. Install stamped steel bridges to fasten flush-mounted junction box between studs.

8. Do not install boxes to ceiling support wires or other piping systems.
9. When boxes are installed in fire-resistive walls and partitions, provide 24” horizontal separation between boxes on opposite sides of a wall. In addition, limit penetrations to 16 square inches per penetration and not to exceed a total of 100 square inches per 100 square feet of wall area. Apply fire stop putty or muffins acceptable to the authority having jurisdiction (AHJ).

I. Projection Screen Installation

1. Install in accordance with manufacturer's instructions.

2. Install front projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.

3. Test electrically operated units to verify that screen, controls, limit switches, closure and other operating components are in optimum functioning condition.

3.5 CLEANING AND PROTECTION

A. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

B. Protect boxes and fittings until acceptance.

3.6 STORAGE AND HANDLING

A. Schedule delivery to minimize delays in the project.

B. Provide storage protection against temperature and humidity extremes, theft, vandalism, physical damage, and environmental damage.

END OF SECTION
SECTION 27 4116

AUDIO VISUAL SYSTEMS

PART 1 - GENERAL

1.1. SUMMARY

A. This document covers the general requirements for the installation of audiovisual (AV) systems for the Health Science and Human Services Building Project located at Midwestern State University, Wichita Falls, Texas.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3. CODES

A. Execute work in accordance with best AV system installation practices, National Electrical Code, and applicable state and local codes.

1.4. REGULATIONS

A. Comply with terms and conditions of Americans with Disabilities Act, especially regarding provisions for hearing impaired and wheelchair access in control areas.

1.5. SUBMITTALS

A. General
   1. Refer to Division 1.
   2. Submit in quantities, format and timetable as required by General Conditions.

B. Product Data Binders
   1. Minimum number of Sets: four (4).
   2. Timetable
      a. Submit within thirty (30) days after award of contract.
      b. Submit simultaneously with Shop Drawings.
      c. Allow minimum of ten (10) business days for review. All sets minus one (1) will be returned with review comments. If a resubmit is required, resubmit total quantity of complete sets. If second resubmit is required, Contractor shall reimburse Owner for expenses incurred during additional review process.
      d. Review and approval of Product Data is required before equipment purchase and installation.
      e. Bind product data sheets together either in GBC or 3-ring type binders.

C. Shop Drawings
   1. Minimum Number of Sets: four (4).
   2. Timetable
      a. Submit within thirty (30) days after award of contract.
      b. Submit simultaneously with Product Data Binders.
      c. Allow minimum of ten (10) business days for review. All sets minus one (1) will be returned with review comments. If a resubmit is required, resubmit total quantity of complete sets. If second resubmit is required, Contract shall reimburse Owner for expenses incurred during additional review process.
3. Description:
   a. Shop Drawings shall be used for coordination between trades and updated as final record drawings.
   b. Bind all Shop Drawings together to form set. Loose drawings will not be accepted.
   c. Each drawing shall include: Project, Building, Location, Contractor Name, Architect, AV Consultant, Date and Revision Number.
   d. Number and title each drawing in logical manner as a set.
   e. Include cover sheet with listing of all drawings included in bound set.
   f. Ensure that labeling on Shop Drawings match labeling on equipment.
   g. Minimum Scale:
      1) Floor Plans: 1/8 inch = 1 foot.
      2) Rack Elevations: 1-1/2 inch = 1 foot.
      3) Plate/Panel Details: 6 inches = 1 foot.
      4) Loudspeaker Details: 1 inch = 1 foot.
   h. Include as a minimum:
      1) Floor plans indicating locations of all AV devices, vertical risers, pull boxes, and exposed wiring. Include Device ID (PRJ, SCREEN, FRK, FB, AVP, etc., as referenced in design contract documents), as appropriate for projectors, screens, racks, floor boxes, AV plates in walls, etc.
      2) Schematic diagram showing all primary and secondary devices, interconnectivity and signal flow.
      3) Plate details showing size, material, finish, connectors, engraving, etc.
      4) Mounting detail drawings of loudspeakers, racks, and overhead equipment. Hire services of professional structural engineer, licensed by the appropriate governing authority, to review shop drawings, building structural drawings, and any existing structures from which equipment is to be suspended. Include Structural Engineer’s stamped report with shop drawing submittal. Report shall include:
         i. Itemization of items reviewed by the Structural Engineer.
         j. Confirmation that proposed methods of suspending equipment as shown on the shop drawings conform to required safety factors.
         k. Confirmation that building structure from which equipment is to be suspended will support equipment including required safety factors.
            1) Rack elevations.
            2) Complete schematic diagram. One-line diagram with detailed descriptions of product inputs and outputs is acceptable. Include terminal strip details and cable label information. If wiring diagram spans more than three (3) sheets, additionally provide simplified block diagram of entire system on one (1) sheet.
            3) Electrical power wiring diagram. Include circuit, switching, and control details.
            4) Wiring diagram of grounding and shielding scheme.
            5) Drawings for custom-fabricated items (i.e., plates, panels, cables, and assemblies).
            6) General construction drawings necessary for completion of work.
   D. Operation and Maintenance Manuals
      1. Minimum number of Sets: four (4).
      2. Bind Operation and Maintenance Manuals using either GBC or 3-ring binders.
      3. Format and Minimum Information below:
         a. Section 1 - System Operation.
            1) Introduction/overview to system components and their functions and locations. Include a brief listing of basic system functions.
            2) Complete but simple system operating instructions to accomplish basic system functions, written for non-technical personnel.
3) Certificate indicating names of Owner personnel trained by AV Contractor, date of training, name of AV Contractor representative that provided training, and name of project.

b. Section 2 - System Documentation.
1) Simplified system one-line schematic diagram showing changes made during construction.
2) Complete inventory of system components including serial numbers. Identify location (equipment rack, over stage, stored in control room, etc.) of each component.
3) Cable and terminal strip documentation including cable numbers, functions, originating locations, terminating locations, and signal levels.
4) All Shop Drawings corrected to reflect as-built conditions.
5) Other data and drawings required during construction.
6) Initial Tests and Adjustments data.
7) Final Tests and Adjustments data.
8) CD-ROM discs including all utilized manufacturer’s software and saved copies of software configurations (configurations as established during Final Tests and Adjustments).

Section 3 - Manufacturer’s Documentation.
1) For each equipment model at no additional costs to Owner, even if manufacturer does not include costs of such documentation with purchase of equipment item.
2) Manufacturer’s Product Data.
3) Operating instructions.
4) Installation instructions.
5) Service information.
6) Schematic diagrams.
7) Replacement parts list.

d. Section 4 - Maintenance Information.
1) Preventive maintenance schedule letter clearly stating target dates of six month and end-of-warranty preventative maintenance inspections, and list of maintenance tasks performed.
2) Maintenance instructions including manufacturer’s recommended maintenance, recommended maintenance schedule and information concerning proper inspection, testing, and replacement of components.
3) Troubleshooting information complete with instructions for procedures during equipment failure.

e. Section 5 – Warranty Information
1) System warranty letter.

4. Provide three (3) sets on CD-R disc that include all material in Operation and Maintenance Manuals in PDF format except for copyrighted material.

5. Submit one (1) set of Operation and Maintenance Manuals at least ten (10) days before Final Tests and Adjustments procedures (minus data from Final Tests and Adjustments). This set will be reviewed by Owner and returned to Contractor. Re-submit after Final Tests and Adjustments and include data. NOTE: Do not schedule Final Tests and Adjustments or perform training of Owner personnel before submitting Operation and Maintenance Manual.

6. Submit remaining number of complete manuals as required by General Conditions within ten (10) days after return of reviewed set(s). Include Final Tests and Adjustment data, warranty period letter, and any other data not included in first submission.

E. Samples
1. Request for Samples - Upon request, furnish samples (at no additional cost) to Owner and/or General Contractor of submitted items proposed as substitutes for specified items. Products will be reviewed to determine if proposed substitute items meet required function and quality.
2. Product Tests
   a. Products submitted as samples may require testing by independent laboratory. Testing at expense of Contractor.
   b. Obtain written approval of tested products before incorporating into system.

1.6. QUALITY ASSURANCE

A. AV Contractor Qualifications
   1. Be established AV System Contractor, regularly engaged in furnishing and installing AV systems. NOTE: Electrical or general contracting firms responsible for completion of this work, but not meeting above requirement, shall employ services of approved AV Contractor as subcontractor to perform work described herein.
   2. Be experienced in installations of similar size and scope within last five (5) years. Submit list of four (4) (minimum) installed jobs of similar magnitude, completed within last five years. For verification, submit complete information, including project name, project address, contact person, daytime telephone number plus month and year of project completion. At Owner’s request, accompany Owner or Owner’s representative on visit to any or all example completed projects submitted.
   3. Be Authorized Dealer for all major lines of equipment listed in Part 2 (Biamp, Sony, Crown, Sharp, Crestron, etc.) Must have at least one permanent staff member who is factory trained in the installation and maintenance of each major product line offered.
   4. Employ personnel (at all levels of work) experienced in projects of similar size and scope. Provide list of key personnel to be responsible for each of the following aspects of work: Project Management, Technical Documentation, Control System programming, DSP programming and Leadership of Field Work (one who is present for all field work). For each identified employee, indicate number of years employed by contractor, number of years’ experience in assigned responsibilities, and list of previously completed projects where similar responsibilities were required.
   5. Project manager assigned to this project must have a minimum of five (5) years’ experience in installing and integrating AV systems of similar scale. Project Manager shall also have either an INFOCOMM CTS-I or CTS-D certification.

PART 2 - PRODUCTS

1.1. GUIDELINES
   A. All active AV equipment shall be furnished by AV Contractor selected by the Owner. All active electronics shall be contractor furnished, contractor installed (CFCI).
   B. Infrastructure Products – All conduits, basket tray/cable tray, pull boxes and associated parts required for infrastructure shall be installed by the electrical contractor unless specifically excluded in these specifications or drawings.
   C. Performance - Regardless of completeness of descriptive paragraphs herein, each device shall meet its manufacturer's published specifications. Verify performance.
   D. Contract Documents - Drawings and specifications are to be used in conjunction with one another and to supplement one another. In general, the specifications determine the nature and quality of the materials, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to in the installation of the AV system components. If there is an apparent conflict between the drawings and specifications, the items with the greater quantity or quality shall be provided and installed. Clarification with the owner about these items shall be made prior to the ordering and installation.
   E. Quantities – All quantities are indicated on AV drawings or in Part 2 AV Products list. Confirm quantities on final Contract Documents. If Contract Documents do not include quantities necessary to deliver complete working system, provide notification of disparity, and install required quantity of devices for complete working system.
F. Small Parts - Systems are described in terms of major products. Even if not specifically mentioned, provide and install patch cables, connectors, hardware, converters, power supplies, labels, terminals, mounting accessories etc. necessary for complete and working system meeting design intent of specifications.

G. Balanced Lines – Unless specifically directed otherwise, wire all line and microphone level circuits as balanced with respect to signal ground. For products without balanced inputs or outputs, provide high quality balancing transformers with proper level, shielding, and impedance characteristics. Assure all audio levels arriving and leaving matrix and routing switches are equal to the manufacturer’s recommended input audio level. If required, use Radio Design Labs, Inc. products or equivalent for level matching.

H. Keys - Provide five (5) sets of keys for any AV system product requiring keys.

I. Condition – Provide and install products listed in this section in factory new condition, conforming to applicable provisions of American National Standards Institute.

J. Designations - Each major product item is given unique designation (such as MIX1 for mixer number 1). The product designations are unique in this section only and may be repeated in other specification sections.

K. Security Screws - Use Middle Atlantic HSK Guardian Series button-head screws and bits to secure rack components, LCD mounts, Projector mounts and any other location deemed necessary by Owner. Use nylon washers (not provided by Bryce) to protect equipment surfaces. Account for appropriate tip wear when ordering quantity and do no use a bit beyond the manufacturer’s recommendations. Provide ten (10) additional unused driver bits and deliver to the customer after completion.

L. AV Electrical Power - Ensure that “Star” ground configuration is properly implemented by the Electrical Contractor. Ensure that ground wires from each outlet are isolated from conduit, neutrals, and each other and are each home-run back to the dedicated breaker panel for AV systems.

M. Wireless Microphones - Coordinate frequency selection with other radio-frequency sources in the area and with manufacturer’s recommendations.

N. Control System Programming:
   1. Program each panel to provide simple, intuitive control of all basic AV functions including: per zone program and speech volume levels, video source and destination routing, AV system power, media player transport functions and CATV tuner control (including channel guide, navigation, last channel, channel select (up, down and manual input) and channel presets).
   2. Utilize InfoComm International’s “Dashboard for Controls” concept for touch panel layout unless directed otherwise by Owner.
   3. Control system shall be integrated into Crestron’s Fusion management system allowing the Owner to manage and control the building’s AV systems and provides reports on system usage, down time and other reportable attributes as requested by Owner.
   4. AV management software shall be installed on Owner furnished computer(s) with adequate specifications per manufacturer’s recommendations.
   5. Provide layout of each and every touch panel and hard-button panel pages in the product data submittal for approval by Owner.
   6. Provide web-control for each touch panel in AV system. Include page tracking, and track current button feedback between touch panel and web-control panel.
   7. Staff member certified by control system manufacturer shall program control system. Control programming must be done by in-house personnel. Programming cannot be subbed out to another contractor or individual.
   8. After programming is approved, all control system code and programming, including touch panel code and graphics, will become property of Owner. AV Contractor shall provide Owner both raw and compiled code on CD-R disc.
O. Audio System Programming - Owner shall coordinate layout and logical branching of DSP audio system. Include screen layout and menu branching drawings in AV submittal. After AV system is approved, all audio control system code and programming will become property of Owner. AV Contractor shall provide Owner both raw and compiled code on CD-R disc.

P. EDID Configuration – The variety of resolutions of laptops and other computer devices that may be connected to these systems is unknown. Set preferred EDID settings to 1920x1080, 60Hz, 2-channel audio.

Q. AV Racks:
1. Provide blank faceplate in any area marked BLANK in drawings.
2. Provide shelf for mounting of any device for which rack mount kit is not available.
3. Provide one Panelcrafters DATCO-XXXXX-RHIM-01 designer/integrator information plate or approved alternate per rack. Install information plate at the top of each rack unless 1RU space is not available. Contact Panelcrafters sales department to add AV Contractor graphic to the “integrator” section (approximately 8.5” x 1.75” of the right-hand side). All alternates must include AV Consultant graphic. Submit to AV designer for approval of final plate design prior to purchasing and installation.

R. AV Floor Boxes and Poke-thrus:
1. Clean floor boxes and poke-thrus of all dust and debris prior to installation of any active or connectorized plate.
2. Any floor box or poke-thru with active or connectorized AV plates found to have any dust, debris or water in bottom of box are subject to replacement of all plates and components. A re-test of all associated components must be completed.
3. Provide blank plates for all unused compartments in the AV floor boxes and poke-thrus.

S. AV Plates
1. The project standard plate color is white unless the plate is mounted on a wood or stone wall in which case it is to be stainless steel.

T. AV Design Bid & Substitutions:
1. System design is around products listed in Part 2. Intent of product specification is to provide standard of quality and function for installed materials. Certain performance specifications are given to clarify job requirements.
2. Bid AV system with products specified in section below unless noted otherwise from Owner.
3. No substitutions will be allowed without prior approval from Owner specific to proposed manufacturer and model numbers.
4. Equipment listed in Part 2 is based on performance criteria to meet Owner design requirements.
5. All requested substitutions need to meet or exceed performance of devices listed in Part 2. For each request provide manufacturer’s published specifications to verify performance and explain functional and cost impact.
6. Evaluation and approval of substitution requests will be performed by Owner.

1.2. ROOM DESCRIPTIONS

A. Conference / Debriefing Rooms (#202, #352, #446): Each room will have a wall mounted flat panel display. The two (2) debriefing rooms Debriefing Room 202 will have existing interactive boards with existing wall mounted projector. A wired input at the table via cable cubby and a wired input at the wall to support owner furnished devices are provided. USB extender will be provided from interactive board in room 202 to table. Speech reinforcement and program audio will be accommodated via ceiling mounted loudspeakers. An output for a portable assistive listening system will be included per ADA requirements. Control of the flat panel will be via wall mounted control keypad.
B. Classrooms Typical (#101, #302, #304, #306, #332): Each classroom will be flexible with multiple displays to allow for multiple configurations. All the wall mounted flat panel displays can be fed the same input source or discrete sources. Sources for display include wired inputs at the lectern via cable cubby and at the wall to support owner furnished devices, a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. All equipment will reside in the local lectern. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program audio and speech reinforcement will be accommodated via ceiling mounted loudspeakers. An assistive listening system will be included per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern. Intuitive controls via graphic touch panel interface will control system power, program audio source selection and volume control, plus lighting presets and shade control (if available).

C. Dental Lab 103A/103B: This instructional lab is a large dividable room with a movable partition. Each lab classroom will have a local lectern housing a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. A wired input at the lectern via cable cubby to support an owner furnished device will be provided. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program content will be presented with a motorized projection screen and a ceiling mounted video projector. An assistive listening system will be included for each classroom per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern. Intuitive controls via graphic touch panel interface will control system power (including screen up and down), program audio source selection and volume control, plus lighting presets and shade control (if available). In the large room configuration with wall partition opened, the presentation content can be distributed from either lectern position.

D. Nursing Skills Lab #2: This instructional lab will have a local lectern housing a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. A ceiling mounted PTZ camera in a dome mount will be mounted in instructional area for close-ups of demonstrations of equipment or working with a manikin. A wired input at the lectern via cable cubby to support an owner furnished device will be provided. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program content will be presented on a ceiling mounted projection screen and ceiling projector (OFE). A wired input and output at the wall will provide source input and content output to the portable interactive white board. An assistive listening system will be included per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern.

E. Radiologic Sciences Lab: This instructional lab will have a local lectern housing a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program content will be presented with a Wall mounted interactive white board (OFE) via ceiling mounted video projector. A wired input and output at the wall will provide source input and content output to a portable interactive white board. An assistive listening system will be included per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern.

F. Respiratory Care Skills Lab: This instructional lab will have a local lectern housing a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a
document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. A wired input at the lectern via cable cubby to support an owner furnished device will be provided. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program content will be presented with a motorized projection screen via ceiling mounted video projector. A large flat panel display will also be provided to present supplementary program content. An assistive listening system will be included per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern.

G. Anatomage/Virtual Lab: This instructional lab will have wired inputs at the center table via cable cubby to support owner furnished devices. A dedicated owner furnished room computer and HDMI extenders will be housed in the equipment cabinet under the anatomage table. Program content will be presented with one (1) fixed wall mount projection screen (2 x 1 configuration) and ceiling mounted video projectors. Ceiling speakers connected to the PC will provide any program audio. A wall mounted 5" touch panel connected to control system will provide control of system.

H. Classroom with ITV Distance Learning (#240): Each classroom will be flexible with multiple displays to allow for multiple configurations. All the wall mounted flat panel displays can be fed the same input source or discrete sources. Sources for display include wired inputs at the lectern via cable cubby and at the wall to support owner furnished devices, a wireless presentation system for display of presenter or participant devices (e.g. laptops or tablets), a document camera, a cable television tuner (cable service feed by others) and a dedicated owner furnished room computer. All equipment will reside in the local lectern. A wired "button" microphone at the lectern and a wireless microphone system for use throughout the room will provide speech reinforcement. Program audio and speech reinforcement will be accommodated via ceiling mounted loudspeakers. An assistive listening system will be included per ADA requirements. Control will be handled via a touchscreen control panel mounted to the lectern. Intuitive controls via graphic touch panel interface will control system power, program audio source selection and volume control, plus lighting presets and shade control (if available). An Add Alternate provides additional equipment for ITV Distance Learning from this room. Displays have been optimized for this use. An additional Codec with a camera in the rear of the classroom as well as the front. Overhead microphones will be added for audience response. A DSP audio processor will need to be added to handle the additional microphones.

I. Dean's Conference Room (#411): Each room will have a wall mounted flat panel display. A wired input at the table via cable cubby and a wired input at the wall to support owner furnished devices are provided. Speech reinforcement and program audio will be accommodated via ceiling mounted loudspeakers. An output for a portable assistive listening system will be included per ADA requirements. Control of the flat panel will be via wall mounted control keypad.

J. Student Lounge 140: Lounge will have Infrastructure for future wall mounted flat panel display for showing cable television (cable television feed by others) and/or digital signage (see below). Control will be handled via the flat panel display's remote.

K. Digital Signage: Each digital signage location will have a wall mounted flat panel display. A small form factor, IP addressable PC will be located at each panel for pushing content from an owner provided signage system.
1.3. AV PRODUCTS

A. The following are major active and infrastructure products for this project.

1. AMP – Power Amplifier
   a. Type 1 – Extron MPA-152 70V 15watt MPA 601 60 watt audio amplifier with rack mount kit
   b. Type 2 – Extron XPA 2001 70V 100watt audio amplifier with rack mount kit

2. AVP – AV Input Plate
   a. Type 1 – Custom one-gang AV plate with one (1) HDMI passive connector to be Extron WPD 110 A
   b. Type 2 – Custom one-gang AV plate with one (1) DTP transmitter and one (1) microphone input (XLR)
   c. Type 3 – Custom two-gang AV plate with one (1) DTP USB transmitter and one (1) DTP receiver

3. AVT – Tuner
   a. Aurora VTUNE PRO 4K/QAM/NTSC/IPTV Tuner
      1) Include manufacturer recommended rack mount kit

4. CAM – PTZ Video Camera
   a. Type 1 - Polycom EagleEye Director II auto tracking camera.
      1) Provide with cable extenders and adaptors as required to connect to CODEC (ADD Alternate #5 only).
      2) Provide with wall mount that will house all the parts required at the camera location.
   b. Type 2 – Vaddio RoboShot 12 HDBT (ceiling mounted) with OneLink HDMI Extension module.
      1) Provide the Vaddio 12” clear indoor flush mount dome

5. CC - Cable Cubby
   a. Type 1 – Extron Cable Cubby 202 with pass-through plates
      1) Coordinate exact mounting location with architect

6. CDC – Videoconferencing Codec (ADD Alternate #5 Only)
   a. Polycom RealPresence Group 700 CODEC.
   b. Provide with rack mount and required adaptors, power supplies to provide complete system.

7. CMIC – Ceiling microphone (ADD Alternate #5).
   a. Shure MXA910W-60CM Ceiling Array microphone With InteliMix DSP Suite.
   b. Dante Audio out.
   c. Provide with PoE power supply to power system.

8. CP – Control Processor
   a. Type 1 – Extron IPCP Pro 250 control processor.

9. DOC – Document Camera
   a. Type 1 - Wolfvision VZ-3 desktop visualizer

10. DSP – Digital Signal Processor
    a. Type 1 – Shure DFR22
    b. Type 2 – Extron DMP 128 Plus C V AT (ADD Alternate #5 only).
       1) Use Extron Electronics ASA 131 passive audio summing adapters for incoming balanced stereo audio signals.
       2) Provide with AEC, Dante and VOIP features.

11. DSPC – Digital Signage PC
    a. Black Box ICKS-VE-KU-N K Series VESA Digital Signage Player.

12. FPD - Flat Panel Display
    a. Type 1 – Samsung DM82E-BR 82” flat panel display
       1) Include Chief Manufacturing XSMU1 wall mount
       2) Include active unbalanced to balanced audio converter for audio output
    b. Type 2 – Samsung DM65E-BR 65” flat panel display
       1) Include Chief Manufacturing XSM1U wall mount
2) Include active unbalanced to balanced audio converter for audio output

c. Type 3 – Samsung DM75E-BR 75” flat panel display
   1) Include Chief Manufacturing XSM1U wall mount
   2) Include active unbalanced to balanced audio converter for audio output

d. Type TV/DS and DS – Samsung DM55E 55” flat panel display
   1) Include Chief Manufacturing MSM1U wall mount
   2) Include active unbalanced to balanced audio converter for audio output

13. FRK – Floor Rack
   a. Middle Atlantic ERK-4425
      1) Power strip for appropriate power distribution
      2) Middle Atlantic caster base
      3) Middle Atlantic ERK-4QFT-FC fan top
      4) Middle Atlantic D Series Drawer
      5) Middle Atlantic vents and blanks as indicated on the drawings

14. IWB – Interactive White Board
   a. Type 1 – OFE existing portable Prometheus Boards with built-in short throw projector.
   b. Type 2- OFE existing wall mounted Prometheus Board utilizing new type ± 2 ceiling mounted projector. USB extender to be mounted in FPD back box.
   c. Type 3 – OFE existing wall mounted Prometheus Board with existing wall mounted projector.

15. LA - Listening Assist System
   a. Listen LT82-01 IR Transmitter with:
      1) Listen LA-140-WH IR emitter- white.
      2) Listen LA-326 Transmitter rack mount kit
      3) Listen LA-364 Recharging station
      4) Provide four (4) Listen LR-44 receivers with two (2) LA-164 over the ear headphones and two (2) LA-166 Neck Loop.

16. LECTERN
      1) Include rack rails.
      2) Include cutouts for the cable cubby and microphone.
      3) Include sliding keyboard and mouse tray.
      4) Include casters with brakes.
      5) Include document camera shelf.
      6) Include Monitor arm to be installed at site.
      7) Finish: Charcoal Grey Carpet.

17. NET – Network Switch
   a. HP 5120-EI-24G-PoE+ gigabit ethernet switch

18. PMIC – Lectern Microphone
   a. Clear One 910-103-162 “button” microphone with shock mount.
      1) Secured to lectern top. Coordinate mounting with architect and consultant.
      2) Coordinate mounting with architect

19. PRJ - Video Projector
   a. Type 1 - Panasonic PT-RZ660BU (6500 lumens) with appropriate lens
      1) Include Chief Manufacturing RPA universal ceiling projector mount
      2) Include Chief Manufacturing CMS adjustable extension column and CMA plate
   b. Type 2 – Panasonic PT RZ575BU (5200 lumens) with appropriate short throw lens
      1) Include Chief Manufacturing RPA universal ceiling projector mount
      2) Include Chief Manufacturing CMS adjustable extension column and CMA plate.
   c. Type 3 – Existing wall mounted projector.
20. PSW – Presentation Switcher
   a. Type 1 - Extron DTP Crosspoint 108 4K all-in-one presentation switcher
      1) Use Extron Electronics ASA 131 passive audio summing adapters for incoming/outgoing balanced stereo audio signals.
      2) Include RS-232 extenders for cable runs over 50 feet.
   b. Type 2 - Extron DTP Crosspoint 84 4K all-in-one presentation switcher
      1) Use Extron Electronics ASA 131 passive audio summing adapters for incoming/outgoing balanced stereo audio signals.
      2) Include RS-232 extenders for cable runs over 50 feet.

21. PWR - Power Management
   a. Type 1 - Middle Atlantic PDC-915R-6 power supply
   b. Type 2 – Middle Atlantic UPS-2200R-IP uninterruptable power supply.

22. S – Loudspeaker
   a. Extron FF-220T Full-Range Flat Field
      1) Tap at 7.5 watts.
   2) Follow manufacturer’s guidelines to paint speakers to match architect provided color sample

23. TP - Control Touch Panel
   a. Type 1 – Extron TLP Pro 520M wall mount 5” touch panel
      1) Coordinate color with architect
      2) Include PoE injector connected to building LAN

24. UPS – Uninterruptable Power Supply
   a. APC SMT1000RM2U Smart UPS 1000VA RM @U 120V.
      1) Mount in bottom of each Lectern.

25. UTP Rx – Digital Twisted Pair Receiver
   a. Type 1 - Extron DTP HDMI 4K 230 Rx DTP receiver
   b. Type 2 – Extron DTP HDMI 4K 230 D Rx DTP receiver (decora style)

26. UTP Tx – Digital Twisted Pair Transmitter
   a. Type 1 - Extron DTP T UWP 232 D two input DTP transmitter (decora style)
   b. Type 2 - Extron DTP T HWP 4K 231 D DTP transmitter (decora style)

27. USB Rx – Digital USB Twisted Pair Receiver
   a. Real prType 1 – Extron USB Extender Plus R USB Extender Receiver

28. USB Tx – Digital USB Twisted Pair Transmitter
   a. Type 1 – Extron USB Extender Plus T USB Extender Transmitter

29. WCP – Wall Mounted Control Panel
   a. Type 1 – Extron TLP Pro 520M wall mount 5” touch panel
      1) Coordinate color with architect
      2) Include PoE injector connected to building LAN
   b. Type 2 – Extron EBP 100 wall mount push button control panel
      1) Include PoE injector connected to building LAN
      2) Coordinate color with architect.
   c. Type 3 – Extron MLC Plus 84D Media Link Controller (Decora Style)
      1) Coordinate color with Architect
      2) Power unit from power outlet behind Flat Panel Display.
      3) Connect RS232 directly to Flat Panel Display.

30. WMIC – Wireless Microphone
   a. Shure ULXD Single Receiver System
      1) Extend antenna as necessary for full coverage within each system’s corresponding room.
      2) Provide Shure UA864US ceiling mounted antennas when extending.
      3) Provide Shure ULXD1 body pack with MX153 earset head-worn microphone.
      4) Provide Shure ULXD2/SM58 hand-held transmitter.
      5) Provide with charging station and rechargeable batteries
31. WPS – Wireless Presentation System
   a. OFE Apple TV
      1) Include Middle Atlantic RSH4A2S custom rack shelf.

32. SCREEN – FIXED – Wall mounted fixed stretched projection screen Anatomage Room (303) only.
   a. Draper Clarion wall mounted fixed stretched screen.
      1) Size: 208" W x 65" T Frame (dual 16:10 images).
      2) Projection Material: OptiFlex Matt White XT1000V.
      3) Provide additional frame support trusses as required.
      4) Provide wall mount brackets.

1.4. CABLES

A. Interconnect Wiring – All AV cables will be plenum rated per NEC.
   1. Analog Audio Plenum Rated Cable - West Penn 25291, or similar.
   3. Analog Composite Video Plenum Rated Cable: West Penn 25806 or Belden 89120.
   4. RGBHV Plenum Rated Cable: Belden 1283S5, or West Penn 258195.
   5. Control Plenum Rated Cable: West Penn D25350.
   6. Loudspeaker Plenum Rated Cable: West Penn 25226B & 25227B.
   7. Shielded Cat7a Cable: Crestron DM-CBL-ULTRA
   8. Fiber 62.5 µm Cable: Corning 62.5/125.
   9. Interface/Adapter Cables: AMX or Extron Certified Cables
   10. HDMI Interconnect Cables: Extron Pro Series HDMI Cables

B. Connectors – All AV (including microphone) connectors shall be made by Canare or Neutrik.
   Connectors shall be of the quantity and type as required for proper and durable operation, and
   signal transmission of the electrical characteristics for associated circuitry.
   1. Microphone connectors: 3-conductor XLR AES/EBU compliant (for microphones in
      tables/lecterns, use Neutrik RF shielded connectors).
   2. Control panels: XLR type with number of conductors as required.
   3. Line level and left/right audio connectors: tip/ring/sleeve 1/4" phone jacks with insulated
      bushings.
   4. Composite video and RGBHV connectors: BNC dual crimp true 75 ohm BCP-C.
   5. BNC shall be made by ADC or Kings and be HD-SDI compliant to 3 GHz.
   7. Loudspeaker shall be Neutrik Speakon type.
   8. Provide strain relief for each and every connector.

PART 3 - EXECUTION

1.1. INSTALLATION

A. General Guidelines
   1. Quality of Work - Perform labor to accepted industry standards and state and local codes
      to accomplish complete and working system.
   2. Material and Labor - Provide specified products and other incidental materials, appliances, tools, and transportation required for complete and functioning systems.
      Provide personnel to perform labor who are skilled in techniques and can demonstrate technical knowledge AV infrastructure system installations.
   3. Documents at Job Site - Keep following documents at job site during entire construction period:
      a. Complete Specifications and Drawings.
      b. Approved Shop Drawings.
      c. Approved Product Data.
d. Progress Set of Project Record Documents.

4. Mounting - Mount equipment and enclosures plumb and square. Ensure that permanently installed equipment is firmly and safely held in place. Design equipment supports to support loads imposed with project safety factor of five (5) or greater. For devices hung overhead, obtain review by Structural Engineer licensed by the appropriate governing authority prior to installation.

5. Dimension Verification - Verify dimensions and space requirements to assure that proper mounting, clearance, and maintenance access space is available for system components.

6. Clean-Up - Leave project clean each day. Place debris where designated by General Contractor. Debris includes but not limited to: solder splatter, cable ends, stripped insulation, spent crimp connectors, gypsum board and ceiling tile dust, and product wrappings and cartons. After completion of installation, thoroughly clean areas worked, including non-visible areas such as equipment rack interiors, rack top panels, and inside lockable floor and wall boxes.

7. Coordinate installation of AV infrastructure and equipment with other trades in order to follow project schedule.

8. Maintain any licensing required by the appropriate governing authority to install and terminate low voltage systems.

B. Labeling

1. Equipment Labels - AV Contractor shall provide engraved laminoid labels on front and rear of rack-mounted equipment. Mount labels plumb and square. Include schematic reference design, item name, and system or area controlled by labeled component. On program preamps and mixers, provide label for each input indicating which source is controlled by labeled channel. Unless otherwise indicated, provide permanently-mounted black labels engraved with 1/8-inch white block characters. Handwritten, self-laminating, or embossed plastic (Dymo) labels are not acceptable. Provide labels for major equipment with two (2) lines (minimum) of engraving, coded as follows:
   a. Line 1: Generic name of device, such as MIXER AMPLIFIER.
   b. Line 2: Schematic designation of device, such as AV-MSW-1.

2. Control Labels – AV Contractor shall provide engraved label over each user-operated control that describes the function or purpose of control. Provide label of proper size to fit available space.

3. Terminal Strip Labels - AV Contractor shall label each terminal strip with unique identification code in addition to numerical label (Cinch MS series) for each terminal. Show terminal strip codes on system schematic drawings included with Project Record Documents.

4. Rear Equipment Labels - AV Contractor shall provide adhesive label on rear of equipment where cables attach, to indicate designation of cable connected at each point.

5. Cable and Wire Labels - Label cables and wiring logically, legibly and permanently for easy identification. Labels on cables shall be adhesive strip type, covered with clear heat shrink tubing. Factory stamped heat shrink tubing may be used. Hand-written or self-laminating type labels are not acceptable.

6. Cable Label Codes and Locations - Label each cable with unique alpha-numeric code. Locate cable designation at start and end of each cable run, within three (3) inches of termination point. For cable runs that have intermediate splice points, label cable with same designation throughout, with additional suffix to indicate each segment of run. Provide cable designation codes to schematic drawings included with Project Record Documents and Operation and Maintenance Manuals.

C. Power and Grounding

1. Power Coordination – Coordinate final connection of power and ground wiring to rack. Electrical contractor will provide power to audio visual systems. Before installation, verify load requirements for systems as accepted.

2. Bus Bars - Install 1-inch by ¼-inch copper ground bus bar, top to bottom in floor mounted AV racks. Ground and bond equipment chassis of each rack-mounted component...
without three-pin grounding plug to bus bars with #12 AWG insulated green wire using 6-32 or larger nuts, bolts, lock-washers, and appropriate NEMA connectors. Electrical Contractor (Division 16) shall provide and connect #4 AWG green insulated wire from Bus Bars to ground point in AV technical electrical panel.

D. Equipment Racks
1. Ventilation - Provide ventilation adequate to keep temperature in rack below 85 degrees Fahrenheit. Use “whisper” type ventilation fans in racks, adjusted to come on when temperature in rack rises above 85 degrees Fahrenheit, only if adequate cooling cannot be provided by Owner.

E. Wiring
1. Wiring Standards - Execute wiring in strict adherence to best AV engineering practices.
2. Field Connection Devices - Connect cable to active components through screw terminal connections and spade lugs when appropriate. For BNC connections use three-piece, dual crimp BNC properly sized for cable with insulating bushings. Wire nut or “Skotchlock” connectors are not acceptable. Do not wrap audio cable splices or connections with adhesive backed tape. Punch connectors or telephone-style punch blocks are not acceptable anywhere in the installation unless specifically authorized by Owner.
3. Run cable in ceiling plenums neatly parallel to building walls, supported every three feet to structure with plenum rated ties.
4. Raceways - Run vertical wiring inside rack in Panduit (or equivalent) plastic raceways with snap-on covers, sized to allow at least 50% future wiring. Mount raceways on full length ¾-inch flat black plywood backboards, attached to rack sides. If between-rack wiring chases are provided, Panduit raceways are not required. Horizontal wiring in rack shall be neatly tied in manageable bundles with cable lengths cut to minimize excess cable slack, but still allow for service and testing. Provide horizontal support bars if cable bundles sag. Individually bundle excess AC power cable away from rack mounted equipment with plastic cable ties. Electrical tape and adhesive backed cable tie anchors are not acceptable.
5. Accessibility - Ensure that wiring and connections are completely visible and labeled in rack. Mount termination resistors, if required, on terminal strips, fully visible and not concealed within equipment or connectors.
6. Loudspeaker Polarity - Connect loudspeakers electrically in phase, using same wire color for loudspeaker wiring throughout project.
7. Physical Damage Prevention - Take necessary precautions to prevent physical damage to cables and equipment. Damaged cables or equipment will not be accepted. Separate, organize, and route cables to restrict channel crosstalk and feedback oscillation.
8. Racks - Looking into the rack from the rear, locate AC power, control, data and speaker wiring on the left; line level audio, control, video, and RF wiring on the right. Keep several inches of space between power cables and other signals.
9. Hum Prevention - Ensure that electromagnetic and electrostatic hum is at inaudible levels. For line level signals, float cable shields at the output of the source device. Do not cut or remove shield conductors; fold back unconnected shields over cable jacket and cover with clear heat-shrink tubing. Do not obstruct cable labels.
10. Other Connections - Make connections using rosin core solder or approved mechanical connectors. Where spade lugs are used, crimp properly with ratchet type crimping tool. Solder spade lugs mounted on #22 AWG or smaller cable after crimping.

1.2. STORAGE AND HANDLING
A. Power up any electronic equipment to ensure its proper functioning before its arrival onsite.
B. Ensure that materials (especially electronic and electro-acoustic devices) are protected against physical, environmental, and electronic damage until final acceptance by Owner.
C. Schedule delivery to minimize delays in the project.

D. Provide storage protection against temperature and humidity extremes, theft, vandalism, physical damage, and environmental damage.

1.3. WARRANTY

A. Refer to Division 1.

B. Warranty - Submit letter providing warranty covering labor and materials supplied under this contract. Bind in Operation and Maintenance Manuals. Terms as described in General Conditions. Minimum terms as follows:

1. System - Systems shall be free of manufacturing or installation defects for a minimum period of one (1) year from the date of final acceptance. Clearly designate begin and end dates of system warranty period.

2. Parts and Labor - Provide parts and labor to repair defects in materials and workmanship during system warranty period.

3. Response Time - Within system warranty period, provide initial on-site service response within one (1) business day of service call. Provide resolution to any system defects within 72 hours or within 48 hours of receipt of repaired or replaced product from manufacturer.

4. Replacement Products - If any item must be removed for repair during system warranty period, provide replacement item of similar quality at no charge.

5. Repair Limit - Do not repair any piece of equipment found defective during installation or system warranty period more than two (2) times. After second repair, replace defective item with similar approved item at no additional cost to Owner.

6. Extended Manufacturer’s Warranties – Identify products with manufacturer’s warranties extending beyond one (1) year. Provide terms and conditions of such warranties.

7. Service Personnel Information - Provide name(s) and telephone number(s) of service personnel to be contacted regarding repair and maintenance.

C. Extended Warranty - Provide cost to extend complete AV system warranty from one (1) year to three (3) years. Included a list of all provided services including maintenance schedules.

1.4. INITIAL TESTS

A. Purpose – These tests are to ensure that the AV system is installed and functioning as specified, and to ensure the system is ready for Final Tests and Adjustments (described later).

B. Testing Standards – Perform testing in accordance with ANSI standards.

C. Inspection - Verify prior to beginning actual tests and adjustments on systems:

1. Proper grounding of all electronic components (through third prong of power connector or separate connection between component chassis and ground bus bar).

2. Cables dressed, routed, and labeled, connected with proper polarity.

3. Insulation and shrink tubing in place.

4. Dust, debris, solder splatter, etc. removed.

5. Proper frequency settings (or modules) at crossovers and controllers.

6. All equalizer bands and tone controls set for flat frequency response.

7. Survey temperatures of each piece of equipment after four (4) hours use (minimum). Note and report any hot equipment.

D. Electrical Power Quality - While all sound and AV system components are unplugged from electrical power outlets, AV Contractor shall turn on power to outlets, and confirm proper voltages at each outlet across the following pairs of terminals: hot and neutral, hot and ground, and neutral and ground (zero volts across neutral and ground). AV Contractor to document measurements.
E. General Function Tests - Test each piece of equipment to ensure that it performs its intended function. Include all portable equipment in tests. Intent of initial tests is to verify complete, functioning system before Final Tests and Adjustments. Correct problems found during initial testing before beginning Final Tests and Adjustments. Document whether all pieces performed intended functions; note any unresolved malfunctions.

F. Initial Tests and Adjustments Data - Submit written report of Initial Tests and Adjustments data upon completion to Owner. Include printed name(s) of technician(s) performing tests, date(s) and time(s) of tests, model and serial numbers of test equipment, results of each initial test, descriptions of problems encountered and their solutions, and statement that system is ready for Final Tests and Adjustments. Initial Tests and Adjustments Data to include signatures of technician(s) performing tests.

1.5. FINAL TESTS AND ADJUSTMENTS

A. Purpose – These tests are to be witnessed by AV Consultant to determine if system is complete and functioning as designed and specified. Also, AV Consultant will perform listening and viewing tests and witness adjustments of all images for optimum clarity.

B. Timetable - Coordinate with Owner, General Contractor, and AV Consultant to schedule Final Tests and Adjustments after submittal of Initial Tests and Adjustments data.

C. System and Site Conditions – AV Consultant will witness Final Tests and Adjustments. Have systems fully functional and ready for observation and testing upon AV Consultant’s arrival. Coordinate with all trades for quiet conditions throughout the listening areas and for the duration of the test schedule. If upon AV Consultant’s arrival, systems do not meet criteria, site is not sufficiently quiet, or if Owner or AV Consultant is required to make additional trips to job site to witness additional testing or perform additional reviews of installed equipment, Contractor shall reimburse Owner for labor and expenses incurred by having incurred costs deducted from payments to contractor.

D. Test Labor - Provide technician familiar with this project’s AV systems and operation of test equipment to perform testing. Provide additional technician to assist in the tests and to perform troubleshooting, repairs, and adjustments. Include labor for these technicians to be present for one (1), eight (8)-hour day during Final Tests and Adjustments.

E. Tools - Provide standard hand tools including screwdrivers, pliers, wire strippers, nut drivers, soldering iron, and other tools appropriate for troubleshooting system problems.

F. Ladders and Scaffolds - Provide ladders and scaffolds to inspect/adjust loudspeakers and rigging points.

G. Verification of Initial Tests and Adjustments - Verify that Initial Tests and Adjustments have been performed and meet criteria. During Final Tests and Adjustments, AV Consultant may require portions of the Initial Tests and Adjustments to be repeated. Repeat measurements as requested without claim for additional payment.

1.6. FINAL ACCEPTANCE BY OWNER

A. Certificate – Submit Certificate of Final Acceptance form signed by Owner verifying complete installation and proper operation of systems upon fulfillment of all requirements and upon recommendation by Owner.

B. General Adjustments – Adjust, balance, and align equipment for optimum quality, meeting manufacturers published specifications.

C. Input/Output Jack Demonstration – Demonstrate proper performance and phase of each system input and output jack (all audio input and output jacks) as received at AV and network systems.

D. Inventory – Inventory all installed and portable equipment for correct quantities.
E. Functional Demonstration – Demonstrate operation of each function of each major piece of equipment.

F. Other Tests - Perform any other tests on any part of the AV system as requested by Owner.

G. Final Equipment Settings – Record final settings of all equalizer bands, tone controls, filters, delays, limiters, etc., including those established through computer software settings. Include descriptions of settings (including software settings) in Operation and Maintenance Manual. Include software copy of configuration file(s) in Operation and Maintenance Manual.

H. Security Inspection – Inspect equipment for security from tampering (covers, shaft-locks, etc.).

I. Review of Labels – Review installed labels on cables, equipment, controls, and terminal strips.

1.7. OWNER TRAINING

A. Provide Owner training as described in General Conditions. As a minimum, provide twelve (12) hours instruction (within four (4) trips to site) regarding AV Systems operation to Owner-designated personnel. Schedule instruction time(s) with Owner to occur after completion of Final Tests and Adjustments. Coordinate with Owner in advance to schedule instruction time. Document date, time, and attendees of the training session and include documentation in Operation and Maintenance Manuals to serve as record of trained personnel.

1.8. SUPPORT DURING OWNER’S FIRST USE OF COMPLETED SYSTEM

A. Provide personnel familiar with design, installation, and operation of each system to be present at Owner’s first use of each completed system (up to six (6) hours total in two sessions). During first use of each system, respond to Owner requests for troubleshooting, adjustments, and additional training. If no one contractor employee or representative can provide expertise in all aspects of the system, provide multiple personnel for the six (6) hours per session as required. Schedule presence of personnel in advance with Owner. Should significant elements of the new system be operational prior to final completion, Owner may elect to schedule contractor presence for Owner function prior to final completion of system. Should Owner exercise this option, contractor presence will not be required at first use following final completion.

END OF SECTION 27 41 16