Froedtert & Medical College of Wisconsin
Milwaukee, Wisconsin

PROJECT MANUAL
Volume 1 of 2

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Master Specifications Version 7
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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for the performance of each component of the building enclosure in addition to those specified in the related specification sections.

B. Related Sections:
   1. Section 072100 Thermal Insulation
   2. Section 074213.13 Formed Metal Wall Panels
   3. Section 074243 Composite Wall Panels
   4. Section 075423 Thermoplastic Polyolefin (TPO) Roofing
   5. Section 076200 Sheet Metal Flashing and Trim
   6. Section 077110 Roof Specialties
   7. Section 077200 Roof Accessories
   8. Section 078100 Applied Fireproofing
   9. Section 078446 Fire Resistive Joint Systems
   10. Section 079200 Joint Sealants
   11. Section 084413 Glazed Aluminum Curtain Wall
   12. Section 088000 Glazing
   13. Section 089119 Fixed Louvers
   14. Section 092400 Portland Cement Plaster

C. Description:
   1. The Drawings establish the design concept for each component of the building enclosure by means of the dimensions of individual units, members, or other components; the individual units, members, or other components; the arrangement and/or alignment of individual or groups of units, members or other components; and the sight lines, however established. Details indicated are not all-inclusive. Within these parameters, the contractor is responsible for the design and engineering of the system, including all modifications and additions that may be required to meet the specified requirements and maintain the design concept for the entire project. Additional details as are necessary and reasonably inferable from the details shown and the materials and performance criteria specified shall be the responsibility of the Building Enclosure System Contractors.
   2. Additional details required to complete the engineering, shop drawings, fabrication or installation of any component of the building enclosure shall be done by the party engineering the component.
   3. The design concept is not to be modified, except as can be conclusively demonstrated to be necessary to meet the specified performance criteria and allow for the effective integration of each component that, together, constitute the building enclosure system. Necessary modifications are to be presented to the Architect with complete explanatory data for review prior to submission of bids.

D. Exterior Wall Design Requirements:
   1. The design of all curtain wall components shall meet the minimum requirements of AAMA CW-DG-1, Aluminum Curtain Wall Design Guide Manual.
      a. Metal-to-metal jointery without the inclusion of a solid or closed cell elastomer, shall not be considered a watertight (face) seal.
b. Minimal dependence shall be placed on sealants and caulking materials. Weeps and gutters shall be provided to drain to the outside any condensation and water, which may enter the pressure equalization chambers.

c. All components shall be selected and engineered to withstand applied wind pressures in accordance with sound and accepted engineering practice.

d. Where possible and practical, sealants employed as air seals shall be located so as to be accessible and maintainable, through the employment of sill covers and removable trim.

e. System shall employ concealed weeps or drainage holes, baffled to prevent percolation.

2. Thermal Insulation System: Provide continuous thermal insulation system, as specified in Division 07, uninterrupted except as indicated, meeting performance requirements specified in this Section and applicable individual sections, and documented by tests and inspections specified in this Section.

3. Air and Water Barrier System: Provide continuous, connected air and water barrier system consisting of components specified in other Sections, uninterrupted except as indicated and meeting performance requirements specified in this Section and applicable individual Sections, resulting in overall building performance meeting performance requirements specified in this Section.

a. Provide exterior enclosure with air barrier that performs as a continuous air barrier and as a liquid-water drainage plane flashed to discharge incidental condensation or water penetration to the exterior.

1) Provide air barrier assemblies capable of accommodating substrate movement and sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and without air leakage exceeding specified limits.

b. Supplement air barrier system components shown on Drawings and as required to provide a complete air barrier system.

1) Structurally support air barrier system to withstand positive and negative air pressures applied to building enclosure.

2) Make connection between:

   a) Foundation and walls, including penetrations, ties and anchors.
   b) Walls, windows, curtain walls, storefronts, louvers and doors.
   c) Different wall assemblies, and fixed openings with those assemblies.
   d) Wall and roof connections.
   e) Wall and roof over unconditioned space.
   f) Walls, floor and roof across construction, control and expansion joints.
   g) Walls, floor and roof to utility, pipe and duct penetrations.
   h) Floor over unconditioned space.
   i) Juncures, abutment, and connections or overlaying with air barrier materials by different manufacturers.
   j) Expansion joints.

3) Make penetrations of air barrier and pathways of air infiltration/exfiltration airtight with the following properties:

   a) Air Penetrations: 0.004 cubic feet per minute per square foot under a pressure differential of 0.3-inch water gauge (1.57 pounds per square foot) when tested according to ASTM E2178 for Type I air barrier per
ASTM E1677 and tested as required under applicable Division 07 Section.

b) Water Vapor Transmission: 13 perms or less when tested according to ASTM E96/E96M, Method B.

c) Surface Burning Characteristics: Class A when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.

E. Perimeter Fire Containment System:

1. A complete fire containment system shall be provided along the perimeter. Perimeter Fire Containment System shall prevent fire from spreading from floor to floor, contract documents and per the requirements of the UL listing for each condition. Contractor shall be responsible for coordinating all conditions with the appropriate containment assembly.

1.2 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct a preinstallation conference at Project site before building enclosure work.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration of the building enclosure, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review coordination of construction activities and preparations for the building enclosure, including requirements for the following:
   a. Coordinated Submittals.
   b. Possible conflicts.
   c. Warranty requirements.
   d. Compatibility of materials.
   e. Verification of Field Test Schedule
   f. Testing and inspecting requirements.
   g. Coordination with other work.
   h. Required performance results.

3. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

4. Do not proceed with building enclosure installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.3 QUALITY ASSURANCE

A. Design Professional

1. Each component of the building enclosure shall be designed by a Wisconsin Registered Structural Engineer in accordance with the engineering design requirements of this Section and the specifications for said component.

2. Every submittal shall bear the stamp of the design engineer.

B. The Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the design professional services. The Architect will review submittals only for the limited purpose of checking for conformance with the design concept expressed in the Drawings and shall not be responsible for the adequacy of the performance or design criteria required of the Contract Documents.

C. Building Enclosure Coordinator: Provide an experienced coordinator to oversee installation of building enclosure products who has completed building enclosure Work installations similar in
material, design, and extent to that indicated for Project, and whose work has resulted in construction with a record of successful in-service performance, and meeting the following requirements:

1. Minimum of three years’ experience installing similar Work or equivalent, and minimum one year supervisory experience, able to communicate verbally with Contractor, Architect, and installers of building enclosure Work.

D. Building Enclosure Coordinator Responsibilities:

1. Preinstallation conferences for building enclosure Work.
2. Notifications: Prepare memoranda for distribution to each party involved with building enclosure work, outlining special procedures required for coordination of building enclosure Work. Include such items as required notices, reports, and attendance at meetings.
3. Coordinate scheduling of building enclosure work to enable testing and inspection prior to concealing Work.
   a. Notify Architect when testing is scheduled; Architect reserves the right to attend the testing and inspection.
4. Preparation of building enclosure Work subschedule for Contractor's Construction Schedule.
5. Coordinate submittals process for building enclosure work. Approve building enclosure submittals.
6. Coordinate exchange of data for loading and anchorage data, to professional engineers engaged in delegated design responsibilities for building enclosure.
8. Coordinate installation of building enclosure products.
9. Supervise field quality-control services for building enclosure work identified as the responsibility of the Contractor.
10. Expedite testing and minimize unnecessary delays, while not compromising integrity of tests; do not overlook deficient work or loosen acceptance criteria to satisfy scheduling or cost issues unless directed to do so by the Owner.
11. Project closeout activities for building enclosure Work.

E. Air Tightness Testing Agency Qualifications: Third-party testing firm with minimum 2 years’ experience in air tightness testing and analysis, and minimum of 3 successful projects of similar type and scope in previous 3 years, using specified testing standard, and employing qualified test technicians.

1. Air Tightness Test Technician Qualifications: Minimum 2 years’ experience in air tightness testing using specified testing standard and equipment.

F. Thermography Testing Agency Qualifications - Deficiencies’ Analysis: Same firm providing building airtightness testing for the Project, capable of coordinating testing procedures, analysis, recommendations, and reporting, minimum 2 years’ experience in thermographic testing and analysis, and minimum of 3 successful projects of similar type and scope in previous 3 years using specified testing standard and employing qualified test technicians.

1. Thermography Test Technician Qualifications: Minimum Level II Certified Infrared Thermographer with 2 years’ experience in thermographic testing using specified testing standard and equipment.

G. Codes and Standards:

1. Regulations: Conform in requirements of the International Building Code, NFPA, and Americans with Disabilities Act. Comply with the building code or where required by this
specification, exceed the code. Nothing in this specification shall be construed as allowing or requiring noncompliance with the code.

2. Reference Codes, Specifications and Standards: Conform with the requirements of applicable portions of the following reference codes, specifications and standards:

c. “Metal Curtain Wall Manual”, published by AAMA.
d. “Aluminum Standards and Data”, as published by the Aluminum Association.
f. “Specifications for Aluminum Structures” by The Aluminum Association for design of aluminum components.
   1) ACWS Vol. 11: Design Wind Loads for Buildings and Boundary Layer Wind Tunnel Testing.
   2) ACWS Vol. 12: Structural Properties of glass.
h. Metal Finishes Manual as published by NAAMM.
i. “Manual of Steel Construction” by AISC, for design of steel components.
j. Welding shall be in accordance with American Welding Society “Structural Welding Code”.
l. AISI Specification for the Design of Cold Formed Steel Structural Members.
m. AISI Stainless Steel Cold-Formed Structural Design Manual.

o. AAMA 800 “Voluntary Specifications and Test Methods for Sealants.”
s. “Specifications for Architectural Granite, National Building Granite Quarries Association, Inc.”
t. AAMA 501-83 for Metal Curtain Walls.
   1) AA “Specifications for Aluminum Sheet Metal Work in Building Construction”
   2) AA “Drafting Standards for Aluminum Extruded and Tubular Products”
   3) Aluminum Association Aluminum Standards and Data current edition
   4) GSA Specification TT-P-645 for alkyd Type Zinc Chromate Primer Paint
   5) AAMA 605.2-92 Specification for High Performance Organic Coatings
   6) AAMA 607.1-1977 Specification for Clear Anodic Finishes
   7) ASTM standards referenced herein; unless otherwise specified, the current revisions of standards are applicable
   8) OSHA instruction STD 1-3.3 as amended November 12, 1985 regarding scaffold tiebacks
1.4 ACTION SUBMITTALS

A. Submittals Procedures for Building Enclosure Work:
   1. Refer to individual specification sections for submittals applicable to specific Sections.
   2. Assemble submittals for exterior enclosure assembly, in single consolidated package in accordance with requirements specified in Division 01 Section “Submittal Procedures;” refer to Coordination paragraph of this Section for additional requirements.
   3. Include informational submittals for delegated design of cold-formed metal envelope wall framing and secondary framing systems required for enclosure.
   4. Individual submittals will be returned without review or held by the Architect until wall assembly submittals are deemed complete.

1.5 INFORMATIONAL SUBMITTALS

A. Product List: Indicate products of separate manufacturers that will be in contact with one another. Submit individual manufacturers’ certificates indicating products as proposed are compatible.

B. Contractor and Installer Certifications: Provide a letter, signed by the Contractor and building enclosure subcontractors stating that each acknowledges in writing that the Owner regards the new building enclosure to be an important and performance-sensitive single element of the Project. Acknowledge that the Contractor and building enclosure subcontractors are solely responsible for the quality and coordination of building enclosure materials, components and systems such that the materials, components, and systems result in a fully integrated, weather-tight building enclosure that is in compliance with the Construction Documents.

C. Submit Statement of Application from sealant manufacturer for sealant conditions shown in each package of submitted shop drawings. Statement of Application to address:
   1. Compatibility of sealants with substrate indicated.
   2. Capacity of sealant to perform in range of joint moment and combination of joint movements shown.
   3. Need for primers and cleaners.

1.6 FIELD CONDITIONS

A. Perform testing under conditions stipulated in test standards, instrument manufacturer's instructions, and as required by this Section.

B. Thermography Test - Deficiencies’ Analysis: Perform testing on dry building surfaces after sunset and prior to sunrise under following environmental conditions:
   1. Windspeed: Not greater than 15 mph.
   2. Outside Air Temperature: At level to present differential with building interior temperature of 18 deg F minimum, for minimum of 4 hours prior to test, and not varying more than 30 percent during duration of testing.
   3. Indoor Air Temperature: At constant temperature varying not more than 4 deg. F.
   4. Direct Solar Exposure of Surfaces: No direct solar radiation on inspected surfaces during and for minimum 4 hours prior to inspection for frame construction, 8 hours for masonry veneer construction, at acceptable outside air temperature.
1.7 PERFORMANCE CRITERIA

A. Structural Frame Tolerances and Deflections: All designed and detailed parts of each building enclosure system component to allow for their proper attachment to the structural frame of the building taking into account the fabrication and erection tolerances allowed for the elements of the frame and all predictable structural deflection.

1. Allowable, structural fabrication and erection tolerances: Refer to Division 3 – Concrete, and Division 5 – Metals.
2. Maximum design criteria for predictable vertical structural deflections for the elements of the structural frame.
   a. Typical Floor Areas: Superimposed load midspan vertical deflection limits between any two columns on the edge of any floor: \( L/360 \), where \( L \) is the column spacing or \( 3/8" \), whichever is smaller.
3. Maximum design criteria for horizontal building movement (interstory drift) at any floor: \( H/400 \); where \( H \) is the floor-to-floor height at that floor.
5. Anticipated column shortening: 1/8" per 10 feet of column height.

B. Structural Frame Provisions for Loads from the Building Enclosure System:

1. Structural frame of the building is designed to provide the main wind force resisting system for the building.
2. Members of the building structural system are designed to carry loads transferred from the building enclosure system as follows:
   a. Each perimeter column is designed to carry all wind loads applied in their vicinity, and the building enclosure system dead loads as indicated on the drawings.
   b. Each perimeter beam is designed to carry the Building Enclosure System as indicated on the drawings.
   c. Perimeter beams are not designed to resist any lateral forces applied to their webs or bottom flanges at any point. Except where spandrel beam braces are located
   d. Perimeter girders are not designed to resist any lateral forces applied to their webs or bottom flanges at any point except where supported beams frame into them.

C. Structural Properties: Design all parts of the building enclosure component for pressures and loads satisfying governing code but not be less than values specified herein. Where permitted by code, the sum of dead load, snow load, and wind or seismic load may be multiplied by a reduction factor not to exceed the reduction factor established within ANSI/ASCE 7. An increase in the allowable stress by any factor shall not be used in conjunction with a reduced load combination factor.

1. Gravity Loads:
   a. Dead Loads: Actual weight of all components and elements of the building enclosure system, and any associated materials.
   b. Live Loads:
      1) Roof Coping: 500 lbs. on three square feet, located anywhere.
      2) Interior Window Sills: 250 lbs. on 72 square inches, located anywhere.
      3) Horizontal Wall System Projections wider than 6": 20 psf maintenance load.
2. Wind Loads: Horizontal design wind pressures.
   a. The minimum design wind pressures shall meet or exceed the requirements of the
      International Building Code.

3. Window Cleaning Equipment Loads:
   a. Building Anchorage: Capable of supporting window cleaning anchor loads applied
      as required by ANSI/ASME A39.1.
   b. Intermittent Stabilization of Window Cleaning Equipment:
      1) Locate anchors in vertical rows with stabilization points at a maximum of every
         third level or 50 feet.
      2) Design each anchor capable of sustaining a maximum load of 600 pounds
         parallel to or perpendicular to the face of the building but not applied
         simultaneously.

4. Thermal Loads: Take into account self-straining forces and effects arising from expansion
   or contraction due to the temperature specified herein.

5. Strength Requirements:
   a. Aluminum and Steel Design: Calculated stresses in aluminum or steel components
      of the building enclosure system shall not exceed the allowable stresses, as defined
      in the governing regulations, when the system is subjected to gravity loads, or to the
      appropriate design wind pressures in combination with gravity loads. Increases in
      allowable stresses for wind load may be taken, so long as loadings of 1.5 times the
      appropriate design wind pressures in combination with gravity loads do not cause
      stresses in excess of the yield or buckling strength of the metal.
   b. Glass Design: Glass thicknesses shown on the Drawings are to facilitate detailing
      only and are to be confirmed by analysis for the loads and conditions of service of
      the installation. All glass units for the various sized openings shall be provided in
      thicknesses and strengths (annealed or heat treated) to meet or exceed the following
      criteria:
      1) The minimum thickness of glass panes in the exterior wall areas shall be 6mm
         (1/4”) and all tinted glass, of the same color, shall be of the same thickness.
      2) All units, whether annealed or heat treated, shall be designed and selected
         such that the probability of breakage in the worst case scenario shall not
         exceed:
         a) 8 lights per 1000 for vertical units under action of wind.
      c. 1 light per 400 over the life of the building for all heat-tREATED units where breakage
         can be traced to inclusions within the glass.
   d. No breakage will be allowed strictly due to the action of thermal stress in the glass.
      1) Glass shall be designed and selected based on the action of the appropriate
         wind, snow and temperature requirements specified within this section, for the
         following load durations:
         a) Wind Load: 10 seconds.
      2) In no case shall glass be considered to provide lateral support to metal
         framing members.
         a) Specific locations for the use of tempered glass on the Project are
            subject to review with the Architect prior to acceptance.
6. Thermal Break Criteria: All curtainwall and window unit components are to be thermally broken to meet requirements of 1.04 (I) “Condensation Resistance” within this specification. Thermal breaks to be designed per AAMA TIR-A8-90.

D. Joint Design:
1. Provide movable joints to accommodate the full range of manufacturing tolerance, thermal movement, floor, beam deflection and column settlement and to accommodate the worst possible combination of effects to prevent internal stress, oil canning, failure, deterioration or failure of weather seals.
2. Adequate accommodations such as sleeving should be made during detailing to allow for alignment from piece to piece with internal sleeves conceal unfinished metal edges with end caps.

E. Stiffness Requirements:
1. Aluminum and Steel: The maximum allowable deflections of the members under the action of gravity load or design wind pressures combined with appropriate gravity loads and thermal effects shall be as follows:
   b. 0.125” in the plane of the wall; except 0.250” at corner mullions.
   c. The influence of glass, sealants, or interior finishes on stiffness, when it reduces deflection, shall not be considered.
   d. Compliance with these provisions shall be verifiable by the test methods of ASTM 330.
2. Glass: Glass center deflection, relative to glass edges, at 50 percent of the appropriate design wind load, shall not exceed one (1) inch. Glass deflection at 1.5 times the appropriate design wind load shall be limited to prevent glass disengagement from the frame.

F. Air Infiltration:
1. Design each component of the building enclosure system to prevent air infiltration through the wall in excess of the following: 0.06 cubic feet per minute per square foot of fixed wall area when tested in accordance with ASTM E 283, with a differential static pressure of 6.24 psf.

G. Water Penetration: Design each component of the building enclosure system to prevent water penetration as verifiable by the test methods of ASTM E-331 (static pressure method) and AAMA 501.1 (dynamic pressure method) with a differential static pressure of 12.0 psf and a total time of 15 minutes.
   1. Water penetration shall be as defined as the appearance of water other than condensation, on any interior surface of the building enclosure systems.

H. Animal Nuisance Control: Design each component of the building enclosure system to inhibit the unintended entry, to the building interior through the cavity system itself insects and/or small animals, which would constitute a nuisance by their presence.

I. Condensation Resistance: Design, fabricate, assemble and erect the enclosure systems for the Project to provide the following condensation resistance:
   1. General Condition: No uncontrolled nor visible condensation shall form on any interior metal surface when the exterior temperature is -10 deg. F. with a 15 mph wind and the interior conditions are 72 deg. F. at a relative humidity of 30%.
   2. Special Conditions: No uncontrolled nor visible condensation shall form on any interior metal surface as a result of the interior conditions indicated on the Mechanical Piping
1.8 CONNECTIONS AND ATTACHMENTS REQUIREMENTS:

A. General: Design and detail connections and attachments to provide all resistance to forces and effects considered in their design. Prevent friction between connected materials from inducing unanticipated restraint by the use of appropriate friction-inhibiting detailing.

B. Gravity Load Connections: Design gravity load connections to rely on friction between connected materials induced by bolt tension to transfer gravity loads at vertical slots.

C. Wind or Thermal Connections: Provide wind or thermal connections with slotted or oversized holes or other approved means of non-restraint. Where sliding friction or mechanical interlock could inhibit the relative movements of joined materials, provide appropriately designed slide plates, such as high durometer plastic, Korolath, or Teflon coated material.

D. Snow Loads: Provide snow clips on the entire perimeter of the building where copings, sills ledges, mullions or any projection is greater than 4”.

E. Fasteners:

1. As a minimum, conform to the requirements of the following standards:
   a. AISC Steel Construction Manual, for carbon steel bolts and screws.
   b. AISI Stainless Steel Cold Formed Structural Design Manual, for stainless steel bolts and screws.
   c. ICBO Standards for fasteners in drilled holes into concrete or concrete masonry.
   d. Aluminum Association Specifications for Aluminum Structures, for aluminum fasteners.
   e. Local code and governing authorities.

2. Design fasteners to prevent loosening under all service conditions. “Lockable” fasteners must have a demonstrable and successful history of use. Provide lock nuts where fastener sizes allow.

F. Provisions for Thermal Movements: Design and fabricate each component of the building enclosure system to allow for noiseless thermal expansion and contraction caused by an ambient air temperature range of 130 °F -30 °F low, 70 °F nominal and 110 °F high for unrestrained members and to provide appropriate anchoring for restrained members, without causing buckling, opening of joints, cracking of welds, undue stresses on anchors, fasteners, structure of joining elements, or other detrimental effects. Anticipated material surface temperatures, due to solar heat gain, or night sky heat loss, shall be evaluated.

1. The above exterior thermal range shall be analyzed with the assumption of an interior temperature range of 45 °F to 100 °F.
2. Parking Garage is not to be considered an interior space; however, the stairs and elevator areas within the garage are to be considered interior space.
1.9 PERFORMANCE VERIFICATION MOCK-UP/TESTING:

A. Provide all labor, materials, equipment and services required to install and test a full size mock-up of the wall system at either one of the following locations:

1. At the facilities of the selected window wall manufacturer and witnessed by a recognized testing agency.
2. At the laboratory facilities of a recognized testing agency.
3. Acceptable Testing Agencies:
   a. Construction Research Laboratory, Inc.
      7600 N.W. 79th Avenue; Miami, Florida 33166
   b. Mid America Testing Laboratory, Inc.
      10525 Signal Hill Drive; Catawissa, Missouri 63015
   c. Architectural Testing, Inc.
      130 Derry Court, York, PA 17402
   d. Quast Consulting and Testing
      1055 Indianhead Drive, Mosinee WI 54455

B. Mock-up shall include the furnishing and installing of all system components, including aluminum and glass window system, insulation, flashing, glazing, gypsum board, and sealants as specified.

C. Provide all necessary material within the test cell to suitably simulate the building structure to which the mock-up is to be attached. Make all necessary corrections and provide for retesting until successful completion of the entire test procedure.

1. It is the intent of the Owner and Architect that the erection of the mock-up be conducted by or supervised by the Project erection supervisory personnel.
   a. Details of construction of the necessary materials within the test cell to suitably simulate the structure to which the wall system mock-up is to attach shall be established by the System Subcontractor in consultation with the Testing Agency to assure the suitability of the mock-up installation for the required testing program.
   b. Details of mock-up construction, including joints and connections with other parts of the structure, and methods of glazing shall be as established by the System Subcontractor to provide a system which meets all the design criteria while strictly following the visual design concept illustrated on the Drawings. The mock-up shall be clearly and completely defined by a set of shop drawings that have been submitted to and reviewed by the Architect.

D. Design Review of Mock-up: Upon completion of the erection of the mock-up, and prior to the commencement of any pre-testing, it shall be reviewed by representatives of the Owner and Architect. This review shall be for general compliance with the visual design concepts of the window and precast concrete systems. When all questions of compliance with the visual design concepts have been satisfactorily answered, and the answers acknowledged, the testing procedure shall begin.

E. Prior to the commencing of testing, the Testing Agency shall submit for review a detailed statement of the procedures and sequence of testing, the testing methods to be employed, the test loads, pressures, temperatures, etc. for each test, and the design performance requirements for each test. The Testing Laboratory shall submit a manual describing the intended procedures and evaluating methods. After review of the procedures by the Architect a copy will be submitted to the Contractor for information.
All testing shall be conducted by Testing Agency Technicians, and shall be witnessed by representatives of the Owner, Window System Subcontractor, General Contractor, Architect, and manufacturers of major components of the system as shall be agreed by Architect, General Contractor and Wall Subcontractor.

1. Pretests: Contractor shall not pretest mock-up without prior permission from the Architect and General Contractor. If permission is granted, pretesting shall only be performed in the presence of the Architect’s representative.

G. The Testing Agency shall be responsible for conducting and interpreting the tests and shall state in each report whether or not the test specimens conform to or deviate from the overall performance requirements of the Contract Documents. In addition to the specific test information required under the various testing procedures, the report shall also list any deficiencies in the system disclosed by any of the tests.

H. Tests shall be performed in the following sequences and as specified:

1. Glass Re-Glazing: Remove one vision unit and one spandrel unit; and re-glaze from outside the chamber only.
2. Demonstration of Gutter Action: Where window head sections or precast concrete surfaces are designed to perform as gutters to collect water infiltration and condensation perform the following test:
   a. Pour one pint of water into window head and/or precast gutter. Observe for weepage to exterior.
3. Static Pressure Test for Air Infiltration: Perform static pressure test for air in accordance with ASTM E 283.
4. Static Pressure Test for Water Infiltration: Perform static pressure test for water in accordance with ASTM E 331. Perform dynamic pressure test for water in accordance with AAMA 501.1.
5. Dynamic Pressure Test for Water Infiltration: No visible water infiltration shall occur when the mock-up is tested in accordance with AAMA 501.1
6. Test for Structural Performance: Deflections shall not exceed the allowable maximum, when tested in accordance with ASTM E 330. Load the mock-up with positive pressure in steps to the maximum positive design wind load, recording deflections and permanent sets, in accordance with procedures established by the Architect and Testing Agency. Next load the mock-up with negative pressure in steps to the maximum negative design wind load, again recording deflections and permanent sets as required.
7. Test for Structural Performance of Tie-Back Anchor for both precast and window wall: No distress, distortion of components, permanent set, etc. of the tie -back anchor or to the element it is attached to, or to any other wall system component, when tested as follows:
   a. 600 pound force tension
   b. 600 pound force shear, in a direction as recommended by the Testing Agency.
   c. 600 pound force combined shear and tension, in a direction as recommended by the Testing Agency.
   d. Hold load for 10 seconds.
8. Static Pressure Re-Test for Air Infiltration (After Structural): Same criteria as for test in Paragraph I.3. If the results of this test of the mock-up are not satisfactory, suitable repairs or revisions shall be made. Prior to re-testing, the above “Test for Structural Performance” (I.5) shall be redone, but deflections shall only be recorded if, in the opinion of the Testing Agency Technicians, the repairs or revisions made warrant that action.
9. Static Pressure Re-Test for Water Leakage (After Structural): Same criteria as for test in Paragraph I.4. If the results of this test of the mock-up are not satisfactory, suitable repairs
or revisions shall be made. Prior to re-testing, the above “Test for Structural Performance” (I.5.) shall be redone, but deflections shall only be recorded if, in the opinion of the Testing Agency Technicians, the repairs or revisions made warrant that action.

10. Condensation Resistance: Perform condensation resistance testing in accordance with AAMA 1503

11. Static Pressure Test for Air Infiltration (After Thermal): Same criteria as for test in Paragraph I.4. If excessive leakage occurs, evaluation of the problem shall be undertaken by the Testing Agency, and a suitable course of action developed, with the agreement of the Owner and Architect.

12. Static Pressure Test for Water Infiltration (After Thermal): Same criteria as for test in Paragraph I.5. If leakage occurs, evaluation of the problem shall be undertaken by the Testing Agency, and a suitable course of action developed, with the agreement of the Owner and Architect.

   a. A suitable course of action may include a repeat of the thermal cycling test.

13. Supplementary Load Test for Structural Performances: No metal failure, gasket dislodgment, glass breakage, or disengagement from frame nor permanent set of metal in excess of L/1000, when the wall is tested in accordance with ASTM E 330, and as follows:

   a. Load the mock-up with positive pressure in steps to 1.5 times the maximum positive design load, recording deflections and permanent sets in accordance with procedures established by the Architect/Testing Agency.

   b. Load the mock-up with negative pressure in steps to 1.5 times the maximum negative design load, recording deflections in permanent sets in accordance with previously established procedures.

I. If, at any time during the testing, the test results indicate that the system(s) as represented by the test sections, does not meet the specified performance criteria, the Subcontractor shall make all necessary corrections subject to the Architect’s review, and retest until successful completion at his own expense.

1. Corrections required to be made in the mock-ups shall be incorporated into the Building Enclosure Systems at no additional cost to the Owner.

2. Modifications must be realistic in terms of Project Conditions, maintaining standards of quality and durability, and are subject to approval.

J. Provide at least one (1) extra light of glass for each type and size on the mock-up. Glass which breaks during testing shall be replaced with new glass, and the tests shall be continued. Repeated glass breakage shall constitute failure.

K. Immediately following successful completion of the testing of the proposed window system, the Testing Agency shall prepare the required Testing Report and submit it to the Subcontractor with copies to Architect, General Contractor and Owner. At the same time, the Subcontractor shall revise the Engineering-Design Drawings and Analysis, and shop drawings to incorporate all changes required during the testing or because of the results of the testing, and re-submit them to the Architect for final review. The project shop drawings shall be based upon the revised engineering and mock-up drawings. Any detailing and/or fabrication accomplished prior to final revision and review of the mock-up drawings will be at the Subcontractor’s risk.

1.10 FIELD MOCK-UPS/FIELD TESTING:

A. Testing Agency: All field testing shall be under the direction of the Contractor’s Testing Agency. All testing shall be conducted by Testing Agency technicians, and test reports shall be prepared indicating the circumstances surrounding the testing, the procedure followed, the results obtained, and conclusions appropriate to those results.
B. Field Mock-Ups: Prior to general installation of the work, representative portions of the work shall be erected on the building, in areas designated by the Contractor with the Architect’s concurrence, field mock-ups will be reviewed for design intent, workmanship, and coordination of the interfacing details with other trades.

1. It is anticipated that five (5) such representative portions will be required to be erected and reviewed. Reference drawings for locations.
2. Each erected and reviewed portion of the work shall be retained as the standard for judging similar completed work.

C. Field Testing

1. In the presence of representatives of Owner, Architect, Contractor, Installer and Manufacturers, the Testing Agency shall conduct field tests of installed portions of building enclosure in accordance with methods described in ASTM E 783.

2. Airtightness Testing: Owner's Testing Agency will perform the following tests:
   a. Air-Leakage-Location Testing: Test air-barrier assemblies for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   b. Adhesion Testing: Test air-barrier assemblies by ABAA auditor for required adhesion to substrate according to ASTM D 4541 for each 600 square feet of installed air barrier.

3. Thermography Testing - Deficiencies' Analysis: Owner's Testing Agency will perform thermography testing in accordance with ASTM C 1060, instrument manufacturer's instructions, and the following:
   a. Supplement thermography test of roof conditions with requirements of ASTM C 1153 as applicable.
   b. Perform thermographic testing in coordination with building airtightness testing.
   c. Reporting: Report results of testing in accordance with cited test standards. Include thermograms (images) and key drawings of building surfaces. Indicate missing insulation, defective insulation, and other anomalies. Provide written interpretation of thermal images.

4. Schedule of Testing: Perform tests at times and/or quantities, as indicated above, and within Field Quality Control Testing Schedule at end of this Section.
   a. Retest locations found deficient by testing.
   b. When a deficiency is discovered at a location type listed in Field Quality Testing Schedule, perform additional tests in amount equal to half of testing specified in Field Quality Testing Schedule at Contractor’s expense.
      1) Perform additional prescribed single test at an additional location.
3.2 PREPARATION
   A. Prepare building envelope in accordance with test standards, instrument manufacturer's instructions, and as required by this Section.

3.3 REPAIR, ADJUSTING AND RETESTING OF WORK
   A. Remedial Work: If the field test reveals leakage, points of entry and paths of entry shall be identified, analyzed, and necessary remedial work shall be established, subject to Architect's review and comment. Repairs and/or modifications shall be made and, after adequate curing of all sealants, re-test to successful conclusion.
   B. Failed materials shall be removed completely, including adjacent materials subjected to damage and reinstalled to meet building enclosure performance requirements.
   C. At the discretion of the Owner and Architect, the test can be expanded to include a different unit that has also been modified or corrected.
   D. Perform re-testing, at Contractor's expense, to verify building with corrections meets performance requirements
   E. All Building enclosure work accomplished prior to the attempted test shall be reviewed for similar leakage and repaired where necessary.

3.4 FIELD TEST SCHEDULE
   A. Number of test locations to be 5% of the total area of system but no less than 1.

<table>
<thead>
<tr>
<th>Location/Test</th>
<th>Testing Standard</th>
<th>Description</th>
<th>Pass/Fail Criteria</th>
<th>Schedule of Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window Systems</td>
<td>ASTM E 783</td>
<td>Field air leakage testing</td>
<td>&lt;0.09 cfm/sq.ft at 6.24 lbf/sq.ft.</td>
<td>Mock-Up, and 90% completion.</td>
</tr>
<tr>
<td>Storefront Systems</td>
<td>ASTM E 783</td>
<td>Field air leakage testing</td>
<td>&lt;0.09 cfm/sq.ft at 6.24 lbf/sq.ft.</td>
<td>Mock-Up and 90% completion.</td>
</tr>
<tr>
<td>Curtain Wall</td>
<td>ASTM E 783</td>
<td>Field air leakage testing</td>
<td>&lt;0.09 cfm/sq.ft at 6.24 lbf/sq.ft.</td>
<td>Mock-Up and 90% completion.</td>
</tr>
<tr>
<td>Metal Panels</td>
<td>ASTM E 783</td>
<td>Field air leakage testing</td>
<td>&lt;0.09 cfm/sq.ft at 6.24 lbf/sq.ft.</td>
<td>Mock-Up and 90% completion.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location/Test</th>
<th>Testing Standard</th>
<th>Description</th>
<th>Schedule of Tests</th>
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<tr>
<td>Curtain Wall and window perimeter sealant tests</td>
<td>ASTM E 1186</td>
<td>Sealant continuity using smoke test</td>
<td>90% completion.</td>
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<tr>
<td>Transitions to adjacent systems, field of air barrier penetrations</td>
<td>ASTM E 1186</td>
<td>Field air leakage tests for air barrier assembly</td>
<td>Mock-up and 50% completion.</td>
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<tr>
<td>Canopy and miscellaneous soffits</td>
<td>ASTM E 1186</td>
<td>Field air leakage tests for air barrier assembly</td>
<td>100% prior to cladding, including cladding attachments</td>
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<tr>
<td>Vertical and horizontal expansion joints, at each transitions / changes in plane in EJ cover</td>
<td>ASTM E 1186</td>
<td>Field air and water leakage tests</td>
<td>Completion of system</td>
</tr>
</tbody>
</table>

END OF SECTION 010110
SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

1.2 DEFINITIONS
A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP
A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS
A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For refrigerant recovery technician.
C. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

SELECTIVE STRUCTURE DEMOLITION

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D. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS
A. Inventory: Submit a list of items that have been removed and salvaged.
B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE
A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS
A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
E. Storage or sale of removed items or materials on-site is not permitted.
F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.
1.9 WARRANTY
   A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.
   B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION
   A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
   B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
   B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
   C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
   D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
   E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
      1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
   F. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
   G. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS
   A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Notify Owner of services/systems requiring shut off at least 72 hours in advance.
2. Obtain approval from Owner before arranging shut off of services/systems.
3. Arrange to shut off indicated utilities with utility companies.
4. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
5. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
6. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

   a. Piping to Be Removed:
      1) Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      2) Remove piping to within 2 feet of nearest active main. Do not abandon in place piping without approval from Owner.

   b. Equipment to Be Removed: Disconnect and cap services and remove equipment.

   c. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

   d. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

   e. Ducts to Be Removed:
      1) Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      2) Remove ducts to nearest active main. Do not abandon in place ducts without approval from Owner.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of Authorities Having Jurisdiction.

D. Electrical Systems Requirements:

1. Remove all electric work presently installed on or in existing walls, ceilings and partitions that are to be demolished. Remove all exposed portions of wiring and raceways.

2. Remove all exposed raceways, exposed and concealed outlet boxes, etc. that are not to be reused where existing walls are to remain. Where new raceways and outlet boxes are shown on existing walls in finished rooms, they shall be installed concealed by cutting and patching method.

3. Reuse existing outlet boxes and raceway systems wherever practical in renovation areas. Install new wiring devices, coverplates, and wiring per applicable specification sections, where such existing outlet boxes are used. Special coverplates may be required to suit conditions.

4. Disconnect and remove, per NEC Articles 770 and 800, exposed feeder, branch circuit, remote control, power limited, non-power limited, and signal line system raceways and their associated circuits and wiring, including wiring for systems and equipment operating at 50 volts or less not installed in raceway rendered inoperable due to removals, relocations and rearrangements. This shall include the complete removal of wiring and cable abandoned by other Divisions, above or below ceilings, as part of this project.
5. Disconnect, remove, rework and otherwise rearrange existing raceways and wiring to accommodate new circuit arrangements indicated and/or required to maintain continuity of existing circuits feeding devices that are to remain.

6. Be responsible for removal and reinstallation of existing electrical equipment to accommodate the work of or disturbed by other trades.

7. In such cases where new circuit breakers or fusible switches are to be added to existing electrical distribution equipment, they shall be of the same manufacturer and design as the existing breakers or fusible switches, except as otherwise noted, and shall be of the sizes as shown on Drawings.
   a. Be responsible for rearranging any and all existing circuit breakers within the existing equipment, to facilitate the installation of new circuit breakers being added. Provide additional bus, bus extensions, bolts and hardware, enclosure modifications, directory modifications, etc., required to accomplish these modifications.
   b. Provide new arc-fault signage per Division 26 Sections "Protective Device Coordination" and "Electrical Identification", where changes to the electrical distribution system alter or change the rating, hazard or safety requirements for the room, space, or area.

8. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide types circuits directory showing revised circuiting arrangement.

3.3 PROTECTION

A. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand
tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain fire watch during and for number of hours required by Owner and Owner’s ILSM requirements after flame-cutting operations.


7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly.
    a. Do not bury waste materials from selective demolition activities.
    b. Do not dispose of waste materials resulting from selective demolition activities into watercourses, storm drainage system, or sanitary sewer system.
    c. Do not discharge water containing suspended materials into watercourses, storm drainage system, sanitary sewers, or onto adjacent property.

11. Ensure selective demolition operations do not adversely affect adjacent watercourse, groundwater or wildlife and do not contribute to air and noise pollution.

12. Cover or dampen dry materials and waste sufficient to prevent blown dust or debris.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
    1. Clean salvaged items.
    2. Pack or crate items after cleaning. Identify contents of containers.
    3. Store items in a secure area until delivery to Owner.
    4. Transport items to Owner’s storage area designated by Owner.
    5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
    1. Clean and repair items to functional condition adequate for intended reuse.
    2. Pack or crate items after cleaning and repairing. Identify contents of containers.
    3. Protect items from damage during transport and storage.
    4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

E. Luminaires:
   1. Disconnect, remove, and store, at the job site, in an indoor dry location, luminaires scheduled for reuse, that have been previously determined to not contain PCB fluorescent ballasts, until such time as they are ready to be reinstalled.
      a. Existing lamps shall not be reused, regardless of whether or not the existing luminaire is scheduled for reuse. Existing lamps shall be legally disposed of, and reused luminaires shall be relamped with new lamps.
   2. Move luminaires that have been previously determined to not contain PCB fluorescent ballasts, and that are scheduled for disconnection and removal, and are not scheduled for reuse or reinstallation, to an on-site location, directed by the Owner. Moved luminaires shall remain the property of the Owner.
      a. Remove lamps from luminaires, and store separately at an on-site location, directed by the Owner.
   3. Remove from the site, and legally dispose of, disconnected and removed luminaires, that have been previously determined to not contain PCB fluorescent ballasts, and that the Owner does not wish to retain.
      a. Remove lamps from luminaires and dispose of separately.
   4. Do not use existing luminaires that have been determined to contain integral or remote mounted PCB fluorescent ballasts, either known, or determined by field survey and investigation.
      a. Disconnect and remove the PCB containing fluorescent ballast(s), if the ballast(s) is not leaking, per the ballast disposal requirements written herein, and replace with a new non-PCB replacement ballast.
      b. Notify the project Owner if the PCB containing ballast is leaking, and proceed no further. The luminaire is considered contaminated and hazardous. Removal of the luminaire shall be the responsibility of the Owner.
   5. Do not remove or re-use existing luminaires installed in project spaces being abated for asbestos. Luminaires installed in project spaces being abated for asbestos shall be considered hazardous material, and as such shall be removed as part of the abatement process.
6. Do not remove existing luminaires installed in suspended, or other false ceiling spaces below known asbestos containing ceiling cavities. Luminaires installed in such ceiling spaces shall be considered hazardous material, and their removal shall be responsibility of the Owner.

F. Lamp Disposal:

1. Fluorescent, mercury vapor, metal halide, high pressure sodium, and neon lamps, contain some amount of the chemical mercury, and as such shall be handled as hazardous waste.
2. Lamp removal and disposal (both mercury containing and low-mercury types) shall be legally disposed of, in accordance with the requirements of the United States Environmental Protection Agency (USEPA) Universal Waste Rule (64 FR 36465-36490), and the state and local level project locale disposal requirements.
3. Remove lamps separately from their respective luminaires, and place (unbroken) into approved, labeled containers.
   a. Containers may be new cardboard boxes with cardboard lamp sleeves, or discarded cardboard boxes from new lamps with the lamp spacers left intact.
4. The total weight for all on-site, project related, disposed lamp containers, cannot exceed 500 lbs. at any one time. The containers shall be removed from the project site, delivered or picked-up by a licensed lamp recycler, and legally disposed of, within 1 year of lamp removal.

G. Fluorescent Lamp Ballast Disposal:

1. Dispose of ballasts identified or labeled "NON-PCB", "NO PCB", or similar marking, (indicating that the ballast does not contain PCB), as ordinary construction waste.
2. Ballasts not identified or labeled "NON-PCB", "NO PCB", or similar marking (indicating that the ballast does not contain PCB), shall be presumed to be PCB containing, and shall be handled as hazardous waste.
3. Remove non-leaking ballasts containing PCB, or presumed to be containing PCB, from their respective luminaires.
   a. Provide protective gloves, eye protection, and protective clothing, for the person(s) removing ballasts.
   b. Place removed ballasts in contractor provided 55 or 30 gallon, US DOT approved, type 17C, or 17H drums (barrels). The quantity and size of the drums shall be determined by the Contractor.
   c. Provide approved PCB absorbent materials placed and stored immediately adjacent to the drum storage area. Do not place loose absorbent material inside the drums.
   d. Label and mark the PCB ballast storage drums with EPA approved PCB labels, and provide the appropriate warning signs, markings, and clearance lines, to meet the federal, state, and local hazardous materials handling regulations.
   e. Place barrels containing removed PCB containing ballasts at an on-site, indoor storage location, sealed with the cover that came with the barrels. Barrels shall not be placed outside exposed to weather.
   f. Provide to the Project representative, in written form, the total count of the ballasts removed (or their total weight by barrel), and where they are stored.
   g. Barrels containing removed PCB ballasts shall not to be removed from the work site by the Contractor. To do so, would be a violation of DOT hazardous waste regulations and may result in a fine. Provide for the services of an authorized hazardous waste hauler to remove and deliver the ballasts to an authorized recycler, or PCB incinerator facility.
4. Do not remove ballasts containing PCB, or presumed to be containing PCB, that are visibly showing signs of leakage (evidenced by potting compound leakage or by an oily film on the ballast surface), from their respective luminaire. The entire luminaire shall be presumed to be contaminated, and shall be handled as a hazardous material.
   a. Notify the project Owner, and proceed no further. Removal of the luminaire shall be the responsibility of the Owner.

H. Wire and Cable:
   1. Disconnect and remove, per NEC Articles 770 and 800, exposed feeder, branch circuit, remote control, power limited, non-power limited, and signal line system raceways and their associated circuits and wiring, including wiring for systems and equipment operating at 50 volts or less not installed in raceway rendered inoperable due to removals, relocations and rearrangements. This shall include the complete removal of wiring and cable abandoned by other Divisions, above or below ceilings, as part of this project.

I. Smoke Detectors:
   1. Remove existing ionization type smoke detectors (that the Owner does not wish to keep) from the project site, delivered to either a licensed and certified recycling provider, or to the original equipment manufacturer, for recycling and their disposal. Landfill disposal or construction waste disposal of ionization type smoke detectors are not permitted.
      a. Dispose of photoelectric type smoke detectors as ordinary waste.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.5 FIELD CONDITIONS
A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 HYDRAULIC CEMENT UNDERLAYMENTS
A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
1. Basis of Design: Subject to compliance with requirements, provide K-15 system by Ardex, or comparable products one of the following:
   a. L&M Construction Chemicals, Inc.
   b. MAPEI Corporation.
3. Compressive Strength: Not less than 5500 psi at 28 days when tested according to ASTM C 109/C 109M.
4. Flexural Strength: Not less than 1200 psi at 28 days when tested according to ASTM C348.
5. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
   a. Provide additive when recommended over metal substrates.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
   1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
   1. VOC Content: Provide primer with VOC content of 200 g/L or less.

E. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
   B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. General: Prepare and clean substrate according to manufacturer's written instructions.
      1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
      2. Fill substrate voids to prevent underlayment from leaking.
   B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
      1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   C. Metal Substrates: Mechanically remove, according to manufacturer's written instructions, rust, foreign matter, and other contaminants that might impair underlayment bond. Apply corrosion-resistant coating compatible with underlayment if recommended in writing by underlayment manufacturer.
   D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.
3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.
   1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
   2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
   3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.
   1. Apply a final layer without aggregate to product surface.
   2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Apply surface sealer at rate recommended by manufacturer.

G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 APPLICATION OF CEMENTITIOUS FLOORING OVER METAL

A. The lead shielding can be placed directly over the concrete using a 100% solids, two-component epoxy adhesive, carefully following the recommendations of the adhesive manufacturer, particularly with regard to application and cure.

B. The lead must be clean, rigid, well supported, properly anchored and free of undue flex and vibration prior to proceeding with this installation.

C. From the lead, remove all dirt, debris and any other contaminants that could act as a bond breaker. Do not use chemicals, including acid etching, sweeping compounds, solvents, vinegar solutions or adhesive removers.
   1. Please be advised that even the finest dust particles will act as bond breakers.
   2. The lead should be handled in accordance with all local, state and federal regulations.
   3. Never sand or otherwise mechanically abrade lead.

D. Thoroughly sweep and deep vacuum the lead to remove all loose material prior to wiping the lead using a clean, white cloth dampened with 91% isopropyl alcohol. Repeat this step until a clean, white cloth exhibits no discoloration.

E. From this point forward, disposable shoe covers or "booties" should be worn by anyone traversing the surface of the prepared lead, including those installers who will be applying the adhesive.

F. Wait 15-20 minutes prior to proceeding to ensure that all residual alcohol has the opportunity to evaporate off the surface of the lead.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMUs).
   2. Mortar and grout materials.
   3. Reinforcement.
      a. Steel reinforcing bars.
      b. Masonry joint reinforcement.
   4. Ties and anchors.
   5. Miscellaneous masonry accessories.
   6. Masonry cell insulation.

B. Products installed but not furnished under this Section:
   1. Steel lintels in unit masonry.
   2. Steel shelf angles for supporting unit masonry.
   3. Cavity wall insulation.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
   2. Integral water repellent used in CMUs.
   3. Cementitious materials. Include name of manufacturer, brand name, and type.
   4. Preblended dry mortar mixes. Include description of type and proportions of ingredients.
   5. Grout mixes. Include description of type and proportions of ingredients.
   6. Reinforcing bars.
   7. Joint reinforcement.
   8. Anchors, ties, and metal accessories.
B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 / C 209M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 / C91M, for grout mixes required to comply with compressive strength requirement.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 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. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 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 and hold cover securely in place.

2. Where 1 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. 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.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
D. **Hot-Weather Requirements**: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

**PART 2 - PRODUCTS**

2.1 **UNIT MASONRY, GENERAL**

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

B. **Defective Units**: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry and will be within 20 feet vertically and horizontally of a walking surface.

C. **Fire-Resistance Ratings**: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to Authorities Having Jurisdiction.

   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 **CONCRETE MASONRY UNITS (CMUS)**

A. **Shapes**: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated:

   1. Provide all special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

   2. Provide square-edged or bullnose units for outside corners, as indicated on Drawings.

B. **Integral Water Repellent**: Provide units made with integral water repellent for exposed units and where indicated.

   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, show no visible water or leaks on the back of test specimen.

      a. **Products**: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

         1) ACM Chemistries; RainBloc.
         2) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
         3) BASF Corporation; Construction Systems; MasterPel 240 (Pre-2014: Rheopel Plus) or MasterPel 200HD (Pre-2014: Rheopel 200HD).

2.3 **MASONRY LINTELS**

A. **Masonry Lintels**: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, 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 MORTAR AND GROUT

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 1.0 percent when tested according to ASTM C 114.

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

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime containing no other ingredients and complying with ASTM C 207, Type S.

D. 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.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ACM Chemistries; RainBloc for Mortar.
      b. BASF Construction Products; Rheopel Mortar Admixture.
      c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

G. Water: Potable.

2.5 REINFORCEMENT

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

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Interior Walls: Hot-dip galvanized, carbon steel.
   2. Exterior Walls: Stainless.
   5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   6. 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 with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
   1. Wire: Fabricate from 1/4-inch-diameter, hot-dip galvanized steel wire.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Concrete or Existing Concrete Masonry Units: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Connector Section - Provide either of the following:
      a. Screw-Attached Masonry-Veneer Anchor for Concrete: Screw with alternating threads, sealing washer and flanged head with eye for wire tie, designed for insertion into concrete in pre-drilled holes. Provide barrel length to match thickness of insulation.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

E. 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.

F. 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.
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 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).
2.8 MASONRY-CELL INSULATION
   A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

2.9 MASONRY CLEANERS
   A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 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 mortar, unless otherwise indicated.
      3. For exterior masonry and reinforced masonry, use portland cement-lime.
      4. For reinforced masonry, use portland cement-lime 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, Proportion 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 N.
      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.
      4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
   D. Grout for Unit Masonry: Comply with ASTM C476.
      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. Minimum compressive strength of grout shall be 3000 pounds per square inch at 28 days of age. Make, cure and determine strength of grout test prisms in accordance with ASTM C1019.
      3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of 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.
4. Verify that substrates are free of substances that impair mortar bond.

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. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

C. 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.

D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements - Maximum Variation:
   1. Dimensions in Cross Section or Elevation: Plus 1/2-inch or minus 1/4-inch.
   2. Location of Elements in Plan - From That Indicated: Plus or minus 1/2-inch or plus 3/4-inch maximum.
   3. Location of Elements in Elevation - From That Indicated: Plus or minus 1/4-inch in a story height or 3/4-inch total.

B. Lines and Levels - Maximum Variation:
   1. Bed Joints and Top Surfaces of Bearing Walls - From Level: 1/4-inch in 10 feet, or 1/2-inch maximum.
   2. Conspicuous Horizontal Lines (such as lintels, sills, parapets, and reveals) From Level: 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
   3. Vertical Lines and Surfaces - From Plumb: 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
   4. Conspicuous Vertical Lines (such as external corners, door jambs, reveals, and expansion and control joints) - From Plumb: 1/8-inch in 10 feet, 1/4-inch in 20 feet, or 1/2-inch maximum.
   5. Lines and Surfaces - From Straight: 1/4-inch in 10 feet, 3/8-inch in 20 feet, or 1/2-inch maximum.
   6. Vertical Alignment of Exposed Head Joints - From Plumb: 1/4-inch in 10 feet, or 1/2-inch maximum.

C. Joints - Maximum Variation:
   1. Bed Joints - From Thickness Indicated: Plus or minus 1/8-inch, with a maximum thickness limited to 1/2-inch.
4. Exposed Head Joints - From Thickness Indicated: Plus or minus 1/8-inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8-inch.
5. Exposed Bed Joints and Head Joints of Stacked Bond - From a Straight Line: 1/16-inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

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

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. 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.

D. 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.

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

F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. 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.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section "Fire-Resistant Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells fully in mortar and make head joints of depth equal to bed joints.
2. Bed webs fully in mortar in grouted masonry, including starting course on footings.
3. Fully bed entire units, including areas under cells, in mortar at starting course on footings where cells are not grouted.
4. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
5. Where hollow units are used to infill openings, remove existing unit and tooth in new units to maintain continuity of coursing.
B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.6 MASONRY-CELL INSULATION

A. Pour loose-fill insulation into cavities to fill void spaces. Maintain inspection ports to show presence of insulation at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of insulation to 1 story in height, but not more than 20 feet.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement where continuous reinforcement is indicated.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel and concrete to comply with the following:
   1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 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 concrete masonry units 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.
3.10 LINTELS
A. Provide masonry lintels where shown and 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.
   1. Provide minimum bearing length of 8 inches at each jamb, unless otherwise indicated.

3.11 REINFORCED UNIT MASONRY INSTALLATION
A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
B. 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/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height, unless otherwise specified.
      a. Limit height of vertical grout pours to not more than 60 inches.
   2. Grout Placement:
      a. Placing Time: Place grout within 1-1/2 hours from introducing water in the mixture and prior to initial set.
      b. Confinement: Confine grout to areas indicated on Drawings using materials the permit bond between unit masonry and mortar.
   3. Consolidation: Consolidate grout at time of placement.
      a. Consolidate grout pours that are 12 inches or less in height by mechanical vibration or puddling.
      b. Consolidate grout pours that exceed 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.

3.12 FIELD QUALITY CONTROL
A. Testing and Inspecting:
   1. Owner will engage qualified, independent special inspectors and testing agency 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. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   2. Place grout only after inspectors have verified proportions of site-prepared grout.
   3. Testing Prior to Construction: One set of tests.
   4. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   5. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   6. Place grout only after inspectors have verified proportions of site-prepared grout.
C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

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. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. 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 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.
   5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.14 MASONRY WASTE DISPOSAL

A. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

END OF SECTION 042000
SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes the following:
      1. Load-bearing wall framing, interior.

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
   B. Shop Drawings: Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   C. Delegated-Design Submittal: For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified Wisconsin Licensed Structural Engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified
   B. Manufacturers' Instructions:
      1. Erection instructions containing sequence of operations and requirements for temporary bracing.
   C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
   B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
      1. AllSteel Products, Inc.
      2. Clark Dietrich Building Systems.
      3. MarinoWare.
      4. SCAFCO Corporation.
5. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 “Quality Requirements” and as follows to design cold-formed steel framing.
   1. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
   2. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

B. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As follows:
      b. Live Loads: As indicated on the drawings.
      c. Wind Loads: As indicated on the drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 1/2 inch.

C. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
   2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

D. AISI Specifications and Standards: Comply with AISI S100 "North American Specification for the Design of Cold-Formed Steel Structural Members" and AISI S200 "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

E. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

F. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3  COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 50 (340), Class 1 or 2.
   2. Coating: G60 (Z180).

2.4  LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.

2.5  FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers, knee braces, and girts.
   9. Joist hangers and end closures.

2.6  ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

COLD-FORMED METAL FRAMING 054000 - 3
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B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel; headless, hooked bolts and carbon-steel nuts; flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035 or ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch-thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine supporting substrates 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 PREPARATION
A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL
A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer’s standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8-inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacing as follows:
   1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
   1. Stud Spacing: As shown on Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

E. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
   1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
   2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

F. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer’s written recommendations and industry standards in each case, considering weight or load resulting from item supported.

G. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.

H. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

I. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

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

B. Field and shop welds will be subject to testing and inspecting.

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

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

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

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer’s written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000
SECTION 054523 - HEALTHCARE METAL SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes the following:
      1. Strut-type steel framing and supports for medical equipment.
   B. Products furnished, but not installed, under this Section include the following:
      1. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
      2. Steel weld plates and angles for casting into concrete not specified in other Sections.

1.2 ADMINISTRATIVE REQUIREMENTS
   A. Scheduling and Coordination: Coordinate metal support system with applicable equipment manufacturer and installer. Coordinate with related construction where medical equipment is to be installed, including ceiling system installer where applicable; to ensure metal supports are installed prior to related construction installation.

1.3 ACTION SUBMITTALS
   A. Product Data: Including materials, strengths, finishes and standard component sizes.
   B. Shop Drawings: Show fabrication and installation details for metal supports, including plans, elevations, sections, and details of metal supports and their connections. Show anchorage and accessory items.
      1. Provide templates for anchors and bolts specified for installation under other Sections.
      2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS
   A. Certificates
      1. Welding Certificates.
   B. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE
   A. Welding Qualifications: Qualify procedures and personnel according to the following:
      1. AWS D1.1, "Structural Welding Code-Steel."
      2. AWS D1.3, "Structural Welding Code-Sheet Steel."
   B. Manufacturer’s Qualifications: Not less than 10 years of experience in manufacture and installation of adjustable metal framing support systems and capable of demonstrating experience with completed projects of similar scope and size.
1.6 FIELD CONDITIONS
A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal supports by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION
A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 WARRANTY
A. Manufacturer’s Warranty: Provide warranty from metal support system manufacturer covering materials and workmanship of metal support system for not less than 2 years after the Date of Substantial Completion.
   1. In addition to written warranty, plainly mark support system with manufacturer’s standard warranty and identification tag system, permanently attached to component and marked with the manufacturer’s name, project number, telephone number and date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal supports exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless otherwise indicated.
E. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
   2. Galvanized Steel: ASTM A 653, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
F. Fasteners
   1. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
   2. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
      a. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
9. Anchors: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
   a. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
   b. Post-Installed Anchors: Torque-controlled expansion anchors, carbon-steel zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

G. Miscellaneous Materials
1. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
2. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”

2.2 STRUT-TYPE STEEL FRAMING AND SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide one of the following:
   1. Unistrut Building Systems.
   2. Flex-Strut Inc.
   3. Cooper B-Line Strut Systems,
   4. Hilti Strut framing by Hilti USA.

B. Performance Requirements
   1. Delegated Design: Design metal support systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated in this Section and on the Drawings.
   2. Standards: Comply with applicable requirements of federal, state and local codes as well as requirements of authorities having jurisdiction.
      a. Provide system designated as a Life Safety System.

C. Design Requirements
   1. Support Structure: Locate support members as indicated on Drawings. Provide channels spaced to allow installation of related construction and accommodating attachment of medical equipment at any point of the support system.
      a. Unless otherwise indicated, provide channels consisting of two roll formed sections welded together horizontally to form metal framing slots top and bottom with configuration substantially reducing weld tension.
b. Provide section profile allowing integral attachment of diagonal bracing at mid-section with continuous 16 gage ledge angles spot-welded to finish rails at the level of the finish construction. Paint ledge angles to match finish rails.

c. Provide plastic closure strip in length equivalent to total length of finish rails for installation after equipment installation.

2. Ceiling Anchorage: Whenever possible, attach to ceiling structure with embedded concrete inserts, through bolts, or by direct attachment to the structural framing of the building.

3. Vertical Supports: Connect exposed rails and related construction anchorage with series of 12-gauge vertical supports as indicated on Drawings, providing both basic and micro adjustment.

4. Seismic Bracing: Brace to meet all requirements of applicable codes.

5. Loading: Design support structure to accommodate a concentrated load, as shown on manufacturer’s drawings, at any single point along the exposed rails with maximum concentrated load that will be encountered by positioning the equipment at the extremities of its travel (maximal load configuration).

6. Safety Factor: Design with minimum safety factor of 2 based upon ultimate strength under static loading conditions.

7. Deflection: Not more than L/720 but not less than requirements of manufacturer of supported equipment for applications shown on Drawings.

2.3 FINISHES, GENERAL

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

B. Finish metal supports after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.4 STEEL AND IRON FINISHES

A. Finish:

1. Framing Members and Fittings: Corrosion resistant acrylic paint Federal Standard 5950. (Galvanized per ASTM A525, G90).


3. Paint: Refer to Section 099000 - Painting for field painting of exposed framing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal support system. Set metal support system accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Field-weld connections that are not exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal support system is required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Installation of Metal Support System

1. Attach metal support system to structure as indicated on Drawings, complying with metal support system manufacturer’s recommendations.
2. Form pattern as indicated, or if not indicated, as required to provide adequate support for equipment while coordinating with layout of adjacent construction and equipment. Coordinate requirements with trades providing construction integrated with the support system.

G. Allowable Tolerances:

1. Install supporting framework plumb and true.
2. Assure that mounting surfaces of support structure are horizontal within 1/32 inch in 24 inches and within 1/16 inch in 18 feet length.
3. Elevation of one rail mounting surface to other within 1/16 inch in any 24 inch length of rails.

3.2 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 054523
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes the following:
1. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal ladders.
4. Ladder Safety System.
5. Metal bollards and covers
6. Shop prime paint on ferrous metal.

1.2 COORDINATION
A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS
A. Product Data: For the following:
   1. Paint products.
   2. Grout.
   3. Bollard cover
B. Samples for verification: Plastic bollard cover for color selection.
C. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorages and accessory items.
   2. Provide templates for anchors and bolts specified for installation under other Sections.
   3. For products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   4. Provide Shop Drawings for the following:
      a. Steel framing and supports for ceiling-hung toilet compartments.
      b. Metal ladders.
      c. Ladder safety cages.
      d. Metal bollards.
D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
E. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1.4 INFORMATIONAL SUBMITTALS
   A. Welding certificates.

1.5 QUALITY ASSURANCE
   A. Welding Qualifications: Qualify procedures and personnel according to the following:
      1. AWS D1.1, "Structural Welding Code-Steel."
      2. AWS D1.3, "Structural Welding Code-Sheet Steel."

1.6 FIELD CONDITIONS
   A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

   B. Structural Performance of Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
      1. Allowable Fastener Loads: Coordinate with substrate and framing systems to determine fastener types and sizes, and required minimum thicknesses of substrate framing members required for fastener pull-out resistance.

2.2 METALS
   A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

   B. Steel Plates, Shapes, and Bars: ASTM A 36.

   C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

   D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless otherwise indicated.

   E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

   F. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

   G. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
      2. Material: Galvanized steel complying with ASTM A 653, commercial steel, Type B, with G90 coating; 0.108-inch nominal thickness.
      3. Material: Cold-rolled steel complying with ASTM A 1008, commercial steel, Type B; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

E. Machine Screws: ASME B18.6.3.


H. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

I. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Zinc-Rich Primer: Provide zinc-rich primer, complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat, at all exterior steel framing and support elements.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.


E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

G. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
   1. Polyethylene with Recycled Content: Fabricated from HDPE and other resins with recycled content.
2.5  FABRICATION, GENERAL

A.  Shop Assembly:  Preassemble items in the shop to greatest extent possible.  Disassemble units only as necessary for shipping and handling limitations.  Use connections that maintain structural value of joined pieces.  Clearly mark units for reassembly and coordinated installation.

B.  Cut, drill, and punch metals cleanly and accurately.  Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated.  Remove sharp or rough areas on exposed surfaces.

C.  Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D.  Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E.  Weld corners and seams continuously to comply with the following:
   1.  Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2.  Obtain fusion without undercut or overlap.
   3.  Remove welding flux immediately.
   4.  At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F.  Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.  Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated.  Locate joints where least conspicuous.

G.  Fabricate seams and other connections that will be exposed to weather in a manner to exclude water.  Provide weep holes where water may accumulate.

H.  Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I.  Provide for anchorage of type indicated; coordinate with supporting structure.  Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1.  Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6  MISCELLANEOUS FRAMING AND SUPPORTS

A.  General:  Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B.  Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated.  Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.  Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1.  Furnish inserts if units are installed after concrete is placed.

C.  Fabricate supports for ceiling-hung toilet compartments from continuous steel beams of sizes recommended by toilet compartment manufacturer with attached bearing plates, anchors, and braces.  Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on toilet compartments Shop Drawings.

D.  Galvanize miscellaneous framing and supports where indicated.
E. Prime miscellaneous framing and supports with primer specified in Division 09, Painting.

2.7 METAL LADDERS

A. General:
   1. Comply with ANSI A14.3, unless otherwise indicated.

B. Steel Ladders:
   1. Space siderails 18 inches apart, unless otherwise indicated.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
   7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
   8. Galvanize exterior ladders, including brackets.
   9. Prime ladders, including brackets and fasteners, with zinc-rich primer.

2.8 LADDER SAFETY SYSTEM

A. Delegated Design: Ladder Safety System to be designed in accordance with OSHA 1910.29 Ladder Safety System.

B. Fabricate ladder safety system to comply with ANSI A14.3. Assemble components with stainless steel fasteners, brackets and clamps. Provide ladder safety system permanently attached to ladder with uninterrupted fall protection.
   1. Top bracket with deceleration device.
   2. Carrier: Stainless steel cable.
   3. Pass-through cable guide: Automatic
   4. Bottom bracket with tensioner

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

B. Fabricate bollards with 3/8-inch- thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 3/4-inch anchor bolts.
   1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Prime bollards with zinc-rich primer.

2.10 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 099123 "Interior Painting" unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Bright, Directional Satin Finish: No. 4.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.13 ALUMINUM FINISHES

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

B. As-Fabricated Finish: AA-M12.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for ceiling hung toilet partitions securely to and rigidly brace from building structure.

3.3 INSTALLING METAL LADDERS

A. Install metal ladders level; plumb; true to line and elevation.

B. Attach metal ladders to supports at locations and with fasteners to achieve performance requirements specified. Install metal ladders with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Seal joints in cladding and air barrier caused by support penetrations to create an airtight seal.

3.4 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch bolts at each bollard, unless otherwise indicated.

1. Embed anchor bolts at least 4 inches in concrete.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

D. Install cover in accordance with manufacturer's written instructions.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

END OF SECTION 055000
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preassembled steel stairs with concrete-filled treads.
   2. Steel tube railings attached to metal stairs.
   3. Steel tube handrails attached to walls adjacent to metal stairs.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Uniform Load: 100 lbf/sq. ft.
   2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.
   1. Handrails and Top Rails of Guards:
      a. Uniform load of 50 lbf/ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Infill of Guards:
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load and other loads need not be assumed to act concurrently.

1.3 ACTION SUBMITTALS

A. Product Data: For metal stairs and the following:
   1. Prefilled metal-pan stair treads.
   2. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1.4 QUALITY ASSURANCE

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
   1. Preassembled Stairs: Commercial class.

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

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

2.3 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

D. Machine Screws: ASME B18.6.3.
E. Plain Washers: Round, ASME B18.22.1.
G. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.


2.4 MISCELLANEOUS MATERIALS
A. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL
A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA’s "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
2.6 STEEL-FRAMED STAIRS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alfab, Inc.
   2. American Stair, Inc.
   3. Sharon Companies Ltd.

B. Stair Framing:
   1. Fabricate stringers of steel plates, tubes or channels.
      a. Provide closures for exposed ends of tube stringers.
   2. Construct platforms of steel tube headers and miscellaneous framing members as needed to comply with performance requirements.
   3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.
      a. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
   4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.
   1. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
   2. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
   3. Shape metal pans to include nosing integral with riser.

2.7 STAIR RAILINGS

A. Comply with applicable requirements as specified.
   1. Rails may be bent at corners and rail returns, instead of using prefabricated fittings.
   2. Connect posts to stair framing by direct welding, unless otherwise indicated.

B. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacing, and anchorage, but not less than that needed to withstand indicated loads.
   1. Rails and Posts: 1-1/2-inch-square top and bottom rails and 1-1/2-inch-square posts.
   2. Picket Infill: 1/2-inch-square pickets spaced less than 4 inches clear.
   3. Intermediate Rails Infill: 1-5/8-inch-diameter intermediate rails spaced less than 12 inches or 21 inches clear per approved shop drawings.

C. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" Type 4 welds: good quality, uniform undressed weld with minimal splatter.

D. Form changes in direction of railings as follows:
   1. By bending.
E. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
   1. Connect posts to stair framing by direct welding unless otherwise indicated.
   2. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

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

B. Finish metal stairs after assembly.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
G. Place and finish concrete fill for treads and platforms to comply with Section "Cast-in-Place Concrete."

3.2 INSTALLING RAILINGS
A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
   1. Anchor posts to steel by welding directly to steel supporting members.
   2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.
B. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction using either method below:
   1. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
   2. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.3 ADJUSTING AND CLEANING
A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09, Painting.

END OF SECTION 055100
SECTION 055119 - METAL GRATING STAIRS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes industrial-type, straight-run stairs with steel-grating treads and railings attached to metal grating stairs.

1.2 COORDINATION
A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS
A. Product Data: For metal grating stairs.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments.
C. Delegated-Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs and railings.
B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Uniform Load: 100 lbf/sq. ft.
   2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
   3. Uniform and concentrated loads need not be assumed to act concurrently.
   4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
   5. Limit deflection of treads, platforms, and framing members to L/360.

2.2 METALS
A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Steel Plates, Shapes, and Bars: ASTM A 36.
C. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.
D. Steel Bars for Grating Treads: ASTM A 36/A 36M or steel strip, ASTM A 1011 or ASTM A 1018.
E. Wire Rod for Grating Crossbars: ASTM A 51.
2.3  FASTENERS
A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.
D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

2.4  MISCELLANEOUS MATERIALS
A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.5  FABRICATION, GENERAL
A. Provide complete stair assemblies, including metal framing, hangers, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
   1. Join components by welding unless otherwise indicated.
   2. Use connections that maintain structural value of joined pieces.
B. Form exposed work with accurate angles and surfaces and straight edges.
C. Weld connections to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 4 welds: good quality, uniform undressed weld with minimal splatter.
D. Fabricate joints that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
2.6 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:
   1. Fabricate stringers of steel plates or channels.
      a. Provide closures for exposed ends of channel stringers.
   2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements indicated.
   3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."
   1. Fabricate treads and platforms from welded or pressure-locked steel grating with openings in gratings no more than 3/4 inch in least dimension.
   2. Surface: Serrated.
   3. Finish: Galvanized.
   4. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
   5. Fabricate grating platforms with nosing matching that on grating treads. Provide toeplates at open-sided edges of grating platforms. Weld grating to platform framing.

2.7 STAIR RAILINGS

A. Comply with applicable requirements in Section “Metal Stairs”
   1. Fabricate newels of square steel tubing and provide newel caps of pressed steel, as shown.
   2. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
   3. Connect posts to stair framing by direct welding unless otherwise indicated.

2.8 FINISHES

A. Finish metal stairs after assembly.
B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
   2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055119
SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Steel pipe and tube railings.
   2. Aluminum pipe and tube railings.

1.2 COORDINATION
A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS
A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS
A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE
A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1 "Structural Welding Code - Steel."
   2. AWS D1.2 "Structural Welding Code - Aluminum."
   3. AWS D1.6 "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING
A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
1.7 FIELD CONDITIONS
   A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Delegated Design: Engage a qualified professional engineer, as defined in Section "Quality Requirements," to design railings, including attachment to building construction.
   B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
      1. Handrails and Top Rails of Guards:
         a. Uniform load of 50 lbf/ ft. applied in any direction.
         b. Concentrated load of 200 lbf applied in any direction.
         c. Uniform and concentrated loads need not be assumed to act concurrently.
      2. Infill of Guards:
         a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
         b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL
   A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
   B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
      1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON
   A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
   B. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
   C. Plates, Shapes, and Bars: ASTM A 36.

2.4 ALUMINUM
   A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
      1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.
2.5 STAINLESS STEEL
   A. Tubing: ASTM A 554, Grade MT 304.
   B. Pipe: ASTM A 312, Grade TP 304.

2.6 FASTENERS
   A. General: Provide the following:
      1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
      2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153 or ASTM F 2329 for zinc coating.
      3. Aluminum Railings: Type 304 stainless-steel fasteners.
      4. Stainless-Steel Railings: Type 304 stainless-steel fasteners.
   B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
   C. Fasteners for Interconnecting Railing Components:
      1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.7 MISCELLANEOUS MATERIALS
   A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
      1. For aluminum and stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
   B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
   D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.8 FABRICATION
   A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
   B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for
reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA’s “Voluntary Joint Finish Standards” Type 4 welds: good quality, uniform undressed weld with minimal splatter.

I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

J. Form Changes in Direction as Follows:

1. By bending.

K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.9 STEEL AND IRON FINISHES

A. Galvanized Railings:

3. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

2.10 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Mill Finish: AA-M12, nonspecular as fabricated.

C. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44.
   1. Color: Dark bronze or Black.

2.11 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.

B. Stainless Steel Tubing Finishes:

C. Stainless Steel Sheet and Plate Finishes:
   1. Directional Satin Finish: ASTM A 489/A 480, No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.
B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
3.6 ADJUSTING AND CLEANING
   A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
   B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
      1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
   C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION
   A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213
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SECTION 055313 - BAR GRATINGS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes metal bar gratings and metal frames and supports for gratings.

1.2 COORDINATION
   A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint
      and coating manufacturers' written instructions to ensure that shop primers and topcoats are
      compatible with one another.
   B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting
      drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts,
      anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
      Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS
   A. Product Data: For the following:
      2. Paint products.
   B. Shop Drawings: Include plans, sections, details, and attachments to other work.
   C. Delegated-Design Submittal: For gratings, including manufacturers' published load tables and
      analysis data signed and sealed by the qualified professional engineer responsible for their
      preparation.

1.4 INFORMATIONAL SUBMITTALS
   A. Welding certificates.
   B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers
      certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE
   A. Welding Qualifications: Qualify procedures and personnel according to the following:
      1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS
   A. Field Measurements: Verify actual locations of walls and other construction contiguous with
      gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering
      products that may be incorporated into the Work include, but are not limited to the following:
      1. All American Grating.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.

B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Floors: Uniform load of 125 lbf/sq. ft. or concentrated load of 2000 lbf, whichever produces the greater stress.
   2. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft.
   3. Walkways and Elevated Platforms Used as Exits: Uniform load of 100 lbf/sq. ft.
   4. Limit deflection to L/360 or 1/4 inch, whichever is less.

C. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Component Importance Factor: 1.5.

2.3 METAL BAR GRATINGS

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."

B. Pressure-Locked Steel Grating: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars.
   1. Bearing Bar Spacing: 1-3/16 inches o.c.
   2. Bearing Bar Depth: As required to comply with structural performance requirements.
   3. Bearing Bar Thickness: As required to comply with structural performance requirements.
   4. Crossbar Spacing: 2 inches o.c.
   5. Traffic Surface: Plain or As indicated.
   6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

2.4 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Bars for Bar Gratings: ASTM A 36 or steel strip, ASTM A 1011 or ASTM A 1018.

D. Wire Rod for Bar Grating Crossbars: ASTM A 510.

E. Uncoated Steel Sheet: ASTM A 1011, structural steel, Grade 30.

F. Galvanized-Steel Sheet: ASTM A 653, structural quality, Grade 33, with G90 coating.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5. Select fasteners for type, grade, and class required.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563 and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Post-Installed Anchors: Torque-controlled expansion or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section "Exterior Painting" and Section "Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
   1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
   2. Toeplate Height: 4 inches unless otherwise indicated.
G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
2. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.

H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

I. Do not notch bearing bars at supports to maintain elevation.

2.8 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4-inch-thick by 8 inches long.

B. Galvanize steel frames and supports in the following locations:

1. Exterior.
2. Interior, where indicated.

2.9 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123/ for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

C. Shop prime gratings, frames, and supports not indicated to be galvanized unless otherwise indicated.

1. Shop prime with universal shop primer unless primers specified in Section "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

2. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Items: SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
   A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
   B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
   D. Fit exposed connections accurately together to form hairline joints.
      1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
   E. Field Welding: Comply with AWS recommendations and the following:
      1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
      2. Obtain fusion without undercut or overlap.
      3. Remove welding flux immediately.

3.2 INSTALLING METAL BAR GRATINGS
   A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
   B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
   C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING
   A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
      1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
   B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section "Interior Painting:"
   C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055313

BAR GRATINGS 055313 - 5

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BAR GRATINGS

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PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. Rooftop equipment bases and support curbs.
2. Roof edge support blocking.
3. Wood blocking, cants, and nailers.
5. Plywood backing panels.

1.2 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. Include data for wood-preserveive treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
B. Shop Drawings: Submit shop drawings for following miscellaneous rough carpentry components:
   1. Roof Edge Support Blocking:
      a. Include planes, details, and other drawings showing attachment to adjacent and adjoining construction, details for expansion and contraction provisions, location of expansion joints showing direction of expansion/contraction, and layout of fasteners, fastener types, and other attachment provisions required to comply with specified performance requirements.
      b. Include details of special conditions.
C. Delegated Design Submittal: Submit engineering analysis data for miscellaneous rough carpentry components indicated to comply with specified performance requirements and design criteria signed and sealed by qualified professional engineer responsible for analysis data preparation.

1.3 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.
1.4 INFORMATIONAL SUBMITTALS
   A. Evaluation Reports: For the following, from ICC-ES:
      1. Preservative-treated wood.
      2. Fire-retardant-treated wood.
      4. Expansion anchors.

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL
   A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
      1. Factory mark each piece of lumber with grade stamp of grading agency.
      2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
      3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
      4. Provide dressed lumber, S4S, unless otherwise indicated.

   B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS
   A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
      1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
      2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

   B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

   C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
      1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, blocking, furring, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   3. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:
   1. Concealed blocking.
   2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following: Provide fire treated.
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Roof edge support blocking.
   5. Cants.
   6. Furring.
B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

F. Roof Edge Support Blocking: Provide support blocking at roof edges as required securing roof edge components shown on Drawings and complying with performance and design criteria specified in applicable Division 07 sections for roof edge components.

1. Delegated Design: Engage qualified professional engineer to design wood blocking supporting roof edge components including, but not limited to, coping, roof edge flashing, gravel stops and similar components in accordance with performance and design criteria specified in applicable Division 07 sections.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than nominal thickness.

B. Floor Underlayment Panels: DOC PS 1, Exposure 1, AC, in thickness indicated or, if not indicated, not less than nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservation treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153 or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

D. Wood Screws: ASME B18.6.1.
E. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
F. Lag Bolts: ASME B18.2.1.
G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS
A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4-inch-thick, selected from manufacturer's standard widths to suit width of sill members indicated.
C. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
D. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
E. Nail Stop: Galvanized steel sheet, minimum 0.064 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC’s International Building Code.
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC’s International Residential Code for One- and Two-Family Dwellings.

J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Nail Stop: Install at wood blocking locations in front of utility runs.

D. Roof Edge Support Blocking: Fabricate and install blocking for coping, roof edge flashing, gravel stops and similar components in accordance with Shop Drawings and complying with performance and design criteria specified in applicable Division 07 sections.

E. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Gypsum Board: Install 1” x 2” nominal-size furring vertically at 16 inches OC.
3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053
SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Wall sheathing.

1.2 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.
   B. Sustainable Design Submittals:
      1. Submit product data for adhesives, documentation including printed statement of VOC
         content.

1.3 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.

1.4 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 WALL SHEATHING
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. CertainTeed Corporation; GlasRoc.
         b. G-P Gypsum Corporation; Dens-Glass Gold.
         c. National Gypsum Company; Gold Bond e(2)XP.
         d. Temple-Inland Inc.; GreenGlass
         e. United States Gypsum Co.; Securock.
      2. Type and Thickness: Type X, 5/8 inch thick.
      USG literature on their web site indicates that the following product is intended for interior
      use only. It appears that their exterior product has been withdrawn.
2.2 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 sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

   1. For steel framing less than 0.0329-inch-thick, use screws that comply with ASTM C 1002.
   2. For steel framing from 0.033 to 0.112-inch-thick, use screws that comply with ASTM C 954.

2.3 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

   1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Unless otherwise indicated, install sheathing products in accordance with sheathing product manufacturer’s recommendations for applications indicated on Drawings.

B. 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.

C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

D. Securely attach to substrate by fastening as indicated, complying with the following:

   1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

E. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

F. 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.

G. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

H. 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 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing 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. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
   1. Space fasteners approximately 8 inches OC 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.

D. 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 OC 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.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.
   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced cabinetwork
   2. Cabinet hardware and accessories.
   3. Interior trim including closet and utility shelving
   4. Solid surfacing countertops, including backsplashes, end splashes, and sinks.
   5. Preparation of cabinetwork for utilities.
   7. Compact Laminate

1.2 DEFINITIONS


1.3 ACTION SUBMITTALS

A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures faucets and other items installed in interior architectural woodwork items including countertops.
   3. For Countertops: Show materials, finishes, edge profiles, and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
      a. Show locations and details of joints.
      b. Show direction of directional pattern, if any.
   4. Show locations of lighting luminaires, their control locations and electrical wiring connections point(s).

B. Samples for Verification:
   1. Plastic Laminates for Cabinets: 8 by 10 inches, for each type, color, pattern, and surface finish.
   2. Countertops:
      a. Countertop material, 6 inches square.
      b. Wood trim, 8 inches long.
   3. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.
   4. Grommets for color.
   5. Thermoset decorative overlays.
   6. Hardware sample for appearance.
1.4 INFORMATIONAL SUBMITTALS
   A. Certification Letter: Submit letter on Contractor’s letter head stationary signed by Contractor indicating that all materials incorporated into this Project comply with requirements specified in this Specification and comply with WDMA I.S.1-A, “Architectural Wood Flush Doors.”

1.5 QUALITY ASSURANCE
   A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricates products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI’s Quality Certification Program.
   B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
      1. Build mockups of typical architectural wood cabinets, plastic-laminate-faced architectural cabinets and countertops as shown on Drawings.
      2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Do not deliver interior architectural woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in “Field Conditions” Article.

1.7 FIELD CONDITIONS
   A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.
   B. Field Measurements: Where interior architectural woodwork items are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
      1. Locate concealed framing, blocking, and reinforcements that support interior architectural woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
      2. Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION
   A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural cabinets and countertops can be supported and installed as indicated.
      1. Coordinate locations of utilities that will penetrate countertops or backsplashes.
PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL


2.2 TRIM FOR TRANSPARENT FINISH

1. Grade: Premium
2. Wood Species and Cut:
   a. Species: White Maple or Red Oak as indicated on drawings.
   b. Cut: Plain sawn.
   c. Stain to match: As indicated on drawings.

2.3 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Grade: Custom.
B. Type of Construction: Frameless.
C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

1. Fittings and Sizes: Trim square and factory-size to nominal opening size less approximately 1/16 inch in width and 1/8 inch in height (unless otherwise required) for final fitting.
   a. Provide bottom valance on cabinets to cover under cabinet lighting where indicated, except at side of cabinet where units are gang units.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Abet Laminati, Inc.
   b. Formica Corporation.
   c. Lamin-Art, Inc.
   d. Pionite; a Panolam Industries International, Inc. brand.
   e. Wilsonart International Holdings, Inc.

E. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Edges: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
   a. Basis-of-Design Products: Subject to compliance with requirements, provide products Rehau Express Collection or acceptable comparable product.

F. Materials for Semi-Exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.

3. Drawer Bottoms: Thermoset decorative panels.

G. Cabinet Liner: Thermoset decorative overlay (melamine) or .020 inch cabinet liner, 45 lb. density particleboard.

1. 1. Color: White, unless otherwise selected.

H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BK L.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

K. Colors, Patterns, and Finishes: Provide materials and products as indicated on drawings.

1. Color for Semi-Exposed Surfaces: White

L. High Acuity Spaces, Plastic Laminate Faced Architectural Cabinets:

1. Core surfaces not laminate-faced: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.

   a. Basis-of-Design Products: Subject to compliance with requirements, provide products Rehau Express Collection or acceptable comparable product.

2. Semi-Exposed Surfaces not receiving PVC edge banding: Seal core surfaces with clear synthetic resin sealer

2.4 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Grade: Premium.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

   a. Abet Laminati, Inc.
   b. Arborite; Division of ITW Canada, Inc.
   c. Formica Corporation.
   d. Lamin-Art, Inc.
   e. Nevamar Company, LLC; Decorative Products Div.
   f. Panolam Industries International Incorporated.

C. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade HGP, and as follows:

1. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.9.5:
a. Nitric Acid (30 Percent): Moderate effect.
b. Sulfuric Acid (77 Percent): Moderate effect.
c. Hydrochloric Acid (37 Percent): Moderate effect.
d. Phosphoric Acid (75 Percent): No effect.
e. Acetic Acid (98 Percent): No effect.
f. Formaldehyde: No effect.
g. Ethyl Acetate: No effect.
h. Ethyl Ether: No effect.
i. Phenol (85 Percent): Moderate effect.
j. Benzene: No effect.
k. Xylene: No effect.
l. Butyl Alcohol: No effect.
m. Furfural: No effect.
n. Methyl Ethyl Ketone: No effect.
o. Sodium Hydroxide (25 Percent): No effect.
p. Sodium Sulfide (15 Percent): No effect.
q. Ammonium Hydroxide (28 Percent): No effect.
r. Zinc Chloride: No effect.
s. Gentian Violet: No effect.
t. Methyl Red: No effect.

2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Formica Corporation; Lab Grade 840 Black.
   b. Panolam Industries International Incorporated; Pionite Chemguard.

D. Colors, Patterns, and Finishes: Provide materials and products as indicated on drawings.

E. Edge Treatment: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.

F. Core Material: Particleboard.

G. Core Material at Sinks: Water Resistant Coreboard: Medium density fiberboard.

H. Core Thickness: 1-1/8 inch.
   1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Types of Tops:
   1. No sink: standard core, no splash, 3mm PVC edge molding.
   3. At ice maker: Water Resistant Coreboard: Medium density fiberboard, chemical resistant plastic laminate with epoxy adhesive. Coved backsplash, coved side splash integral with top.

2.5 COMPACT LAMINATE MATERIALS

A. Plastic laminate facing with a solid phenolic core, total thickness 1/4 inch.
1. Compact Laminate Manufacturers, Types and Colors: As indicated on drawings.

2. Manufacturers attachment accessories for wall installation:
   c. (PL TRIM-3): Extruded aluminum inside corner molding.
   d. (PL TRIM-4): Extruded aluminum outside corner molding.
   e. Finish: As selected by the Architect from the manufacturers standards.

2.6 SOLID SURFACE COUNTERTOP MATERIALS
   A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
      1. 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:
         a. ABA Industries.
         b. Avonite, Inc.
         d. Formica Corporation.
         e. LG Chemical, Ltd.
         f. Meganite Inc.; a division of the Pyrochem Group.
         g. Nevamar Company, LLC; Decorative Products Div.
         h. Samsung; Cheil Industries Inc.
         i. Swan Corporation (The).
         j. Transolid, Inc.
         k. Wilsonart International; Div. of Premark International, Inc.
   
   2. Type: Provide Standard type unless Special Purpose type is indicated.
   4. Colors and Patterns: As indicated on drawings.

2.7 CLOSET AND UTILITY SHELVING
   A. Grade: Custom.
   B. Closet Rods: 1-1/16-inch diameter, chrome-plated-steel, tubes complying with BHMA A156.16, L03131, satin chrome finish, US26D.
      2. Provide 4 closed loop hangers to fit rods at Patient Room Storage Cabinets.
   C. Rod Flanges: Chrome-plated steel.
      1. Knape & Vogt: KV 734 CHR Commercial Closet Rod Flanges
   D. Rod & Shelf Bracket: cold rolled steel.
      1. Knape & Vogt: KV 1195 Series Commercial Heavy-Duty Closet Rod & Shelf Bracket
   E. Shelf Standards and Brackets: steel, Anochrome finish.
   F. Janitor Shelf Standards and Brackets: steel, Anochrome finish, 3 shelves, with 9 brackets. Space standards not over 32 inches on center. Where length of standards cannot be determined from...
2.8 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
   2. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Composite Wood Products: Products shall be made without urea formaldehyde.
      a. Available Manufacturer: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Medite Corp; Exterior Medex.
   4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.9 CABINET HARDWARE AND ACCESSORIES

A. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges, with hospital tip made from 0.095-inch-thick metal, and as follows:
   1. Semi-Concealed Hinges for Flush Doors: BHMA A156.9, B01361.

B. Frameless Concealed Hinges: BHMA A156.9, 110 degrees of opening, self-closing; equivalent to following:
   1. Blum CLIP top BLUMOTION with Plate 173H9100.
   2. Provide at Nurse Server.

C. Continuous Hinge: stainless steel complying with BHMA A156.9, Grade 1.

D. Spring Hinge: Cold rolled steel, V127 by National Hardware

E. Wire Pulls: Back mounted, BHMA A156.9, B02011 solid brass, 4 inches long, 5/16 inch in diameter; equivalent to the following:
   1. Model 357, satin chrome by Colonial Bronze Co.
   2. No. MC-4024, dull chrome by Epco Hardware.

F. Flush Pulls:
   1. Rectangular Configuration recessed plastic, color selected from manufacturer’s standards.
      a. Item No. 158.88.099 Flush Pull by Hafele
G. Catches: Magnetic catches, BHMA A156.9, B03141, Grade 1, with clear anodized aluminum case and impregnated floating rubber magnet, zinc plated strike, slotted screw holes in case and off-center hole in strike, equivalent to No. SP41 or SP45 by Stanley Hardware, or approved equal.

H. Catches: Magnetic catches, pressure push, steel magnet and strike equivalent to 245.80.320 by Hafele, or approved equal.

I. Adjustable Shelf Standards and Supports:
   1. Shelf Rests: BHMA A156.9, B04013; metal.

J. Counter Support Brackets:
   1. 1/8 inch steel; 1-1/2 inch forms with multiple 1/4 inch mounting holes per side; reversible; color as chosen by Architect from manufacturer's standard colors.
   2. Sizes as required by application
   3. Capacity: 1,000 pounds minimum
      a. By A & M Hardware, Inc

K. Drawer Slides: BHMA A156.9, B05111; Side-mounted, full-extension, all ball bearing zinc-plated steel drawer slides with hold-in detent, rated for indicated loads, and equivalent to the following:
   1. Drawers 6-inches or less in depth and up to 16-inches in width:
      a. Model 3832ESC, 100 lb./pr. load rating, telescoping, self-closing movement, by Accuride International, or approved equal.
   2. Drawers 6-inches or less in depth and up to 24-inches in width:
      a. Model 7432, 100 lb./pr. load rating, progressive movement, by Accuride International, or approved equal.
   3. Drawers over 6-inches in depth and up to 42-inches in width:
      a. Model 3640A, 200lb./pr. load rating, sequential movement, by Accuride International, or approved equal.
   4. Drawers with soft close feature
      a. Model 3832EC, 100 lb./pr. Load rating, telescoping, soft close by Accuride International, or approved equal.

L. File Drawer Followers:

M. Writing Surface Runners:
   1. Hafele 423.37.0XX or equal, with Grass 6197 door protectors.

N. Plastic Slides for Sliding Glass Doors: BHMA A156.9, B07063; equivalent to Series 2412 Track and Upper Guides by Knapec and Vogt Mfr. Co., or approved equal.

O. Locks:
   1. Door Locks: Multi-function pin tumbler cam locks suitable for specific project applications. All brass construction with 26D-Dull Chrome finish, equivalent to "No. C8053 by
CompX National," or approved equal. Provide two stamped brass keys per lock. Locks to be capable of 850 key changes.

2. Drawer Locks: Multi-function pin tumbler cam locks suitable for specific project applications. All brass construction with 26D-Dull Chrome finish, equivalent to "No. C8060 by CompX National," or approved equal. Provide two stamped brass keys per lock. Locks to be capable of 850 key changes.
   a. All locks shall be keyed alike within each room and masterkeyed, including locks on under-counter refrigerators. Locks on inner and outer doors of narcotics cabinets shall be keyed separately.

3. Nurse Server/Med Drawer Lock/Medicine cabinet lock: standard length knob, self-locking (SlamCAM), top vertical mount (keypad below locking point), 1-3/16 inch cylinder length. RegulatoR part number: RES-SL-T-3, by CompX.

P. Door and Drawer Silencers:
   1. Self-adhesive clear polyurethane bumpers, 2 stage impact force reduction, at all locations. Silent Bumper 356.25.455 by Häfele.
   A. Grommets for Cord Passage through Countertops: molded-plastic grommets and matching plastic caps with slot for wire passage. 1- 7/8 inches inside diameter, 2-3/8 inches overall diameter, with cap where indicated on Drawings.
      1. Product: Subject to compliance with requirements, provide "TG Series" by Doug Mockett & Company, Inc.
   B. Grommets for Cable Passage through Countertops: molded-plastic grommets and matching plastic caps with slot for wire passage. 4 inches by 2 inches overall, with cap where indicated on drawings for countertops.
      1. Product: Subject to compliance with requirements, provide "RG Series" by Doug Mockett & Company, Inc.
   C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
      1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
      2. Satin Stainless Steel: BHMA 630.
   D. For concealed hardware, provide manufacturer’s standard finish that complies with product class requirements in BHMA A156.9.
   E. Ceiling hook, magnetic catches, and other required hardware, as recommended by fabricator for intended use.

2.10 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
B. Adhesives: Do not use adhesives that contain urea formaldehyde.
C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
D. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."
FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate woodwork to dimensions, profiles, and details indicated.
   1. Ease edges to radius indicated for the following: Corners of Cabinets and Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
   2. Glue joints in shop, using hardwood spline, except where field joints are necessary for shipping or placing in work.
   3. Use Type 1 waterproof glue for work exposed in any part of exterior, around sinks and at other locations where work is exposed to moisture or dampness that might affect glue bond.
   4. Provide screw caps for screws used to mount cabinets on walls or attach cabinets together when screws are semi-exposed.
   5. Prepare counter field joints in shop using bolt-up Tite-Joint fasteners at spacing recommended by fastener manufacturer.
   6. Provide 2 inch radius at all outside corners of tops.
   7. Unless specifically shown otherwise, apply PVC banding to exposed edges (including back edge not tight to wall) and provide approved bevel edge at joint with face or top.
      a. High Acuity Spaces: apply PVC banding to cut and exposed core material.
   8. Seal core surfaces not laminate-faced with clear synthetic resin sealer recommended by laminate manufacturer.
      a. High Acuity Spaces: Apply clear synthetic resin sealer to cut and exposed core material when PVC banding application requirements cannot be executed.

C. Solid-Surfacing Countertops: Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Premium.
   2. Countertops: 1/2-inch-thick, solid surface material laminated to 3/4-inch-thick particleboard with exposed edges built up with 3/4-inch-thick, solid surface material.
   4. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   5. Joints: Fabricate countertops in sections for joining in field.
      a. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
   6. Cutouts and Holes:
      a. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
         1) Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

F. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.12 SHOP FINISHING

A. General: Finish architectural trim at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural trim, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

C. Transparent Finish:

1. Grade: Custom.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
4. Staining: Stain to match as indicated on drawings.

2.13 MISCELLANEOUS SPECIALTIES

A. Tackboard:

1. Fabric-Faced Tackboards: Provide fabric laminated to 1/2-inch (12.70 mm) thick fiber board. Provide only fabric that has a flame spread rating of 25 or less when tested in accordance with the requirements of ASTM E84. Wrap fabric around all edges that are not trimmed after installation.
2. Fabric: As indicated on the Drawings.
3. Mineral Fiber Board: Micore 300 by USG.
B. Tackboard:
   1. Fabric Wrapped Natural Cork Tackboard: Provide single layer 1/4-inch thick, seamless compressed fine grain bulletin board quality natural cork sheet, face sanded for natural finish, complying with MS MIL-C15116, Type II. Exposed fabric covering of modacrylic weave, minimum weight 9-1/2 oz./sq. yd., by Guilford Fabrics.
      a. Color: As selected by Architect from manufacturer’s standard colors.
      b. Mechanically fasten, do not use adhesive to mount to wall.

C. Markerboard Panels:
   1. Porcelain enamel fused to 28 gauge enameling steel with ground coat both sides, finish coat of fine grain matte in white color. Laminate steel to core with waterproof cement, by Claridge Products, Neal Slate, or Mirawal.
      a. Trim: Finish exposed trim surfaces with plastic laminate.
      c. Mechanically fasten, do not use adhesive to mount to wall.

D. Column Legs:
   1. Steel legs with mounting plate 3-1/2 inch diameter, polished chrome finish.

E. Casters
   1. Twin-wheel caster with mounting plate and brake, Häfele 660.58.321 or equal.

PART 3 - EXECUTION

3.1 PREPARATION
A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION
A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
B. Cabinets:
   1. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
   2. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
   3. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
   4. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
      a. For shop finished items use filler matching finish of items being installed.
   5. Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide...
unencumbered operation. Complete installation of hardware and accessory items as indicated.

a. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

b. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish, or toggle bolts through metal backing or metal framing behind wall finish.

C. Lighting:

1. Provide lighting shop-wired to common accessible outlet box for field connection under Division 26.

a. Install lengths and quantity of luminaires to provide continuous unbroken lighting effect across entire length of woodwork indicated. Verify length, configuration, and lighting requirement with Architect prior to woodwork fabrication.

b. Install and connect multiple luminaires such that a single switch, integral to woodwork, controls the luminaires.

c. Exceptions:

1) Where luminaire is specified and provided with factory-installed cord, plug and switch assemblies.

2) Where integral luminaires are specified to be controlled from remote switch location.

d. Provide LED lighting shop-wired to local control switch and remote driver(s), shop-installed in accessible, concealed location for single field connection under Division 26.

D. Plastic-Laminate-Faced Countertops: Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.

2. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

a. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

3. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

4. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

5. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

6. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

a. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
b. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c.
c. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

E. Compact Laminate
1. Gypsum board substrate to be painted prior to installing compact laminate to partition.
2. Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches OC. Secure tops and bottoms of boards to walls.

F. Solid Surfacing Countertops
1. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
2. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
3. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
   a. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
4. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
5. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
6. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING
A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.
C. Clean exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023
SECTION 070151 - MODIFICATIONS OF EXISTING ROOFING, FLASHING AND SHEET METAL

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. Patching existing roof system.
      2. Removal and replacement of flashings and counterflashings.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
   A. Certification Letter indicating system conforms to requirements of existing roof system warranty and identifies materials and details utilized.

1.5 CLOSEOUT SUBMITTALS
   A. Certified statement stating that existing roof warranty has not been affected by Work performed under this Section.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: [Approved by warrantor of existing roofing system to work on existing roofing] [and] [licensed to perform asbestos abatement in the state or jurisdiction where Project is located].

1.7 FIELD CONDITIONS
   A. Existing Roofing System: [Built-up asphalt] [Built-up coal-tar] [APP-modified bituminous] [SBS-modified bituminous] [EPDM] [CSPE] [KEE] [PVC] [TPO] [APP-modified bituminous protected membrane] [SBS-modified bituminous protected membrane] [Fluid-applied protected membrane] [Coated foamed] <Insert roof type> roofing.
   B. Owner [will] [will not] occupy portions of building immediately below reroofing area.
      1. Conduct reroofing so Owner's operations are not disrupted.
      2. Provide Owner with not less than [72] <Insert number> hours' written notice of activities that may affect Owner's operations.
      3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or detection equipment if needed, and evacuate occupants from below work area.
      4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
         a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.
C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
   1. Remove only as much roofing in one day as can be made watertight in the same day.

G. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. Existing roof will be left no less watertight than before removal.
   3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
      a. Hazardous materials will be removed by Owner under a separate contract.

H. Hazardous Materials: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
   1. Hazardous material remediation is specified elsewhere in the Contract Documents.
   2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
   3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty.
   1. Notify warrantor before proceeding with the Work.
   2. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect.
      a. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 MATERIALS – GENERAL

A. Provide materials and details approved by existing roof system manufacturer and required to maintain existing warranty.

2.2 TEMPORARY PROTECTION MATERIALS

A. EPS Insulation: ASTM C 578.

B. Plywood: DOC PS 1, Grade CD, Exposure 1.
2.3 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

B. Wood blocking, curbs, and nailers are specified in [Section 061000 "Rough Carpentry."] [Section 061053 Miscellaneous Rough Carpentry.]

C. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed acceptable to new roofing system manufacturer.

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

B. Sheet Flashing: As recommended by roof membrane manufacturer.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard, water based.

E. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Protect existing roofing system that is not to be reroofed.

2. Loosely lay 1-inch-25-mm- minimum thick, EPS insulation over existing roofing in areas not to be reroofed.

   a. Loosely lay 15/32-inch12-mm plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch25 mm.

3. Limit traffic and material storage to areas of existing roofing that have been protected.

4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

5. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
C. Shut off rooftop utilities and service piping before beginning the Work.

D. Test existing roof drains to verify that they are not blocked or restricted.
   1. Immediately notify Architect of any blockages or restrictions.

E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
   1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
   1. Prevent debris from entering or blocking roof drains and conductors.
      a. Use roof-drain plugs specifically designed for this purpose.
      b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
   2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
      a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF PATCHING

A. Notify Owner each day of extent of roof tear-off proposed for that day[ and obtain authorization to proceed].

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Roof Patching: [Where indicated on Drawings, remove] [Remove] existing roofing down to [existing cover board] [existing insulation] <Insert substrate> and immediately check for presence of moisture.
   1. Remove wet or damp materials below existing roofing and above deck as directed by Architect.
   2. Inspect wood blocking, curbs, and nailers for deterioration and damage.
      a. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.3 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.
   1. Installation of wood blocking, curbs, and nailers is specified in [Section 061000 "Rough Carpentry." ] [Section 061053 Miscellaneous Rough Carpentry.]

B. Cut insulation to exactly fill void to top of existing roof mat with adhesive. Provide cants as required to provide sound substrate for flashing.

C. Install new roofing patch over roof infill area.
3.4 BASE FLASHING REMOVAL
   A. Remove existing base flashings.
      1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
   B. Do not damage metal counterflashings that are to remain.
      1. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish as existing.

3.5 DISPOSAL
   A. Collect demolished materials and place in containers.
      1. Promptly dispose of demolished materials.
      2. Do not allow demolished materials to accumulate on-site.
      3. Storage or sale of demolished items or materials on-site is not permitted.
   B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070151
MODIFICATIONS OF EXISTING ROOFING

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SECTION 071800 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes traffic coatings for the following applications:
   1. Vehicular traffic.
   2. Equipment Room Floor
   3. Delineator Posts

1.2 PERFORMANCE REQUIREMENTS
A. Dynamic Coefficient of Friction: For walkway surfaces, provide products with the following values as determined by testing identical products per ANSI A 137.1:
   1. Level Surfaces: .42
   2. Ramp Surfaces: .42

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product, including installation instructions.
B. Sustainable Design Submittals:
   1. Product Data: For interior field-applied traffic coatings, documentation including printed statement of VOC content.
C. Shop Drawings: For traffic coatings.
   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.
   1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.
B. Product Certificates: For each type of traffic coating.
C. Field quality-control reports.
D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS
A. Maintenance Data: For traffic coatings to include in maintenance manuals.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
B. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build mockup for each traffic coating and substrate to receive traffic coatings.
   2. Size: 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.9 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Adhesive or cohesive failures.
      b. Abrasion or tearing failures.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
   2. Warranty Period: Five years from date of Substantial Completion of project.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Source Limitations:
   1. Obtain traffic coatings from single source from single manufacturer.
   2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
   3. Obtain pavement-marking paint from single source from single manufacturer.
2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for vehicular traffic and equipment-room floor.

1. Basis of Design Product: Subject to compliance with requirements, provide Auto Guard F by Neogard or a comparable product by one of the following:

   a. BASF Construction Chemicals, LLC - Building Systems.
   b. Euclid Chemical Company (The); an RPM company.
   c. Sika Corporation US.
   d. Sonneborn

B. Materials

1. Vehicular Traffic Coating Materials:

   a. Primer: Concrete and metal primers by Neogard.
   b. Flashing Tape: 86218 flashing tape.
   d. Sealant: 70991 or 70995 urethane sealant.
   e. Aggregate: Uniformly graded #3 flint.
   f. Base Coat: FC7500/FC7960 urethane coating.
   g. Wear Coat: 70714/70715-09 100% solids epoxy.
   h. Topcoat (Non-UV Exposed Applications Only): 70714/70715-09 100% solids pigmented epoxy.
   i. Topcoat (UV Exposed Applications): FC7540/FC7964 series urethane coating.

C. Material Performance

1. Typical physical properties of cured vehicular traffic coating materials used on this project are:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES</th>
<th>TEST METHOD</th>
<th>FC7500/FC7960</th>
<th>70714/70715</th>
<th>FC7540/FC7964</th>
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<tr>
<td>Tensile Strength</td>
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<td>2000 psi</td>
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<tr>
<td></td>
<td>ASTM D638</td>
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<td>ASTM D638</td>
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<td>40%</td>
<td></td>
</tr>
<tr>
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<td>N/A</td>
<td>&lt;10%</td>
</tr>
<tr>
<td>Tear Resistant</td>
<td>ASTM D1004</td>
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<tr>
<td>Water Resistance</td>
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<td>&lt;2% @ 7 days</td>
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<tr>
<td></td>
<td>ASTM D570</td>
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<td></td>
<td></td>
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<tr>
<td>Taber Abrasion</td>
<td>ASTM D4060</td>
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<td>95 mg</td>
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<tr>
<td>Taber Abrasion 1,000</td>
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<td>95 mg</td>
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<tr>
<td>Shore A</td>
<td>ASTM D2240</td>
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<td>Adhesion</td>
<td>ASTM D4541</td>
<td>400 psi</td>
<td>400 psi</td>
<td>400 psi</td>
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</tbody>
</table>
D. Fire-Test-Response Characteristics: Provide traffic-coating materials with the fire-test-response characteristics as determined by testing identical products per test method below for deck type and slopes indicated by an independent testing and inspecting agency that is acceptable to authorities having jurisdiction.

1. Class A roof covering per ASTM E 108 or UL 790.

2.3 EQUIPMENT ROOM FLOOR COATING

A. Coating: Manufacturer’s standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for equipment-room floor.

1. Basis of Design Product: Subject to compliance with requirements, provide Peda-Gard M by Neogard or a comparable product by one of the following:
   a. BASF Construction Chemicals, LLC - Building Systems.
   b. Euclid Chemical Company
   c. Sika Corporation US.
   d. Sonneborn

B. Materials

1. Equipment Room Coating Materials:
   a. Primer: Concrete and metal primers as required by Neogard.
   b. Flashing Tape: 86218 flashing tape
   d. Sealant: 70991 or 70995 urethane sealant.
   e. Aggregate: 7992 (16/30 mesh) silica (quartz) sand.
   f. Base Coat: FC7500/FC7960 urethane coating.
   g. Topcoat (Non-UV Exposed Applications Only):
      h. FC7510/FC7961 polyurethane coating OR 70714/70715 100% solids pigmented epoxy.

C. Material Performance:

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<thead>
<tr>
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<th>70714/70715</th>
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<td></td>
<td>ASTM D638</td>
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<td>ASTM D2240</td>
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<td>400 psi</td>
</tr>
</tbody>
</table>

TRAFFIC COATINGS

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D. VOC Content: 100 g/L or less.
E. Low-Emitting Materials: Interior coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 ACCESSORY MATERIALS
A. Joint Sealants: As specified in Section "Joint Sealants."
B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.
   1. Thickness: Minimum 60 mils.
C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.
D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

2.5 DELINEATOR POSTS
A. A two-piece design consisting of HDPE or polypropylene round tubing bolted to a reboundable base; 360-degree reflectivity.
B. Provide one of the following:

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.
B. Verify that substrates are visibly dry and free of moisture.
   1. Test for moisture according to ASTM D 4263.
   2. Test for moisture content by measuring with an electronic moisture meter or by method recommended in writing by traffic-coating manufacturer.
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.
D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
   1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
   2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION
A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.
B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.

C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D4259. Do not acid etch.
   1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
   2. Remove concrete fins, ridges, and other projections.
   3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
   4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D4258.

3.3 TERMINATIONS AND PENETRATIONS
A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

3.4 JOINT AND CRACK TREATMENT
A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D4258.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION
A. Apply traffic coating according to ASTM C1127 and manufacturer's written instructions.

B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Start traffic-coating application in presence of manufacturer's technical representative.

D. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft.

E. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.

F. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

G. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

3.6 INSTALLATION OF DELINEATOR POSTS
A. Anchor posts to with anchor bolts or expansion anchors.
3.7 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800
TRAFFIC COATINGS

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Glass-fiber blanket insulation.
   5. Foam-in-place masonry wall insulation.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE
A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   5. Owens Corning.
B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
D. Sustainability Requirements: Provide glass-fiber blanket insulation with either of the following requirements:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 MINERAL WOOL BOARD INSULATION

A. Mineral Wool Board:

1. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   a. Nominal density of 4.5 lb/cu. Ft, Types IA and IB, thermal resistivity of 4.2 deg F x h x sq. ft./Btu x in. at 75 deg F.
      1) Thermafiber Rainbarrier 45, Dark Color.

B. Faced Mineral-Wool Board: ASTM C 612, Type III; faced on one side with foil scrim or foil scrim polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84. Nominal density of 8 lb/cu. ft.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Industrial Insulation Group, LLC (IIG-LLC); Johns-Manville.
   b. Roxul Inc.
   c. Thermafiber, Inc.; an Owens Corning company. FS-25

2.3 MINERAL-WOOL BLANKET INSULATION

A. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Industrial Insulation Group, LLC (IIG-LLC).
   b. Roxul Inc.
   c. Thermafiber, Inc.; an Owens Corning company.

2.4 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
d. Pactiv Building Products.

2. Type IV, 25 psi.

B. Foil-Faced, Polysisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Dow Chemical Company (The).
   c. Rmax, Inc.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.5 FOAM-IN-PLACE MASONRY WALL INSULATION

A. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly ratioed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

   1. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 0, 5 and 0 respectively.
   2. Combustion Characteristics: Must be noncombustible, Class A building material.
   3. Thermal Values: "R" Value of 4.91/inch at 32 degrees F mean; ASTM C-177.

B. Manufacturers of Foamed-In-Place Masonry Insulation: Subject to compliance with requirements, provide products from the following or approved equal by the Architect:

   1. "Core-Fill 500TM"; Tailored Chemical Products.

2.6 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      b. Gemco; Spindle Type.

   2. Plate: Perforated, galvanized carbon-steel sheet, 0.030-inch-thick by 2 inches square.

   3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Gemco; 90-Degree Insulation Hangers.

2. Angle: Formed from 0.030-inch thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.

3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. AGM Industries, Inc.; SC150.
   b. Gemco; S-150.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

   a. Crawl spaces.
   b. Ceiling plenums.
   c. Attic spaces.
   d. Where indicated.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air between face of insulation and substrate to which anchor is attached.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Gemco; Clutch Clip.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

   A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

   A. Comply with insulation manufacturer’s written instructions applicable to products and applications indicated.

   B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

   C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
   1. If not otherwise indicated, extend insulation a minimum of 36 inches in from exterior walls.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

3.5 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
   1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
   2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.6 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.

B. Installation: Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8-inches to 7/8 inches holes drilled into every vertical column of block cells (every 8 inches o.c.) beginning at an approximate height of four 4 feet from finished floor level. Repeat this procedure at an approximate height of ten 10 feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.
3.7 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100
SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.

1.2 DEFINITIONS
A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
D. ABAA: Air Barrier Association of America.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.
   1. Participants: Owner, Architect, Contractor, air barrier installer, air barrier manufacturer’s representative, and installers whose work interfaces with or affects air barrier.
      a. Include review of penetrations, building deflection joints, and other construction affecting air barrier installation.
      b. Review methods, procedures, and construction sequence for air barrier and related construction, including review of manufacturer’s written product specifications and installation instructions.
         1) Review requirements for coordination of air barrier with adjacent materials and construction.
      c. Review substrate conditions and finishes required to comply with manufacturer’s requirements for installation of air barrier including fastening and flatness of substrate.
   2. Air Barrier Manufacturer’s Acceptance: Obtain manufacturer’s acceptance of air barrier for intended use shown on Drawings and of compatibility of air barrier with all materials in contact with air barrier.
   3. Agenda:
      a. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
         1) Include review of penetrations, building deflection joints, and other construction affecting air barrier installation.
      b. Review methods, procedures, and construction sequence for air barrier and related construction, including review of manufacturer’s written product specifications and installation instructions.
         1) Review requirements for coordination of air barrier with adjacent materials and construction.
c. Review substrate conditions and finishes required to comply with manufacturer’s requirements for installation of air barrier including fastening and flatness of substrate.

4. Air Barrier Manufacturer’s Acceptance: Obtain manufacturer’s acceptance of air barrier for intended use shown on Drawings and of compatibility of air barrier with all materials in contact with air barrier.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include manufacturer’s written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.
B. Shop Drawings: For air-barrier assemblies.
   1. Show locations and extent of air barrier materials, accessories, and assemblies specific to Project conditions.
   2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   3. Include details of interfaces with other materials that form part of air barrier including, but not limited to, the following as applicable to this Project:
      a. Connection of air barrier in walls to roof membrane.
      b. Connection of air barrier in walls to air barrier in foundation.
      c. Application of air barrier to seismic and expansion joints.
      d. Application of air barrier to openings and penetrations by windows, storefront framing, curtain wall framing, door frames, piping, conduit, ducts, masonry ties, screws, bolts, and similar components and penetrations.
      e. Application of air barrier to precast concrete and other types of exterior wall construction.
C. Samples: Submit minimum 3-inch by 4-inch samples of each air barrier material, clearly labeled to indicate material and use in air barrier system.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with air barrier.
   1. Submit evidence that Installer is currently accredited under ABAA Quality Assurance Program, including accreditation number for ABAA Certified Installers.
C. Certifications
   1. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
   2. Acceptance of Materials: Submit document from air-barrier manufacturer certifying acceptance of materials proposed for use with air barrier that are not specified in this Section.
   3. Substrate Compatibility: Submit document from air-barrier manufacturer certifying that air barrier system materials used to adhere air barrier to substrate are chemically compatible.
   4. ABAA Certification: Submit evidence that air barrier system complies with requirements of ABAA Quality Assurance program specified in Quality Assurance article in this Section.
D. Field Quality-Control Reports: Submit test results from testing specified in Field Quality Control article in Part 3 of this Section.


1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA’s Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project. Refer to ABAA web site for current listing of ABAA accredited installers.

B. ABAA Quality Assurance Program: Comply with requirements of ABAA Quality Assurance Program and cooperate with ABAA inspectors and independent testing and inspection agencies engaged by Owner. Do not permit covering of air barrier system until after inspection, testing, and acceptance by ABAA inspectors and testing and inspection agencies.

1. Refer to Air Barrier Association of America (ABAA) web site for listing of contractors complying with this requirement (www.airbarrier.org).

C. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly as indicated on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

   a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.

   b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.

   c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

   1. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 783.

   2. Quantitative Water-Leakage Testing: Test mockups for air leakage according to ASTM E 1105.

   3. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541. Include adhesion testing for transition membranes and submit documentation of measures required to correct failures of adhesion.
4. Notify Architect seven (7) days in advance of the dates and times when mockups will be tested.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS
A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
   1. Protect substrates from environmental conditions that affect air-barrier performance.
   2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
   1. Movement/Control Joints: Provide air barrier assembly capable of accommodating movements of building and building materials, including providing expansion and control joints and applicable accessories required to accommodate these movements.
      a. Provide air barrier assembly capable of withstanding combined design wind, fan, and stack pressures, positive and negative, on building envelope without damage or displacement and transferring loads to structure.
      b. Provide air barrier assembly materials that do not displace adjacent materials and air barrier assembly materials under full load.
      c. Provide air barrier assembly joined in airtight and flexible manner to air barrier materials incorporated into adjacent construction and that allows relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.
   2. Connections to Adjacent Materials: Provide connections to adjacent materials that prevent air leakage at following locations:
      a. Foundation and walls, including penetrations, ties and anchors.
      b. Walls, windows, curtain walls, storefronts, louvers and doors.
      c. Different assemblies and fixed openings within those assemblies.
      d. Wall and roof connections.
      e. Floors/soffits over unconditioned space.
f. Walls, floor and roof across construction, control and expansion joints.
g. Walls, floors and roof to utility, pipe and duct penetrations.
h. Seismic and expansion joints.
i. All other potential air leakage pathways in building envelope.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Carlisle Coatings & Waterproofing Inc; CCW-705.
   b. Grace Construction Products; Perm-A-Barrier Wall Membrane.
   c. Henry Company; Blueskin SA.
   d. Polyguard Products, Inc.; Polyguard 400 Sheet Air Barrier.
   e. Rubber Polymer Corporation, Inc.; Rub-R-Wall SA.
   f. Tremco Incorporated; ExoAir 110/110LT.
   g. W. R. Meadows, Inc; Air-Shield.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Tensile Strength: Minimum 250 psi; ASTM D 412, Die C.
   c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
   d. Puncture Resistance: Minimum 40 lbf; ASTM E 154/E 154M.
   e. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 570.
   f. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M, Desiccant Method.
   g. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541 as modified by ABAA.
   h. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   i. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflushing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
   1. VOC Content: 250 g/L or less.
   2. Low-Emitting Materials: Interior coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the
Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187-inch thick, and Series 300 stainless-steel fasteners.

D. Preformed Silicone Extrusion: Manufacturer’s standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; Dow Corning 123 Silicone Seal.
   b. GE Construction Sealants; US11000 UltraSpan.
   c. Pecora Corporation; Sil-Span.
   d. Tremco Incorporated; Spectrem Simple Seal.

E. Membrane at Transitions in Substrate and Connections to Adjacent Elements:

1. Perimeter of Curtain Wall Assemblies Cover transition assemblies specified in applicable Division 08 Sections with air barrier sheet. Ensure air barrier sheet is compatible with transition assemblies specified in applicable Division 08 Sections to ensure adherence of transition membrane to air barrier sheet for continuity of air barrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

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

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer’s written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer’s written instructions and details.

3.3 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details and according to recommendations in ASTM D 6135 to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air-barrier sheet produced for low-temperature application. Do not install low-temperature sheet if ambient or substrate temperature is higher than 60 deg F.

2. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Reprime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform 2-1/2-inch minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water.

2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch wide, transition strip.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate air-barrier installation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

3. Ensure joints in substrate materials covered by air barrier system are covered with materials compatible with air barrier system.

I. Connect and seal exterior wall air-barrier sheet continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems,
glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

1. Coordinate all penetrations or mechanical fastenings through air barrier system and substrate to supporting framing to ensure transition membrane is fully bonded, provides not less than 3 inches of exposure on all sides of attachment, and all penetrations are sealed with accessories compatible with air barrier system.

J. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

K. Apply joint sealants forming part of air-barrier assembly within manufacturer’s recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

L. Wall Openings: Prime concealed, perimeter frame surfaces of windows and doors. Apply preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
   1. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
   2. Refer to Division 08 sections for entrances and storefronts and curtain walls for transition assemblies for concealed perimeter frame surfaces for entrances and storefronts and curtain walls.
      a. Coordinate with curtain wall and storefront installers to ensure compatibility between transition membranes and transition assemblies specified in applicable curtain wall and storefront Sections.

M. Fill gaps in perimeter frame surfaces of windows doors, and miscellaneous penetrations of air-barrier material with foam sealant.

N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

O. Do not cover air barrier until it has been tested and inspected by testing agency.

P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA’s Quality Assurance Program.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Cooperate with Owner’s testing agency, allowing Owner’s testing agency access to work areas and staging and notifying Owner’s testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection by Owner’s testing agency. Do not cover Work of this section until testing and inspection by Owner’s testing agency has been completed and accepted.

C. ABAA Installer Testing and Audits: Cooperate with ABAA testing agency, allowing ABAA testing agency access to work areas and staging and notifying ABAA testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection by ABAA testing agency. Do not cover Work of this section until testing and inspection by ABAA testing agency has been completed and accepted.
1. Cost of ABAA Testing and Audit: Arrange and pay for site inspections and testing by ABAA to verify conformance of air barrier with specified requirements, air barrier system manufacturer’s installation instructions, and ABAA Site Quality Assurance Program.

2. Extent of Audit and Testing: Provide audit and testing as follows:
   a. Up to 10,000 sq. ft.: 1 audit/test.
   b. 10,001 to 35,000 sq. ft.: 2 audits/tests.
   c. 35,001 to 75,000 sq. ft.: 3 audits/tests.
   d. 75,001 to 125,000 sq. ft.: 4 audits/tests.
   e. 125,001 to 200,000 sq. ft.: 5 audits/tests.
   f. 200,001 sq. ft. and over: 6 audits/tests.

3. Reporting: Submit written audit/testing reports to Architect within 10 working days of date inspection and testing performed.

4. Correction: If audit and testing reveals defects, promptly remove and replace defective air barriers at no additional cost to Owner.

D. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.
7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

E. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

F. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

G. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

H. Prepare test and inspection reports.
3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer’s written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer’s written instructions.

2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 072713
SECTION 072730 - SPRAYED POLYURETHANE FOAM INSULATION AND AIR BARRIER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Materials and installation methods for a spray polyurethane foam building insulation and air barrier system located in exterior wall assemblies.
2. Materials and installation to bridge and seal the following air leakage pathways and gaps:
   a. Seismic and expansion joints.
   b. Openings and penetrations of window frames, store front, curtain wall.
   c. Barrier precast concrete and other envelope systems.
   d. Door frames.
   e. Piping, conduit, duct and similar penetrations.
   f. Masonry ties, screws, bolts and similar penetrations.
   g. All other air leakage pathways in the building envelope.
3. Materials to act as flashings and counterflashings.

1.2 DEFINITIONS

A. ABAA: Air Barrier Association of America.
B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Include all spray foam applicator tradesmen, manufactured, installers of other construction connecting to air barrier, including sealants, windows, and door frames.
      a. Include a representative from the Air Barrier Association.
   2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Sustainable Design Submittals:
   1. Provide Product Data for VOC Content: For polyurethane foam used inside of the weatherproofing system, documentation including printed statement of VOC content.
   2. Provide Product Data indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
      a. Include statement indicating costs for each product having recycled content.
3. **Product Data for Regional Materials:** Submit a statement from aluminum manufacturer stating the distance between the place of extraction, harvesting, recovery and manufacturing and the Project location and the percentage by weight.

C. **Shop Drawings:** Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and ties with adjoining construction.
   1. Include details of interfaces with other materials that form part of air barrier.
   2. Include details of mockups.

### 1.5 INFORMATIONAL SUBMITTALS

A. **Qualification Data:** For Applicator.

B. **Quality Assurance Program:** Submit evidence of current accreditation of the subcontractor and certification of the installers under the Air Barrier Association of America’s (ABAA) Quality Assurance Program. Submit accreditation number of subcontractor and certification number of installers.

### 1.6 QUALITY ASSURANCE

A. **Applicator Qualifications:** A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and that is accredited by the Air Barrier Association of America (ABAA), and whose installers are certified in accordance with the ABAA Quality Assurance Program.

   1. Installers shall also be certified by ABAA/BPQI (Building Performance Quality Institute) in accordance with the training requirements outlined in the ULC S705.2-05 Installation Standard. Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.

B. **Mockups:** Before beginning installation of air barrier, build mockups of exterior wall assembly shown on Drawings, incorporating backup wall construction, external cladding, window, door frame and sill, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

   1. Coordinate construction of mockup to permit inspection by Owner’s testing agency of air barrier before external cladding is installed.
   2. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
   3. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
   4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. **Single-Source Responsibility:** Obtain air barrier materials from a single manufacturer regularly engaged in manufacturing the product.

D. **Regulatory Requirements:** Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

### 1.7 PRECONSTRUCTION TESTING

A. **Mockup Testing:** Air barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.
1. Owner may engage a qualified testing agency.
2. Notify Architect seven days in advance of the dates and times when mockup testing will take place.

B. Mock-Up Tests for Air and Water Infiltration: Test mock-up for air and water infiltration in accordance with ASTM E 1186 (air leakage location) or ASTM E 783 (air leakage quantification), and ASTM E 1105 (water penetration). Use smoke tracer to locate sources of air leakage. If deficiencies are found, reconstruct mock-up and retest until satisfactory results are obtained. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.

1. Perform the air leakage tests and water penetration test of mock-up prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements.

C. Mock-Up Tests for Adhesion: Test mock-up of materials for adhesion in accordance with manufacturer’s recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D 4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, then the inspector shall simply record the value.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Protect stored materials from direct sunlight.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Avoid spillage. Immediately notify Architect if spillage occurs and start clean up procedures.

D. Clean spills and leave area as it was prior to spill.

E. Waste Management and Disposal

1. Separate and recycle waste materials in accordance with Division 01 Section “Construction Waste Management and Disposal” and with the Waste Reduction Workplan specified in that Section.

2. Place materials defined as hazardous or toxic waste in designated containers.

3. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.9 FIELD CONDITIONS

A. Environmental Conditions: Apply air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.

1. Do not apply air barrier in snow, rain, fog, or mist.

2. Do not apply air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

B. The product shall not be installed after the expiry date printed on the label of each container.
WARRANTY

A. System Warranty: Provide the air barrier system manufacturer’s 3-year system warranty, including the primary air barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

B. Air Barrier Installation Warranty: Provide air barrier system installer’s 2-year warranty from date of Substantial Completion, including all components of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 SPRAYED POLYURETHANE FOAM INSULATION AND AIR BARRIER SYSTEM

A. Closed-Cell Polyurethane Foam Insulation and Air Barrier System: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Products: Subject to compliance with requirements, provide one of the following or an approved equal product:

   a. BASF Corporation: Walltite Series Building Envelope Insulation System.
   b. Demilec USA LLC: HEATLOK SOY.
   c. Dow Chemical Company: Styrofoam SPF RS 2045.
   e. NCFI Polyurethanes: Insulbloc.

B. Performance Requirements: Provide an air barrier system capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge incidental condensation or water penetration to the exterior as well as accommodating substrate movement and sealing of substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

   1. Material Performance: Provide materials which have an air permeance not exceeding 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) when tested according to ASTM E 2178.

   2. Spray Polyurethane Foam: Meet requirements of ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification. CCMC Evaluation Report. Upon request, submit reports from accredited testing laboratory indicating compliance with specified requirements. Meet or exceed the following performance requirements:

      a. Design R Value: Minimum R6 per inch.
      b. Density: 1.9 pounds per cubic foot.
      c. Surface Burning Characteristics: Smoke development not greater than 450 and flame spread not greater than 25 when tested in accordance with ASTM E 84.

   3. Water Vapor Permeance: 1.4 perm/inch when tested per ASTM E96 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

   5. Closed Cell Content: ASTM D2842; 90 percent.
   6. Water Absorption: ASTM D2842; 2.5 percent by volume.
   7. Connections to Adjacent Materials: Provide connections to prevent air leakage at the following locations:
a. Walls, windows, curtain walls, storefronts, louvers or doors.
b. Different wall assemblies, and fixed openings within those assemblies.
c. Wall and roof connections.
d. Walls and floor across construction, control and expansion joints.
e. Walls and floors to utility, pipe and duct penetrations.
f. Seismic and expansion joints.
g. All other leakage pathways in the building envelope.

C. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage rate not to exceed 0.040 cubic feet per square foot per minute under a pressure differential of 0.03 in. water (1.57 psf) when tested in accordance with ASTM E 2357. Assembly shall perform as liquid drainage plane flashed to discharge condensation or water penetration to the exterior. Assembly shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air and vapor seal materials at such locations, changes in substrate and perimeter conditions.

1. Assembly shall be capable of withstanding positive and negative combined design, wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure.
2. Assembly shall not displace adjacent materials under full load.
3. Assembly shall be joined in an airtight and flexible manner to the air barrier materials due to thermal and moisture variations and creep, and anticipated seismic movement.

2.2 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by air/ barrier manufacturer for intended use and compatible with the air barrier.

B. Primer: Water based liquid primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates, as recommended by manufacturer.

C. Membrane at Transitions in Substrate and Connections to Adjacent Elements: Subject to compliance with requirements, provide one of the following products acceptable to the spray polyurethane foam air barrier system manufacturer:

1. Carlisle Coatings and Waterproofing; CCW-705 TWF.
2. Grace Construction Products; Perm-A-Barrier Flashing.
3. Henry Company, Inc.; Blueskin SA.
5. Tremco, Inc.; ExoAir 110.

D. Sealant: Provide sealants in accordance with Division 07 Section Joint Sealants complying with ASTM C920 classifications for type, grade, class, and uses.

1. SPF (Sprayed Polyurethane Foam) Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant with the following characteristics:

   a. Density: 1.5 to 2.0 PCF.
   b. Flame Spread (ASTM E162): 25 or less.
   c. Initial R-Value (at 1 inch): Not less than 5.9.
   d. Products: Subject to compliance with requirements.

E. Thermal barrier: Provide thermal barriers in accordance with Division 07 Section Applied Fireproofing.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which air barrier systems will be applied, with Installer present, for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after minimum concrete curing period recommended by air barrier manufacturer.
2. Ensure that:
   a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
   b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
   c. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.

3.2 PREPARATION

A. Clean, prepare, and treat substrate according to air barrier system manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions according to air barrier system manufacturer's written instructions and approved tested system in accordance with ABAA air barrier testing protocol.

1. Verify that surfaces and conditions are suitable to accept work as outlined in this section.
2. Prior to commencement of air barrier installation, report in writing to the Architect any defects in surfaces or conditions that may adversely affect the performance of products installed under this section.
3. Commencement of air barrier installation indicates acceptance of existing conditions.
4. Examine joints before sealing to ensure configurations, surfaces and widths are suitable for spray polyurethane foam. Report in writing to the Architect all defects stating the locations of joints deemed unacceptable for the application of the spray polyurethane foam.
5. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion and integrity of the spray polyurethane foam. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam. Ensure surfaces are dry before proceeding.
6. Ensure surfaces to receive foam insulation are clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
7. Ensure that all work by other trades that may penetrate through the air barrier system is in place and complete.
8. Ensure that surface preparation and any primers required conform to the air barrier system manufacturer’s instructions.
9. Install transition membranes to all applicable surfaces and ensure proper adhesion of the transition membranes to the substrate, capable of having spray polyurethane foam insulation.

10. Install counter-flashings.
   a. Membrane: Cut into and uncover only 3-inches of siliconized release paper along one edge of the counter-flashing membrane. Adhere membrane flashing to the pre-primed substrate a minimum of 3-inches and roll firmly in place.
   b. Ensure veneer anchors are in place.

C. Prime substrate for application of sheet membrane transition strips as recommended by air barrier system manufacturer and as follows:
   1. Prime masonry, concrete substrates with conditioning primers.
   2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
   3. Prime wood, metal, and painted substrates with primer.

D. Protection from Spray Applied Materials:
   1. Mask and cover adjacent areas to protect from over spray.
   2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
   3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
   4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

3.3 APPLICATION

A. Transition Strip Installation: Install transition strip materials to provide continuity throughout the building envelope and in accordance with air barrier system manufacturer's recommendations, including the following:
   1. Apply primer for transition strips at rate recommended by air barrier system manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.
   2. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches, unless greater overlap is recommended by air barrier system manufacturer. Roll into place with roller.
   3. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inches, unless greater overlap is recommended by air barrier system manufacturer. Roll seams with roller.
   4. Seal around all penetrations with a transition strip or other procedure in accordance with air barrier system manufacturer's recommendations.
   5. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors, penetrations, and other intersection conditions using transition membranes and in accordance with the air barrier system manufacturer's recommendations.
   6. At changes in substrate plane, provide transition material recommended by the air barrier system manufacturer to make a smooth transition from one plane to another.
   7. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Provide substrate that continuously supports membrane.
8. At through-wall flashings, provide an additional 6-inch wide strip of membrane counterflashing recommended by air barrier system manufacturer to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic as recommended by air barrier system manufacturer.

9. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

10. At expansion and seismic joints provide transition to the joint assemblies.

11. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the air barrier system manufacturer when membrane will be exposed to the elements.

12. At end of each working day, seal top edge of self-adhered membrane to substrate with termination mastic if exposed.

13. Do not allow materials to come in contact with chemically incompatible materials.

14. Do not expose transition membrane to sunlight longer than as recommended by the air barrier system manufacturer.

15. Inspect installation prior to enclosing assembly and repair damaged areas with spray polyurethane foam as recommended by air barrier system manufacturer.

B. Spray Application of Polyurethane: Install materials in accordance with air barrier system manufacturer's recommendations, ULC S705.2 and the following:

1. Provide equipment to spray polyurethane foam complying with ULC S705.2 and the air barrier system manufacturer’s recommendations for the specific type of application. Record equipment settings on the Daily Work Record as required by the ULC S705.2 installation standard. Provide each proportioner unit supplying only one spray gun.

2. Apply only when surfaces and environmental conditions are within limits prescribed by the air barrier system manufacturer and the ULC S705.2 Installation standard.

3. Apply in consecutive passes as recommended by air barrier system manufacturer to thickness as indicated on Drawings in passes not less than 1/2 inch and not greater than 2 inches. Apply additional 2-inch pass only after first pass has had time to cool down. Do not apply more than 4 inches in a single day.

   a. Maximum Variation from Indicated Thickness: Minus 1/4-inch; plus 1/2-inch.

4. Install within air barrier system manufacturer’s tolerances, but not more than minus 1/4 inch or plus 1/2 inch.

5. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.

6. Ensure finished surface of foam insulation are free of voids and embedded foreign objects.

7. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

8. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.

9. Clean and restore surfaces soiled or damaged by work of this Section. Coordinate with applicator of work soiled to ensure cleaning methods will not damage the soiled work.

10. Complete connections to other components and repair any gaps, holes or other damage using material which conforms to ULC S710.1 or ULC S711.1 and installed in accordance with ULC S710.2 or ULC S711.2 as applicable.

C. Do not permit adjacent work to be damaged by work of this Section. Repair damage to work of this Section caused by work of other sections at no additional cost to Owner.
3.4 FIELD QUALITY CONTROL

A. Owner’s Inspection and Testing: Cooperate with Owner’s testing agency. Allow access to work areas and staging. Notify Owner’s testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Daily inspection and testing may be required. Do not cover Work of this Section until testing and inspection is accepted.

B. Field Quality Assurance: Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Do not cover air barrier until it has been inspected, tested and accepted.

C. ABAA Site Inspections: Arrange and pay for site inspections by ABAA to verify conformance with the air barrier system manufacturer’s instructions, the ULC S705.2 Installation standard, the ABAA Quality Assurance Program, and this Section.
   1. Provide inspections and testing at 5 percent, 50 percent and 95 percent completion. Submit written inspection reports to the Architect within 10 working days of the inspection and test being performed.
   2. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Owner.

3.5 CLEANING AND PROTECTION

A. Protect air barrier assemblies from damage during application and remainder of construction period, according to air barrier system manufacturer’s written instructions.
   1. Coordinate with installation of materials which cover air barrier, to ensure exposure period does not exceed that recommended by the air barrier system manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 072730
SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Exposed-fastener, lap-seam metal wall panels.

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
   B. Shop Drawings:
      1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
      2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
   C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.
      1. Include Samples of trim and accessories involving color selection.
   D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
      1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For metal panels to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
   B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
   C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
   D. Retain strippable protective covering on metal panels during installation.
1.6 FIELD CONDITIONS
A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.7 COORDINATION
A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS
2.1 PERFORMANCE REQUIREMENTS
A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS
A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.
B. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following product:
      a. Style Rib by CENTRIA Architectural Systems
      b. or comparable product by one of the following:
         1) Firestone Building Products.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755.
   a. Nominal Thickness: 0.034 inch.
   c. Color: Match existing panel.

5. Panel Depth: 1.5 inches.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653, G90 hot-dip galvanized coating designation or ASTM A 792, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
   1. Extruded aluminum exterior panel trim: Extrusions to 6063-T5 aluminum with exposed surfaces painted to match wall panels. Trim details to provide sharp, crisp appearance with maximum 2-inch sight lines and not exposed fasteners, unless otherwise noted.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product:
         1) MicroLine as manufactured by CENTRIA.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

F. Substructure: Refer to Section “Cladding Support Systems”.

G. Insulation: Refer to Section “Thermal Insulation.”

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.


3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
C. Steel Panels and Accessories:
   1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish 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.

D. Aluminum Accessories:
   1. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
   1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
   2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
      a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install substructure, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

B. Install insulation according to manufacturer written instructions.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Shim or otherwise plumb substrates receiving metal panels.
   2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
   3. Install screw fasteners in predrilled holes.
   4. Locate and space fastenings in uniform vertical and horizontal alignment.
   5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with mastic sealant, concealed within joints.
3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.13
SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes
      1. Metal composite material wall panels, including mounting system and associated components required for complete system.

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel installer, metal composite material panel manufacturer's representative, structural-support installer, and installers whose work interfaces with or affects metal composite material panels, including, but not limited to, installers of supporting construction, air barrier, doors, windows, and louvers.
      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 methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
      4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
      5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
      6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
      7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
      9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
      2. Include manufacturer's physical characteristics for all components of metal composite material wall panel system as shown on Shop Drawings.
   B. Shop Drawings: Submit shop drawings prepared by, or under supervision of, Structural Design Engineer as specified in Quality Assurance article below and including Structural Design Engineer's stamp or seal on all shop drawings including system attachments and anchors.
      1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
         a. Identify factory-assembled and field-assembled work.
b. Show substrates receiving metal composite material wall panel system and adjacent construction requiring coordination with metal composite material wall panel system installation.

c. Include details showing integration of metal composite material wall panel system with air barrier system.

d. Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

2. Submit computer-generated drawings; manually-prepared drawings not acceptable.

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.
   1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

E. Delegated Design: Submit structural analysis of metal composite material wall panel system demonstrating compliance with specified design loading with signature and seal of Structural Design Engineer as specified in Quality Assurance article below.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit certification and supporting information indicating compliance with requirements specified in Quality Assurance article below for following:
   1. Installer.
   2. Fabricator.
   3. Structural design engineer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field Quality-Control Reports: Submit following reports:
   1. Results of tests conducted on mockups.
   2. Metal composite material wall panel manufacturer’s field reports indicating what was observed and what changes were requested or required by manufacturer. Submit within 48 hours after manufacturer’s field observations.
   3. Inspection reports and letters from air barrier installer and metal composite material wall panel manufacturer indicating acceptance of conditions where panel system is to be installed. Submit report and letter prior to starting panel system installation.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer: Provide representation by manufacturer’s field representative during construction and provide written acceptance of installer and fabricator.
   2. Installer: An entity specializing in installation of metal composite material wall panel systems that employs installers and supervisors who trained and approved by metal
composite material wall panel manufacturer with minimum 3 years documented experience in installing metal composite material wall panel system similar in nature and scope to system to be installed as part of this Project.

3. Fabricator: An entity specializing in fabrication of specified metal composite material wall panel components as indicated for installation as part of this Project and who is acceptable to metal composite material wall panel manufacturer.

4. Structural Design Engineer: Qualified professional structural engineer licensed in state where Project is located and experienced in design of metal composite wall panel systems responsible for design of structural support and anchorage for metal composite material wall panel system as shown on Drawings.

B. Single Source: Obtain metal composite material wall panels and related components from single manufacturer.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, soffits, supports, attachments, and accessories. Include substrate construction with air barrier system as installed on Project.

2. Testing: Conduct following testing of mockups:
   a. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
   b. Air and Water Tightness: Conduct testing of area in mockup containing panel anchors penetrating air barrier for air and water tightness in accordance with performance and testing requirements specified in Division 07 air barrier sections of Project Manual.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.
B. Field Measurements: Take field measurements prior to completion of shop fabrication of metal composite material wall panels. Coordinate panel fabrication schedule with construction progress schedule as established by Contractor to avoid delay of construction.

C. Field Modification: Metal composite material wall panels may be modified in field as required to ensure proper fit as acceptable to panel manufacturer and Architect. Keep field modifications to absolute minimum, ensuring majority of fabrication accomplished under manufacturer and fabricator controlled conditions.

1.9 COORDINATION

A. Coordinate metal composite material panel installation with flashing, trim, construction of soffits, coping system, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Coordinate metal composite material panel system installation in manner to ensure integrity of air barrier system is not disrupted. Provide monitoring and inspection of metal composite material panel system installation by air barrier system installer and manufacturer’s representative.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: 1.57 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems - Extruded Thermoplastic Core: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, and accessories required for weathertight system. Provide system where panels anchored to supporting construction without exposed fasteners.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

1. Rain Screen Wall Assemblies: Provide complete support framing and attachment system for installation of rain screen wall assemblies resulting in continuous insulated wall assembly when combined with insulation and cladding that is thermally isolated from structural wall framing by thermal spacers.

2. Thermal Spacers: Refer to Section 074800 - Cladding Support Systems for thermal spacers.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim:

1. Provide flashing and trim formed from same material as metal composite material panels in not less than 0.050-inch thickness unless otherwise indicated as required to seal against weather and to provide finished appearance.

2. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers.
3. Finish flashing and trim with same finish system as adjacent metal composite material panels.
4. Provide lap strap under flashing where flashing abut adjoining construction and seal lapped surfaces with full bed of non-hardening sealant.

D. Fasteners:
1. Exposed Fasteners: Stainless steel; not acceptable unless acceptable to Architect.
2. Screws: Self-tapping or self-drilling Type 410 stainless steel or zinc-alloy steel screws designed to withstand design loads and provided with EPDM or PVC sealing washers under heads of exposed fasteners and bearing on weather side of metal composite material wall panels.
4. Fasteners for Flashing and Trim: Blind fasteners of high-strength aluminum or stainless steel.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.4 FABRICATION
A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Panel Fabrication: Fabricate panels with 1-inch deep pans formed from metal composite material sheet by routing back edges of sheet, removing corners, and folding edges.
1. Reinforce corners with riveted aluminum angles.
2. Provide concealed attachment to supporting structure by adhering attachment members to back of panel. Attachment members may also function as stiffeners.
3. Maintain maximum panel bow of 0.8 percent of panel dimension in width and length. Provide stiffeners of sufficient size and strength to maintain panel flatness without showing local stresses or read-through on panel face.
4. Secure members to back face of panels using structural silicone sealant approved by metal composite material sheet manufacturer.
5. Fabricate panels under controlled shop conditions.
6. Fabricate as indicated on Drawings and as recommended by metal composite material sheet manufacturer.
   a. Make panel lines, breaks, curves and angles sharp and true.
   b. Keep plane surfaces free from warp or buckle.
   c. Keep panel surfaces free of scratches or marks caused during fabrication.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
   a. Size: As recommended by SMACNA’s "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES
   A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

   B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

   C. Aluminum Panels and Accessories:
      1. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish 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.
      2. Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes 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.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.
      1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
      2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.
         a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

   B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

   C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 **PREPARATION**

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal composite material panel manufacturer’s written recommendations.

3.3 **METAL COMPOSITE MATERIAL PANEL INSTALLATION**

A. General: Install metal composite material panels according to manufacturer’s written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistant barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Air Barrier: After installation of attachment assembly and prior to installing metal composite material wall panels and at no additional cost to Owner, provide following:
   a. In accordance with recommendations of air barrier manufacturer and as directed by air barrier installer, seal penetrations in air barrier created by screws used to secure wall panel system support structure as required to ensure air barrier warranty is not compromised.
   b. In accordance with recommendations of air barrier manufacturer and as directed by air barrier installer, seal holes or tears in air barrier created by installation of metal composite material wall panels as required to ensure air barrier warranty is not compromised.
   c. After repairs to air barrier system, retest air barrier system for air and water tightness in accordance with requirements in Section where applicable air barrier is specified.
and submit field reports of all testing demonstrating compliance with requirements specified in Section where applicable air barrier is specified.

d. Prior to proceeding with metal composite material wall panel installation:

1) Repeat repair and testing process until testing results comply with requirements specified in Section where applicable air barrier is specified as acceptable to Architect.

2) Arrange for inspection of all repairs to air barrier by air barrier manufacturer and air barrier installer and obtain written acceptance of air barrier system with repairs.

E. Rainscreen-Principle Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.

2. Do not apply sealants to joints unless otherwise indicated.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Install metal composite material wall panels square, plumb, straight, and true, accurately fitted with tight joints and intersections maintaining following tolerances:

1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.

2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.

3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Manufacturer’s Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

D. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor’s expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer’s written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23
SECTION 074800 – CLADDING SUPPORT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cladding support systems for cladding systems specified in Division 07 Sections:
   a. Fiberglass clip system.
   b. Wall bracket system.
   c. Thermal break/clip system.
   d. Continuous insulation composite framing support system.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Coordinate construction of cladding support system over substrate indicated for drainage, flashing, trim, back-up support, soffits and related work as required or recommended by cladding support system manufacturer.

1. Review and finalize schedule for installation of cladding support system.
2. Verify availability of materials, installer's personnel, equipment, and facilities required to maintain schedule.
3. Review means and methods related to cladding support system installation, including manufacturer's written instructions.
4. Review support conditions for compliance with cladding support system requirements, including alignment and attachment to structural support system.
5. Review details for flashings, wall cladding, wall penetrations, openings, and condition of other construction affecting cladding support system installation.
6. Review temporary protection requirements for, during, and after cladding support system installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.
B. Shop Drawings: Include plans, sections, details, and attachments to other work.
C. Delegated-Design Submittal: For cladding support system, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.
D. Compatibility Letter: Submit letter from sealant manufacturer on sealant manufacturer’s standard letterhead, stating that sealant used to seal air barrier is compatible with air barrier.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Not less than 3 years' experience specializing in manufacturing cladding support system products complying with requirements specified in this Section.
B. Installer Qualifications:

1. Trained and authorized by manufacturer as qualified to install work of this Section.
2. Employ full-time on-site superintendent or foreman to oversee installation during work of this Section.
3. Able to show successfully completed projects of equivalent scope and quality upon request by Architect.
C. Mock-Ups: Build mockups to verify selections made, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Mock up complete cladding support system at location as directed by Architect.
   2. Include substrate, air barrier, insulation, framing, flashing, thermal isolation, and treatment at fenestrations, corners, and transitions.
   3. Verify mock-up as conforming to manufacturer’s instructions and provisions of Contract Documents.
   4. Do not begin work of this Section until after inspection by manufacturer’s representative is complete and mock-up has been accepted in writing by Architect.
   5. Protect and maintain accepted mock-up as standard of quality for work of this Section.
   6. Approval of mockups is for 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.
   7. Approved mock-ups may be incorporated into the work of this Section.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials to Site in manufacturer’s original unopened containers and packaging with labels clearly identifying product name and manufacturer.
   B. Deliver components and other manufactured items or accessories without damage or deformation.
   C. Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with cladding support system manufacturer's instructions.
   D. Handle components in strict compliance with manufacturer’s written instructions and recommendations and in a manner to prevent bending, warping, twisting, and surface, edge, or corner damage.

1.6 SITE CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of cladding support systems in accordance with cladding support systems manufacturer's written installation instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Delegated Design: Engage qualified professional engineer, as defined in Division 01 Section “Quality Requirements,” to design cladding support system.
   B. General Performance: Comply with performance requirements specified, representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
      1. Cladding support system shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
a. Align cladding support system movement joints with substrate movement joints, unless otherwise noted.

2. Failure includes the following:
   a. Thermal stresses transferring to building structure.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Loosening or weakening of fasteners, attachments, and other components.

C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Dead Loads: As indicated on Drawings.
   3. Other Design Loads: As indicated on Drawings.

D. Allowable Fastener Loads: Coordinate with substrate and framing systems to determine fastener types and sizes, and required minimum thicknesses of substrate framing members required for screw pull-out resistance.

E. Design cladding support system to coordinate and align with substrate framing system specified in Division 05, and cladding system specified in Division 07.

F. Deflection of Framing Members: At design wind pressure, as follows:
   1. As required by manufacturer of materials supported by cladding support system.

2.2 CLADDING SUPPORT SYSTEMS - GENERAL

A. Contractor Option: Provide either Fiberglass Clip System or Wall Bracket System or Continuous Insulation Girt System or Thermal Break/Clip System or as specified in this Article.

2.3 FIBERGLASS CLIP SYSTEM (FCS)

A. Description: Cladding support system consisting of fiberglass thermal spacer and steel Z girts.

B. Basis-of-Design Product: Subject to compliance with the requirements, provide "Cascadia Clip" by Cascadia Windows and Doors, or comparable product.

C. Thermal Spacer: Low conductivity thermal spacer; 4 inches deep or as required for insulation thickness.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 955.
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Depth: As indicated on Drawings.
   3. Coating: ASTM C 1003, G90 (Z275) or equivalent.

2.4 WALL BRACKET SYSTEM (WBS)

A. Description: Thermally insulated system, isolated from support supporting structure.

B. Basis-of-Design Product: Subject to compliance with requirements, provide following products by Knight Wall Systems or comparable product.
   1. System: "MFI-System D-Series Rain Screen System."
   2. Wall Brackets: "TheraBracket-D."
   3. Vertical Rail: "D-Rail."
   4. Horizontal Rail: "PanelRail."
   5. Thermal Barrier: "ThermaStop™ Isolators."
C. Wall Brackets:
   1. Minimum 0.074 inch thick (14 gauge) sheet steel.
   2. Pre-Punched Holes: For minimum two wall anchors per bracket.
   3. Stem for Connecting Rail to Bracket: Must not penetrate exterior layer of insulation.
      a. Dimensions: 1.125 inch wide by 1.375 inch long
         1) Holes allow minimum 0.75 inch adjustment allowing for aligning and plumbing of framing, independent of substrate irregularities and proper cladding installation.
            a) Spaced appropriately to maintain proper alignment of vertical rails
   4. Dimensions: As required to offset cladding from wall plane where meeting substrate and to allow for installation of insulation equal in thickness to offset.
      a. Bracket Base Dimension – Minimum 3.25 inch high and 2.125 inch wide
      b. Offset Brackets – 4-inch depth or as required for insulation thickness.
         1) Align offsets to differing wall planes as shown on Drawings.

D. Vertical Rail:
   1. Minimum 0.0475-inch thick (18 gauge) cold-formed steel.
   2. Profile: C channel, two flanges of equal length and one web.
   3. Nominal Dimensions: 1.5 inch flange for attaching to wall bracket and 1.5 inch at web.
   4. Pre-Punched Attachment Holes: 1.0 inch on center along length of track and oversized allowing for thermal contraction and expansion of rail without placing stress on brackets.

E. Thermal Barrier: Injection molded Polyoxymethylene copolymer (POM)
   1. Size:
      a. Washer Isolation: Designed to thermally isolate fastener heads from metal, minimum 0.125 inch thick
      b. Framing member to framing member isolation: minimum 0.125 inch thick.

2.5 THERMAL BREAK/CLIP SYSTEM (TBCS)
A. Description: Cladding support system consisting of adjustable clip, thermal barrier strip on both ends of clip, and Z-girts.
B. Clip: Adjustable 2-piece stainless steel clip attached to exterior of structure with not less than 2 fasteners and capable of supporting cladding weight and up to 30 psf wind load over 4 square foot area per clip, designed by professional engineer licensed in the state where the Project is located.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide ACS Thermal Break “A-Clip” by ACS Composite Systems Inc. or comparable product.
C. Thermal Barrier Strip: Nanoporous aerogel thermal barrier strip with not less than 10 R-value per inch; 10 mm or 20 mm thick.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Proloft Thermal Barrier Strips by ACS Composite Systems Inc. or comparable product.
D. Z-Girt: 18 gage steel with ASTM A653 G90 (Z275) hot-dip galvanizing and size designed by professional engineer licensed in the state where the Project is located.

E. Fasteners: As recommended by thermal break/clip system manufacturer.

2.6 COMPOSITE FRAMING SUPPORT SYSTEM

A. Continuous Girt System

1. Basis-of-Design Product: Subject to compliance with requirements, provide SMARTci 2-in-1 System or comparable product.

2. Description: Polyester and vinyl ester biorein matrix (FRP) with recycled materials, fire-retardant additives, and integral continuous metal inserts across the length of girt profile anchored to substrate indicated on Drawings. Girt reinforced with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.

   a. Girt Depth: 4-inch depth or as required for insulation thickness.
   b. Spacing: 24 inches
   c. Steel Insert: Continuous, non-corrosive steel, minimum 16 gage, with G90 galvanized coating per ASTM A653,
      1) Insert fully engaged with adjacent girt at ends.
      2) Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of composite support framing system.
   d. Includes integral 3-point compression seal, integral anti-siphon grooves on exterior and interior flanges, force distribution zones integrally designed into profile, and spline seals in profile for adjacent insulation units.

3. Fire-Test Response Characteristics:

   a. Surface Burning Characteristics (ASTM E84):
      1) Flame Spread Index: 25 or less.
      2) Smoke Developed Index: 450 or less.
   b. Intermediate Scale Multistory Fire Test: Comply with requirements of NFPA 285 and applicable requirement of IBC and local and state codes for wall height above grade and fire separation distances.
   c. Self-Extinguishing: Complies with ASTM D635.

4. Accessories: Provide accessories required for complete composite framing support system including, but not limited to, metal closure trim, transition angle, strapping, tie-in brackets, and similar items.

   a. Fasteners: Corrosion-resistant, self-tapping, self-drilling screws, bolts, nuts and other fasteners recommended by composite framing support system manufacturer. Powder, air, or gas actuated fasteners or actuated fastener tools not acceptable. Use of impact wrenches when fastening to or from composite framing support system not acceptable.

B. Clip System

1. Basis-of-Design Product: Subject to compliance with requirements, provide SMARTci GreenGirt Clips Composite Framing Support System or comparable product.

2. Description: Polyester and vinyl ester biorein matrix (FRP) with recycled materials, fire-retardant additives, and integral continuous metal inserts across the length of clip profile. Clip reinforced with glass strand rovings used internally for longitudinal (lengthwise) strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.
strength and continuous strand glass mats or stitched reinforcements used internally for transverse (crosswise) strength.

a. Length of Clip: 6 inches.

b. Depth of Clip: 4-inch or as required for insulation thickness.

c. Spacing, Horizontally and Vertically: 24 by 24 inches with maximum area of 4 square feet.

a. Steel Insert: Continuous, non-corrosive steel, minimum 16 gage, 0.0598-inch thick, with G90 galvanized coating per ASTM A653,

1) Anchor sub-girts and other wall cladding support accessories to steel insert set into and part of composite support framing system.

b. Includes integral compression seal, integral anti-siphon grooves on exterior and interior flanges, and force distribution zones integrally designed into profile.

3. Fire-Test Response Characteristics:

a. Surface Burning Characteristics (ASTM E84):

1) Flame Spread Index: 25 or less.

2) Smoke Developed Index: 450 or less.

b. Intermediate Scale Multistory Fire Test: Comply with requirements of NFPA 285 and applicable requirement of IBC and local and state codes for wall height above grade and fire separation distances.

c. Self-Extinguishing: Complies with ASTM D635.

4. Accessories: Provide accessories required for complete composite framing support system including, but not limited to, metal closure trim, transition angle, strapping, tie-in brackets, and similar items.

a. Fasteners: Corrosion-resistant, self-tapping, self-drilling screws, bolts, nuts and other fasteners recommended by composite framing support system manufacturer. Powder, air, or gas actuated fasteners or actuated fastener tools not acceptable. Use of impact wrenches when fastening to or from composite framing support system not acceptable.

b. Horizontal Hat Channels: Dimensions as shown on Drawing, 16 gage or 18 gage minimum thickness, hot-dip galvanized with G90 coating per ASTM A653.

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. Unless otherwise noted, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.

C. Screw Fasteners: Provide stainless steel screw fasteners.

1. Thermoset Polyester coating that exhibits 1,000 hours of salt spray beyond stainless steel anti-corrosiveness.

2. Minimum No. 14 self-drill hex-head screw fastener to be used to attach horizontal rail to vertical rail.

3. Steel Studs:
a. Self-drill hex-head TEK screw fasteners of sufficient length.
b. Minimum three threads must penetrate steel stud members.

D. Lag Bolts: ASME B18.2.1.

E. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 MISCELLANEOUS MATERIALS

A. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness as required to meet structural requirements for special conditions encountered.

B. Sealants: Comply with Division 07 Section “Joint Sealants,” and with requirement of air barrier system manufacturer’s instructions for compatibility.

C. Galvanic Protection: Utilize tapes and other methods as required to separate and prevent contact between dissimilar metals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions ready to receive work of this Section before starting.

B. Substrate: Verify substrate is level and plumb, free of defects, and conforming to tolerances suitable for installation of subsequent work.

C. Air Barrier System: Verify complete, cured, and conforming to manufacturer’s instructions. Verify fenestrations, transitions, discontinuities, and sills and ledgers flashed and sealed to move moisture to exterior of building as part of air barrier system.
   1. Coordinate compatibility of all cladding support system materials and accessories with air barrier system.

3.2 PREPARATION

A. Review areas of potential interference and conflicts, and coordinate layout and support provisions for interfacing work.

B. Shim and perform work as required for plumb and true alignments.

3.3 INSTALLATION

A. Set cladding support system to required levels and lines, with members plumb, true to line, cut, and fitted, and aligned to attachment requirements of cladding system. Fit member shapes to other construction; scribe and cope as needed for accurate fit.

B. Fiberglass Clip System: Install in strict compliance with manufacturers written directions.
1. Spacing: Install fiberglass thermal spacers at each stud location, and as required by Performance Requirements, but not more than 24 inches on center, horizontally and at no more than 26 inches on center vertically.

2. Insert continuous steel Z girts into fiberglass thermal spacers and anchor to substrate as directed by manufacturer. Where indicated, provide horizontal hat-shaped channels in lieu of, or in addition to Z girts, and anchor as directed by manufacturer. Provide vertical or horizontal girt orientation as required by cladding system.

C. Wall Bracket System:

1. Mount wall brackets horizontally on support wall at each stud location, but not more than 24 inches on center, using self-drilling self-tapping screws at metal stud framed walls and expansion or adhesive anchors at concrete and masonry walls.
   a. Lay out brackets at an even 1/2-inch increment vertically or horizontally.
   b. Tighten to 90 in/lbs of torque, and as instructed by fastener manufacturer instructions.
   c. Verify torque for each installer using hand tools at beginning of project.

2. Thermally isolate wall bracket attachments by sandwiching thermal break material between metal bracket and support wall substrate.

3. Install screw fastener washers to thermally isolate fastener heads from metal bracket.

4. Attach rails to wall bracket stem by use of self-tapping screw fasteners through pre-punched holes in rails and into pre-punched pilot holes on bracket.

5. Isolate horizontal rail from bracket by sandwiching thermal spacer between rail and bracket stem.

6. Attach rails at pre-punched pilot holes on bracket stem to align plumb and true. Account for irregularities in support wall.

7. Establish and re-establish and restart vertical bracket locations using laser or chalk-line at fenestrations and other obstructions to establish horizontal alignments. Place brackets at 1/2-inch increments vertically or horizontally.

D. Thermal Break/Clip System: Comply with system manufacturer's installation instructions and recommendations applicable to conditions shown on Drawings and present in field. Attach clips with not less than two stainless steel self-drilling/self-tapping screws as recommended by system manufacturer and as designed by professional engineer licensed in state where Project is located.

1. Ensure thermal barrier strip is applied to both surfaces of adjustable clip through which clips are attached to Z-girt or building structure.

E. Composite Framing Support System: Comply with system manufacturer's installation instructions and recommendation applicable to conditions shown on Drawings and present in field.

1. Install system to fill in exterior spaces without gaps or voids and not compress insulation panels. Shim and align composite framing support system within tolerance of 1/4-inch in 20 feet, non-cumulative, level, plumb, and on location lines indicated on shop drawings.

F. Sealing of Cladding Support Attachment: Comply with following requirements:

1. Apply full bed of sealant to back side of cladding support attachment.

2. Press attachment into place against air barrier membrane.

3. Use self-tapping screw to secure attachment and drive sealant through hole for sealed gasket effect.

4. Seal all other holes or tears in air barrier resulting from cladding system anchor installation in accordance with air vapor barrier manufacturer’s recommendations.

5. Test mock up area of air barrier with attachments for air and water tightness in accordance with air barrier performance requirements.
6. Repair leaks and retest air barrier for air and water tightness.
7. Repeat this process until results are satisfactory to Architect prior to proceeding with work.

3.4 ERECTION TOLERANCES
A. Maximum Framing Member Variation from True Position: 1/8 inch.
B. Maximum Framing Member Variation from Plane:
   1. Individual Framing Members: Do not exceed 1/8 inch in 10 foot.
   2. Cumulative Over-all Variation for System: Do not exceed 1/8 inch.

3.5 FIELD QUALITY CONTROL FOR CLADDING SUPPORT SYSTEM
A. Manufacturer’s Field Technical Service: Provide intermittent and final inspection to verify installation in conformance to manufacturer instructions and suitable as framing assembly for specified cladding systems.
   1. Confirm torque tightness and fastener sizing.
   2. Confirm framing members installed in correct orientation and location.
   3. If testing of air barrier system at mock-up is required by other Sections, coordinate installation of cladding support systems with air barrier system installation, inspection, and testing.
      a. Install cladding support system prior to inspection and testing of air barrier system.
      b. If inspections reveal any defects, promptly remove and replace, or repair at the approval of the Architect, defective work at no additional expense to the Owner, until testing results are satisfactory.

3.6 ADJUSTING AND PROTECTION
A. Inspect and adjust after installation.
B. Adjust, and reconfigure as required to accommodate cladding systems for installations over work of this Section. Do not reuse pre-drilled holes unless fastener size is increased.
C. Protect cladding support system from damage during work. Replace damaged components and materials as directed by the Architect.

END OF SECTION 074800
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SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ethylene-propylene-diene-terpolymer (EPDM) roofing.
   3. Substrate board.
   4. Vapor retarder.
   5. Roof insulation.
   6. Insulation accessories and cover board.
   7. Walkways.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Ethylene-propylene-diene-terpolymer (EPDM) roofing.
   3. Substrate board.
   4. Vapor retarder.
   5. Roof insulation.
   6. Insulation accessories and cover board.
   7. Walkways.
8. Include documentation indicating that product contains no urea formaldehyde in compliance with California Air Resources Board (CARB) regulations.

B. Product Data Submittals:
   1. For insulation and roof system component fasteners, include copy of SPRI's Directory of Roof Assemblies listing.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
   1. Layout and thickness of insulation.
   2. Base flashings and membrane terminations.
   3. Flashing details at penetrations.
   4. Tapered insulation, thickness, and slopes.
   5. Roof plan showing orientation of steel roof deck and orientation of roof membrane and fastening spacings and patterns for mechanically fastened roofing system.
   6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
   7. Tie-in with air barrier.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates:
      a. Submit evidence of complying with performance requirements.
   2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

B. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

C. Evaluation Reports: For components of roofing system, from ICC-ES.
   1. Field Test Reports:
   2. Concrete internal relative humidity test reports.
   3. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
   D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING
1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
   1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, substrate board, and other components of roofing system.
   2. Warranty Period: 20 years from Date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:
   1. Warranty Period: Two years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings to remain watertight.
   1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested in accordance with ASTM G152, ASTM G154, or ASTM G155.
   2. Impact Resistance: Roof membrane to resist impact damage when tested in accordance with ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested in accordance with FM Approvals 4474, UL 580, or UL 1897:
   1. Zone 1 (Roof Area Field): As indicated on drawings.
   2. Zone 2 (Roof Area Perimeter): As indicated on drawings.
   3. Zone 3 (Roof Area Corners): As indicated on drawings.

D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING
   A. EPDM Sheet: ASTM D4637/D4637M, Type I, nonreinforced, EPDM sheet.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         b. Firestone Building Products.
         c. Versico Roofing Systems; Carlisle Construction Materials.
      2. Thickness: 60 mils, nominal.
      3. Exposed Face Color: Black.
      4. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

2.3 ACCESSORY ROOFING MATERIALS
   A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
      1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
   B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.
   C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
   D. Bonding Adhesive: Manufacturer's standard.
   E. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.
   F. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.
   G. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening components to substrate, and acceptable to roofing system manufacturer.
   H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings,
reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.4 SUBSTRATE BOARD
A. Glass-Mat Gypsum Roof Substrate Board: ASTM C1177/C1177M, water-resistant gypsum board.
   1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
      a. Certainteed; SAINT-GOBAIN.
      b. Georgia-Pacific Gypsum LLC.
      c. USG Corporation.
   2. **Thickness:** Type X, 5/8 inch.

2.5 VAPOR RETARDER

2.6 ROOF INSULATION
A. Polyisocyanurate Board Insulation: Non-Halogen, ASTM C1289, Type II, Class 2 coated glass-fiber facer on both major surfaces.
   1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
      b. GAF.
      c. Hunter Panels.
   2. **Compressive Strength:** 20 psi.
   3. **Size:** 48 by 96 inches.
   4. **Thickness:** As indicated on drawings
B. Tapered Insulation: Provide factory-tapered insulation boards.
   1. **Material:** Match roof insulation.
   2. **Minimum Thickness:** 1/4 inch.
   3. **Slope:**
      a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
      b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES AND COVER BOARD
A. **General:** Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
B. **Insulation Adhesive:** Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
C. Polyisocyanurate Insulation Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2 inch thick, with a minimum compressive strength of 80 psi.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
   1. Size: Approximately 36 by 60 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
   4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer when tested in accordance with ASTM F2170.
      a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with not less than three test probes.
      b. Submit test reports within 24 hours of performing tests.
   6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
   7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
   8. Verify that minimum curing period recommended by roof system manufacturer for lightweight insulating concrete roof decks has passed.
   9. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
  10. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation in accordance with roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

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C. Perform fastener-pullout tests in accordance with roof system manufacturer's written instructions.
   1. Submit test result within 24 hours of performing tests.
      a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system in accordance with roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weather tightness of transition and to not void warranty for existing roofing system.

D. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072713 "Modified Bituminous Sheet Air Barriers."

3.4 INSTALLATION OF SUBSTRATE BOARD AT METAL DECK

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
   1. At steel roof decks, install substrate board at right angle to flutes of deck.
      a. Locate end joints over crests of steel roof deck.
   2. Tightly butt substrate boards together.
   3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   4. Fasten substrate board to top flanges of steel deck in accordance with recommendations in SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity.
   5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof in accordance with roofing system manufacturers' written instructions.

3.5 INSTALLATION OF VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
   1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
   2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.
3.6 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking with substrate board:
   1. Install base layer of insulation with joints staggered not less than **24 inches** in adjacent rows.
      a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
      b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      c. Make joints between adjacent insulation boards not more than **1/4 inch** in width.
      d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus **24 inches**.
         1) Trim insulation so that water flow is unrestricted.
      e. Fill gaps exceeding **1/4 inch** with insulation.
      f. Cut and fit insulation within **1/4 inch** of nailers, projections, and penetrations.
      g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.
         1) Set base layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
   2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than **12 inches** from previous layer of insulation.
      a. Staggered end joints within each layer not less than **24 inches** in adjacent rows.
      b. Install with long joints continuous and with end joints staggered not less than **12 inches** in adjacent rows.
      c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      d. Make joints between adjacent insulation boards not more than **1/4 inch** in width.
      e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus **24 inches**.
      f. Trim insulation so that water flow is unrestricted.
      g. Fill gaps exceeding **1/4 inch** with insulation.
      h. Cut and fit insulation within **1/4 inch** of nailers, projections, and penetrations.
      i. Adhere each layer of insulation to substrate using adhesive in accordance with SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity as follows:
         1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

D. Installation Over Concrete Decks:
   1. Install base layer of insulation with joints staggered not less than **24 inches** in adjacent rows.
a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
   1) Trim insulation so that water flow is unrestricted.
e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Adhere base layer of insulation to vapor retarder in accordance with SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity as follows:
   1) Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft., and allow primer to dry.
   2) Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
   a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
   b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
   c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
   e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
      1) Trim insulation so that water is unrestricted.
   f. Fill gaps exceeding 1/4 inch with insulation.
   g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
   h. Adhere each layer of insulation to substrate using adhesive in accordance with SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity as follows:
      1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.
      a. Trim cover board so that water flow is unrestricted.
   3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive in accordance with SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity as follows:
   a. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 INSTALLATION OF ADHERED ROOF MEMBRANE
   A. Adhere roof membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.
   B. Unroll membrane roof membrane and allow to relax before installing.
   C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
   D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
   E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
   F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.
   G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
   H. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.
      1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
      2. Apply lap sealant and seal exposed edges of roofing terminations.
      3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.
   I. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
   J. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.9 INSTALLATION OF SELF-ADHERING ROOF MEMBRANE
   A. Adhere roof membrane over area to receive roofing in accordance with roofing system manufacturer's written instructions.
   B. Unroll roof membrane and allow to relax before installing.
   C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
   D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
   E. Fold roof membrane to expose half of sheet width's bottom surface.
      1. Remove release liner on exposed half of sheet.
      2. Roll roof membrane over substrate while avoiding wrinkles.
   F. Fold remaining half of roof membrane to expose bottom surface.
1. Remove release liner on exposed half of sheet.
2. Roll roof membrane over substrate while avoiding wrinkles.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.
   1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
   2. Apply lap sealant and seal exposed edges of roofing terminations.
   3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

J. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

K. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.10 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates in accordance with roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.11 INSTALLATION OF WALKWAYS

A. Flexible Walkways: Install walkway products in accordance with manufacturer's written instructions.
   1. Install flexible walkways at the following locations:
      a. Perimeter of each rooftop unit.
      b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
      c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
      d. Top and bottom of each roof access ladder.
      e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
      f. Locations indicated on Drawings.
      g. As required by roof membrane manufacturer's warranty requirements.
   2. Provide 6-inch clearance between adjoining pads.

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING 075323 - 11

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3. Adhere walkway products to substrate with compatible adhesive in accordance with roofing system manufacturer's written instructions.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Perform the following tests:

1. Infrared Thermography: Testing agency surveys entire roof area using infrared color thermography in accordance with ASTM C1153.
   a. Perform tests before overlying construction is placed.
   b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
   c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
      1) Cost of retesting is Contractor's responsibility.
   d. Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture, if any.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and in accordance with warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075323
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Adhered TPO membrane roofing system.
   2. Cover board.
   3. Roof insulation.
   4. Vapor retarder.
   5. Substrate board.
   6. Roof paver.
   7. Walkways.

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Roofing Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacing, and patterns for mechanically fastened roofing.
   4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
C. Samples for Verification: For the following products:
   1. Sheet roofing, of color required, including T-shaped side and end lap seam.
   2. Walkway pads or rolls, of color required.
   3. Roof insulation.
   4. Roof paver in each color and texture required.
1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
B. Source Limitations: Obtain components including roof insulation, fasteners, etc., for membrane roofing system from source approved by membrane roofing manufacturer.
C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

1.6 CLOSEOUT SUBMITTALS
A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS
A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY
A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

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1. Special warranty includes membrane roofing, base flashings, roof insulation, cover boards, vapor retarder and other components of membrane roof system.

2. Provide manufacturer’s no-dollar-limit total system warranty covering defects in material and workmanship of the membrane and other system components supplied by the manufacturer.

3. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements, provide roofing system by the following:
   1. Carlisle SynTec Incorporated.
   2. Firestone Building Products.
   3. GAF Materials Corporation.
   5. Johns Manville.

B. Source Limitations: Obtain all roofing components for the proposed roofing system from the same manufacturer as the membrane roofing.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
   1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 42272.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
   1. Corner Uplift Pressure: As indicated on the drawings.
   2. Perimeter Uplift Pressure: As indicated on the drawings.
   3. Field-of-Roof Uplift Pressure: As indicated on the drawings.

D. Exterior Fire Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.3 TPO MEMBRANE ROOFING

   1. Thickness: 60 mils, nominal.
2. Exposed Face Color: Grey

2.4 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.”

B. Sheet Flashing: Manufacturer’s standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer’s standard, water based.

D. Slip Sheet: Manufacturer’s standard, if required; of thickness required for application.

E. Metal Termination Bars: Manufacturer’s standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Georgia-Pacific Corporation; Dens Deck.
      b. CertainTeed Corporation; GlasRoc Sheathing.
      c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
      d. Temple-Inland, Inc; GreenGlass Exterior Sheathing.
      e. USG Corporation; Securock Glass Mat Roof Board.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening substrate board to roof deck.

2.6 VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D 1970/D 1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil-total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor-retarder manufacturer.
2.7 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application and of thicknesses indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Carlisle SynTec Incorporated.
   c. Firestone Building Products.
   d. GAF Materials Corporation.
   e. Hunter Panels.
   f. Insulfoam LLC; a Carlisle company.
   g. Johns Manville.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Full-spread spray-applied, low-rise, two-component urethane adhesive as recommended by manufacturer’s specification.
   2. Adhesives and sealants shall comply with the testing and product requirements of the California Department of Public Health’s "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Cover Board: ASTM C 1177, glass-mat, water-resistant gypsum board, 1/2 inch, factory primed.

1. Products: Subject to compliance with requirements, provide products by one of the following:
   a. Georgia-Pacific Corporation; Dens Deck.
   b. CertainTeed Corporation; GlasRoc Sheathing.
   c. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
   d. Temple-Inland, Inc; GreenGlass Exterior Sheathing.
   e. USG Corporation; Securock Glass Mat Roof Board.

E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.
2.9 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16-inch thick, and acceptable to membrane roofing system manufacturer.
   1. Color: As selected by Architect from manufacturer’s full range.

B. Walkway Roof Pavers: Heavyweight, hydraulically pressed concrete units, square edged with top edges beveled 3/16 inch, factory cast for use as roof pavers.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hanover Architectural Products.
      c. Roofblok Limited.
      d. Sunny Brook Pressed Concrete Co.
      e. Wausau Tile Inc.
      f. Westile Roofing Products.
   2. Size: 24 by 24 inches; manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
   3. Weight: 22 lb/sq. ft.
   4. Compressive Strength: 7500 psi minimum.
   5. Absorption: not greater than 5 percent; ASTM C 140.
   6. No breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance; ASTM C 67.
   7. Colors and Textures: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
   1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F 2170.
      a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof, of roof deck, with not less than three tests probes.
      b. Submit test reports within 24 hours after performing tests.
   5. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

1. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.

2. Remove and discard temporary seals before beginning work on adjoining roofing

3.4 SUBSTRATE BOARD

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to membrane roofing system manufacturers' written instructions.

3.5 VAPOR-RETARDER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 inches and 6 inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.

2. Seal laps by rolling.

3.6 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

1. Where installing composite and non-composite insulation in two or more layers, install non-composite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhere base layer of insulation to vapor retarder as follows:
   1. Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft., and allow primer to dry.
   2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
   1. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.7 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.8 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer’s written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer’s written instructions in locations indicated, to form walkways. Leave 3 inches of space between adjacent roof pavers.
   1. Install membrane protection slip sheet below entire paver walkway.

3.10 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer’s technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor’s expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

   1. Formed Products:
      a. Formed roof drainage sheet metal fabrications.
      b. Formed low-slope roof sheet metal fabrications.
      c. Formed wall sheet metal fabrications.

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

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

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   4. Details of termination points and assemblies, including fixed points.
   5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
   6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
   7. Details of special conditions.
   8. Details of connections to adjoining work.
   9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.

3. Accessories and Miscellaneous Materials: Full-size Sample.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricates sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA’s "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
   2. Review methods and procedures related to sheet metal flashing and trim.
   3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
   5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
   1. Surface: Smooth, flat.
   2. Exposed Coil-Coated Finishes:
      a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish 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.
   3. Color: Match Metal Wall Panel.
4. Concealed Finish: Pretreat with manufacturer’s standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or passivated Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch wide and 1/8-inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.


2.3 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cheney Flashing Company.
   b. Fry Reglet Corporation.
   c. Heckmann Building Products Inc.
   d. Hickman, W. P. Company.
   e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
   f. Sandell Manufacturing Company, Inc.
2. Material: Aluminum, 0.024 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
   4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
   1. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extend flanges for a minimum of 4-inches embedment.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.
   1. Provide for thermal expansion of running items of more than 15 feet continuous length.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.
2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Counterflashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
   5. Install sealant tape where indicated.
   6. Torch cutting of sheet metal flashing and trim is not permitted.
   7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
   1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with sealant, concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as shown and as required for watertight construction.
   1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Section "Joint Sealants."

G. Do not solder aluminum sheet.

H. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION
A. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
   1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3.4 ROOF FLASHING INSTALLATION
A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

3.5 ERECTION TOLERANCES
A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION
A. Clean off excess sealants.
   B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
   C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
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SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

   A. Section Includes:
      1. Copings.
      2. Roof-edge flashings.

1.2 PERFORMANCE REQUIREMENTS

   A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

   B. SPRI Wind Design Standard: Manufacture and install copings roof-edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

   C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations 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.

1.3 ACTION SUBMITTALS

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

   B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
      1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
      2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
      3. Details of termination points and assemblies, including fixed points.
      4. Details of special conditions.

   C. Samples for Verification: For copings roof-edge flashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.4 QUALITY ASSURANCE

   A. Preinstallation Conference: Conduct conference at Project site.
      1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
      2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
      3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.
1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

1. Surface: Smooth, flat finish.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

   a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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.

   b. Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.

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

   a. ATAS International, Inc.
b. Castle Metal Products.
c. Cheney Flashing Company.
d. Hickman Company, W. P.
e. Metal-Era, Inc.
f. Metal-Fab Manufacturing, LLC.
g. MM Systems Corporation.
h. PAC-CLAD; Petersen Aluminum Corporation.

2. Coping-Cap Material: Formed aluminum, 0.063 inch thick.
   a. Surface: Smooth, flat finish.
   b. Finish: Three-coat fluoropolymer.


4. Coping-Cap Attachment Method: Face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.

5. Face Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.4 ROOF-EDGE FLASHINGS

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hickman Company, W. P.
   b. Metal-Era, Inc.
   c. Metal-Fab Manufacturing, LLC.

2. Fascia Cover: Fabricated from the following exposed metal:
   a. Formed Aluminum: 0.063 inch thick.
   b. Surface: Smooth, flat finish.
   c. Finish: Three-coat fluoropolymer.


4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.

5. Fascia Accessories: Fascia extenders with continuous hold-down cleats Wall cap.

2.5 GENERAL FINISH REQUIREMENTS

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

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.2 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer’s written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.

2. Provide uniform, neat seams with minimum exposure of solder and sealant.

3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

4. Torch cutting of roof specialties is not permitted.

5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.


1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.

2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to meet performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at 30-inch centers.

3.4 ROOF-EDGE FLASHING INSTALLATION
   A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
   B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 CLEANING AND PROTECTION
   A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
   B. Clean and neutralize flux materials. Clean off excess solder and sealants.
   C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
   D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100
SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Roof hatches.

1.2 PERFORMANCE REQUIREMENTS
A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.
C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.4 COORDINATION
A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 ROOF HATCH
A. Roof Hatches: Metal roof-hatch units with lids and insulated single double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.
   1. Manufacturer: Subject to compliance with requirements, provide products specified in this section or a comparable product by one of the following:
      a. Babcock-Davis.
      b. J. L. Industries, Inc.
      c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      d. Naturalite Skylight Systems; Vistawall Group (The).
      e. Nystrom.
      f. O'Keeffe's Inc.
      g. Pate Company (The).
B. Type and Size: Single-leaf lid.

D. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch thick.
   1. Finish: Baked enamel or powder coat.
   2. Color: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Polyisocyanurate board.
   2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
   3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   4. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.

F. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches.
   2. Provide remote-control operation.
   3. Provide a latch on both side of the hatch.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
   1. Height: 42 inches above finished roof deck.
   2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
   4. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
   5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
   6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
   7. Fabricate joints exposed to weather to be watertight.
   8. Fasteners: Manufacturer's standard, finished to match railing system.
      a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
   1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
   2. Height: 42 inches above finished roof deck.
   5. Finish: Manufacturer's standard baked enamel or powder coat.
      a. Color: As selected by Architect from manufacturer's full range.
2.2 GENERAL FINISH REQUIREMENTS

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

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

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

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
   1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
   2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
   3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

C. Roof-Hatch Installation:
   1. Install roof hatch so top surface of hatch curb is level.
   2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
   3. Attach safety railing system to roof-hatch curb.
   4. Attach ladder-assist post according to manufacturer's written instructions.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09, Painting.

C. Clean exposed surfaces according to manufacturer's written instructions.
D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200
PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes sprayed fire-resistive materials (SFRM).

1.2 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to SFRM including, but not limited to, the following:
      1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.
      2. Review and finalize construction schedule and verify sequencing and coordination requirements.
      3. Review weather predictions, ambient conditions, and proposed temporary protections for SFRM during and after installation.
      4. Review surface conditions and preparations.
      5. Review field quality-control testing procedures.

1.3 SEQUENCING
   A. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
   B. Metal Decks: Do not apply fire-resistive material to metal roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
      1. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
   C. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   D. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
   E. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Sustainable Design Submittals:
      1. Product Data: For paints and coatings, documentation including printed statement of VOC content.
   C. Shop Drawings: Framing plans, schedules, or both, indicating the following:
      1. Locations and types of surface preparations required before applying fireproofing.
      2. Extent of fireproofing for each construction and fire-resistance rating.
3. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   a. For steel joist assemblies, include applicable fire-resistance design designations, with each steel joist tested with the same maximum tensile stress as each steel joist indicated on Drawings. Design designations with steel joists tested at lower maximum tensile stress than those indicated are not permitted.

4. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.

5. Designation of restrained and unrestrained conditions based on definitions in ASTM E 119, Appendix X3 as determined by a qualified engineer.

6. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Compatibility and Adhesion Test Reports: From fireproofing manufacturer indicating the following:
   1. Materials have been tested for bond with substrates.
   2. Materials have been verified by fireproofing manufacturer to be compatible with substrate primers and coatings.
   3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its fireproofing to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

   1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility for designation of restrained and unrestrained conditions.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on fireproofing.

   1. Provide test specimens and assemblies representative of proposed materials and construction. Select fireproofing for testing randomly from bags bearing the applicable classification marking. Include accelerator, sealers, Topcoats, tamping, troweling, rolling, and water overspray to be used in final application.

   2. Arrange for testing agency to witness preparation, application and conditioning of test specimens and assemblies and include in test report full description of preparation and conditioning of laboratory test specimens.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

   1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.
B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.
C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.9 FIELD CONDITIONS
A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS
2.1 MATERIALS, GENERAL
A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
B. Source Limitations: Obtain fireproofing from single source.
C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Fire-Resistance Ratings: Indicated on Drawings by design designations in UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Steel members are to be considered unrestrained unless specifically noted otherwise.
D. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard
F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPARED FIRE-RESISTIVE MATERIALS (CONCEALED)

A. SFRM-15/430: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Products: Subject to compliance with requirements, provide the following:
   a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; Southwest Type MD.
   b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z-106G or Monokote MK-10HB.
   c. Isolatek International; Cafco 300 HS.

2. Application: Designated by qualified testing agency acceptable to authorities having jurisdiction for interior, exposed to view use for buildings between 75 and 420 feet above lowest level of fire department vehicle access.

3. Bond Strength: Minimum 430-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.

4. Density: Not less than 15 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E 605.

5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.

6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.

7. Compressive Strength: Minimum 10 lbf/sq. in.; ASTM E 761.


9. Deflection: No cracking, spalling, or delamination; ASTM E 759.

10. Effect of Impact on Bonding: No cracking, spalling, or delamination; ASTM E 760.

11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours; ASTM E 859.

12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

13. Finish: Spray-textured finish

2.3 SPARED FIRE-RESISTIVE MATERIALS (EXPOSED)

A. SFRM-22: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; Southwest Type 7GP.
   b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z-106HY.
   c. Isolatek International; Cafco 400.
2. Application: Designated by qualified testing agency acceptable to authorities having jurisdiction for interior, exposed to moisture or abrasion use for buildings greater than 420 feet above lowest level of fire department vehicle access.

3. Bond Strength: Minimum 2000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.

4. Density: Not less than 22 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E 605.

5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.


7. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.


10. Deflection: No cracking, spalling, or delamination; ASTM E 759.

11. Effect of Impact on Bonding: No cracking, spalling, or delamination; ASTM E 760.

12. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours; ASTM E 859.

13. Fungal Resistance: Treat products with manufacturer’s standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.


2.4 SPRAYED FIRE-RESISTIVE MATERIALS (EXTERIOR)

A. SFRM-40: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.

1. Products: Subject to compliance with requirements, provide one of the following:
   b. Grace, W. R. & Co. - Conn.; Grace Construction Products; Monokote Z-146 or Monokote Z146-T.
   c. Isolatek International; Fendolite M-II.

2. Application: Designated by qualified testing agency acceptable to authorities having jurisdiction for interior or exterior exposed conditions subject to impact.

3. Bond Strength: Minimum 10,000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.

4. Density: Not less than 40 lb/cu. ft. as specified in the approved fire-resistance design, according to ASTM E 605.

5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.

6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.

7. Compressive Strength: Minimum 500 lbf/sq. in. according to ASTM E 761.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

2.5 THERMAL BARRIER - CEMENTITIOUS FIREPROOFING - 15 MIN.

A. Grace Construction Products: Monokote Z3306; spray in a thickness to provide a 15-minute thermal barrier over spray polyurethane foam insulation.
   1. Primer: Firebond

2.6 FIREPROOFING SEALER

A. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
   1. Product: Subject to compliance with requirements, provide "Cafco Bond-Seal Type X" by Isolatek International or comparable product.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
   1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
   1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.

2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.

2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:
1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.

2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer’s written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

J. Cure fireproofing according to fireproofing manufacturer’s written recommendations.

K. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

L. Finishes: Where indicated, apply fireproofing to produce the following finishes:
   1. Manufacturer’s Standard Finishes: Finish according to manufacturer’s written instructions for each finish selected.
   2. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3.4 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer’s recommended trowel-applied product.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Test and inspect as required by Code.

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications
of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

1. Provide additional testing required as result of non-compliance with specified requirements at Contractor’s expense without additional cost to Owner.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer’s written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

1. Clearly indicate on laboratory testing reports the location of the tests and test results. Provide copies of test reports through Architect to Owner and applicable regulatory agencies.

END OF SECTION 078100
SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Sustainable Design Submittals:
   1. Submit Product Data for penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

1.4 QUALITY ASSURANCE
A. Mock-Up: Construct in a location at the site as directed by the Architect, a mock-up showing full depth section of each firestopping condition identified in the Penetration Firestopping Schedule in Part 3 of this Section.
   1. Remove and replace firestopping in mock-up as many times as required to achieve the UL-rating and approval of Authorities Having Jurisdiction (AHJ).
   2. The accepted mockup establishes the appearance standard for all subsequent penetration firestopping.
   3. Demolish or remove mockup from site and dispose of legally; do not incorporate into the Work.

1.5 PROJECT CONDITIONS
A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.
1.6 COORDINATION
A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Provide penetration firestopping systems bearing classification marking of UL in its "Fire Resistance Directory."
B. Penetration Firestopping Assembly Standard: Provide tested penetration firestopping assemblies that comply with and are installed in accordance with penetration firestopping assembly manufacturer's installation instructions and all written and graphic requirements in test assembly documentation.
   1. If penetration firestopping assemblies do not comply with requirements, research testing agency documents such as UL Online Certifications Directory or UL Fire Resistance Directory for assemblies that comply.
   2. If no penetration firestopping assemblies that comply can be identified, submit proposed "Engineering Judgement" to Architect as specified in Submittals article in Part 1 of this Section.

2.2 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Hilti

2.3 PENETRATION FIRESTOPPING
A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   1. Where openings around penetrating items do not meet UL system requirements, provide materials and systems with matching construction materials as required by the annular opening size requirement of the UL system. Where the opening cannot be closed as required to meet the annular opening size requirements of UL, obtain an engineering judgment of the UL system to be used from the Engineering Department of the manufacturer of the firestopping materials, verified in writing by UL.
B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls fire-barrier walls smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floors floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Control Voltage, Communications and Electronic Safety and Security Cable Penetrations in Fire-Resistance-Rated Walls and Smoke Barriers: Provide penetration firestopping with ratings described in this Section and with the ability for Owner to add or remove cables without the need for replacing fill materials.

1. Products: Subject to compliance with the requirements, provide the following fire-rated assemblies:
   a. CP 653 Speed Sleeve by Hilti, Inc.
   b. Firestop Cable Disc by Hilti
2. Provide collars and plates required for mounting single and multiple devices adjacent to each other.
3. Accessories: Provide following accessories required for applications indicated on Drawings:
   a. Extension module increasing effective length.
   b. Radius control module providing minimum bend radius for twisted pair cables.
   c. Multi-gang wall bracket to allow one to five pathways in finished wall to be supported from stud.
   d. Modular floor grid system allowing banks of pathways in floor.
   e. T-rating accessory kit.
   f. Caps for unoccupied wall bracket gangs to allow future capacity.

G. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

H. VOC Content: Penetration firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.


5. Steel sleeves.

2.4 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. **Grade:** Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

K. **Putty Pad or Box Insert:** Protective materials designed to protect electrical outlet boxes.

L. **Firestop Board:** Material for large openings to accommodate electrical busways, raceways, cable trays, and multiple copper pipes.

M. **Drop-In Device:** Pre-formed device with integrated intumescent strips for use with noncombustible and combustible pipes and/or cable bundles.

N. **Firestop Plug:** Intumescent system for sealing the ends of empty or abandoned sleeves with zero percent cable load.

2.5 **MIXING**

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 **EXAMINATION**

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

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

3.2 **PREPARATION**

A. **Surface Cleaning:** Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. **Priming:** Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. **Masking Tape:** Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

D. **Control Voltage, Communications and Electronic Safety and Security Cable Penetrations in Fire-Resistance-Rated Walls and Smoke Barriers:** Coordinate calculations of allowable fill ratio with control voltage, communications and electronic safety, and security installers to ensure size of...
sleeves, openings, core-drilled holes, or cut openings can accommodate cable load according to specified conduit fill.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

D. Control Voltage, Communications and Electronic Safety and Security Cable Penetrations in Fire-Resistance-Rated Walls and Smoke Barriers:
   1. Where specified mechanical device cannot be used in openings in floors and walls, provide products that allow re-entry and do not cure or dry.
   2. Where empty sleeves are installed for future cables or as abandoned cables are harvested, seal both sides of empty sleeves with firestop plug.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners and self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.
3.6 CLEANING AND PROTECTION
   A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with
      cleaning materials that are approved in writing by penetration firestopping manufacturers and that
      do not damage materials in which openings occur.
   B. Provide final protection and maintain conditions during and after installation that ensure that
      penetration firestopping is without damage or deterioration at time of Substantial Completion. If,
      despite such protection, damage or deterioration occurs, immediately cut out and remove
      damaged or deteriorated penetration firestopping and install new materials to produce systems
      complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE
   A. Through-Penetration UL Classification System

<table>
<thead>
<tr>
<th>Fire Stopping Systems</th>
<th>UL Classification System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>Construction Penetrated</td>
</tr>
<tr>
<td>1 No penetrating Items:</td>
<td>F, W, C</td>
</tr>
</tbody>
</table>

B. Construction Penetration:
   1. F Floor Penetration
   2. W Wall Penetration
   3. C Either floor or wall penetration

C. Type of Construction:
   1. A Concrete floors equal to or less than 5-inches thick
   2. B Concrete floors greater than 5-inches thick
   3. J Concrete or masonry walls equal to or less than 8-inches thick
   4. K Concrete of masonry walls greater than 8-inches thick
   5. L Framed Walls

END OF SECTION 078413
SECTION 078443 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Joints in or between fire-resistance-rated constructions.
      2. Joints in smoke barriers.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Sustainable Design Submittals:
      1. Submit product data for fire-resistive joint system sealants, documentation including printed statement of VOC content.
   C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
      1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer.
   B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

1.4 QUALITY ASSURANCE
   A. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS
   A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
   B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION
   A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
   B. Coordinate sizing of joints to accommodate fire-resistive joint systems.
   C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
      a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."
         2) Intertek Group in its "Directory of Listed Building Products."

B. Joint Firestopping Assembly Standard: Provide tested joint firestopping assemblies that comply with and are installed in accordance with joint firestopping assembly manufacturer’s installation instructions and all written and graphic requirements in test assembly documentation.
   1. If joint firestopping assemblies do not comply with requirements, research testing agency documents such as UL Online Certifications Directory or UL Fire Resistance Directory for assemblies that comply.
   2. If no penetration joint assemblies that comply can be identified, submit proposed "Engineering Judgement" to Architect as specified in Submittals Article in Part 1 of this Section.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints at Exterior Curtain-Wall/Floor Intersections: Provide fire-resistive joint systems with rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307:
   1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hilti, Inc.
   3. Refer to Engineering Judgment provided for conditions that do not meet UL-listed assembly requirements.

C. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
   1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies.
   2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
   3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
D. Joints in Smoke Barriers: Provide fire-resistant joint systems with ratings determined per UL 2079.
   1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg (74.7 Pa) at both ambient and elevated temperatures.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hilti, Inc.

E. VOC Content: Fire-resistant joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

F. Accessories: Provide components of fire-resistant joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistant joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

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

3.2 PREPARATION
   A. Surface Cleaning: Clean joints immediately before installing fire-resistant joint systems to comply with fire-resistant joint system manufacturer's written instructions and the following requirements:
      1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
      2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
      3. Remove laitance and form-release agents from concrete.
   B. Priming: Prime substrates where recommended in writing by fire-resistant joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
   C. Masking Tape: Use masking tape to prevent fill materials of fire-resistant joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistant joint system's seal with substrates.

3.3 INSTALLATION
   A. General: Install fire-resistant joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistant joint system.

C. Install fill materials for fire-resistant joint systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
   2. Apply fill materials so they contact and adhere to substrates formed by joints.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION
A. Identify fire-resistant joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL
A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Where deficiencies are found or fire-resistant joint systems are damaged or removed due to testing, repair or replace fire-resistant joint systems so they comply with requirements.
C. Proceed with enclosing fire-resistant joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING
A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistant joint system manufacturers and that do not damage materials in which joints occur.
B. Provide final protection and maintain conditions during and after installation that ensure fire-resistant joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistant joint systems immediately and install new materials to produce fire-resistant joint systems complying with specified requirements.
3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
   1. UL-Classified Systems: HW-D-1067.
   2. Assembly Rating: 2 hours.
   3. Nominal Joint Width: As indicated.
   4. Movement Capabilities: Class II - 40 percent compression or extension.
   5. L-Rating at Ambient: Less than 1 cfm/ft.
   6. L-Rating at 400 Deg F: Less than 1 cfm/ft.

B. Perimeter Joint Firestopping Systems:
   2. Integrity Rating: 2 hours.
   3. Insulation Rating: 1/4 hour.
   4. Linear Opening Width: 8 inches, maximum.
   5. Movement Capabilities: Class II – 5 percent vertical shear.
   6. F-Rating: 2 hours.

C. Perimeter Joint Firestopping Systems:
   2. Integrity Rating: 2 hours.
   3. Insulation Rating: 1 hour.
   4. Linear Opening Width: 2-1/2 inches maximum.
   5. Movement Capabilities: Class II.
   6. F-Rating: 2 hours.

END OF SECTION 078446
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Sustainable Design Submittals:
   1. Product Data for VOC Content: For sealants used inside of the weatherproofing system, documentation including printed statement of VOC content.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
E. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.
C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
D. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
E. Field-Adhesion Test Reports: For each sealant application tested.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS
A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY
A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Stain-Test-Response Characteristics: Provide sealant to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Provide sealant for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials; SilPruf LM SCS2700.
   c. Pecora Corporation; 890NST.
   d. Tremco Incorporated; Spectrem 1 Spectrem 800.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. Pecora Corporation; 300SL.
   c. Tremco Incorporated; Spectrem 800.

C. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:
   a. Tremco Incorporated; Spectrem 4TS.

D. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide the following:
   a. Pecora Corporation; 898NST.
2.3 URETHANE JOINT SEALANTS
   A. Urethane, S, NS, 100/50, T, NT: Single-component, non-sag, plus 100 percent and minus 50 percent movement capability, traffic- and non-traffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.
      1. Products: Subject to compliance with requirements, provide the following:
         a. Sika Corporation; Joint Sealants; Sikaflex 15LM.
   B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. Pacific Polymers International, Inc.; Elasto-Thane 230 LM Type II.
         b. Polymeric Systems, Inc.; PSI-901.
   C. Immersible Multi-Component, Non-Sag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.
      1. Products: Subject to compliance with requirements, provide the following:
         a. BASF Building Systems; Sonolastic NP 2.

2.4 LATEX JOINT SEALANTS
   A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. BASF Building Systems; Sonolac.
         c. Pecora Corporation; AC-20+.
         d. Tremco Incorporated; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS
   A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
      1. Products: Subject to compliance with requirements, provide one of the following:
         a. Pecora Corporation; AIS-919
         b. USG Corporation; Sheetrock Brand Acoustical Sealant.
         c. Hilti; CP 506
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. Pecora Corporation.
         b. Serious Energy Inc.
         c. Tremco
2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type O (open-cell material) or either of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   1. Sealant Backer Rod at Noise Critical Walls: Closed-cell backer rod.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 PREFORMED, FOAM JOINT SEALS

A. General: Joint manufacturer shall review layout, configuration, and anticipated movement and establish the specific model number and size of Foam Gasket Sealant for this application.

B. Foam Gasket Seal: Pre-compressed, impregnated open-cell foam sealant incorporating permanently elastic open cell polyurethane foam, manufacturer's standard impregnating agent, and pressure sensitive backing.
   1. Acceptable Manufacturers and Products:
      b. Illbruck Incorporated: Will-Seal 600.

C. Splice Adhesive for Foam Gasket Seal: One part urethane wet sealant as recommended by gasket seal manufacturer.

D. Soft Gasket: flexible semi-closed cell urethane.
   1. Provide 1/2 inch thicker than joint where foam tape, foam gasket and urethane insulation is indicated and not provided under other sections.
   2. Location: At gaps between framing and other materials.

E. Expansion Material: Dow Chemical Ethafoam. Use where expansion joint material is indicated and not installed under other sections.

2.8 COMPRESSIBLE SEAL

A. General: Joint manufacturer shall review layout, configuration, and anticipated movement and establish the specific model number and size of Compressible Seal for this application.

B. Compression Seal: Wabo WA250 heavy duty neoprene seals in gray color.
   1. Acceptable Manufacturers and Products:
      a. Watson Bowman Acme.
      b. Michael Rizza Company.
2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

JOINT SEALANTS 079200 - 6
3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer’s written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer’s written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FOAM GASKET SEAL INSTALLATION

A. Comply with manufacturer's recommendations except where more stringent requirements are specified, or except where manufacturer's technical representative directs otherwise.

B. Clean, prepare, and size joints to comply with manufacturer's recommendations. Remove loose materials and other foreign matter which might impair adhesion of sealant.

1. Size material to obtain compression of 25 percent of uncompressed dimension.

C. Remove foam gasket from protective wrapping.

D. Expose self-adhesive side and secure against joint face.

E. Horizontal Joints: Proceed sequentially in one direction with scarfed ends pushed well past one another.

F. Vertical Joints: Start at bottom and proceed up wall.

G. Do not stretch material during installation.

3.5 COMPRESSIBLE SEAL

A. Comply with manufacturer’s recommendations except where more stringent requirements are specified, or except where manufacturer’s technical representative directs otherwise.

B. Joint Design: Joint manufacturer shall review layout, configuration, and anticipated movement and establish the specific installation of Compressible Seal for this application.

3.6 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.

B. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

   1. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

C. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.8 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.9 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

   1. Joint Locations:
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between plant-precast architectural concrete paving units.
      d. Joints in stone paving units, including steps.
      e. Tile control and expansion joints.
      f. Joints between different materials listed above.
      g. Other joints as indicated.


4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior vertical joints in horizontal traffic surfaces subject to water immersion.
   1. Joint Locations:
      a. Joints in precast below grade
   2. Urethane Joint Sealant: Immersible, multi-component, non-sag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      b. Joints between plant-precast architectural concrete units unless below grade.
      c. Control and expansion joints in unit masonry.
      d. Joints in dimension stone cladding.
      e. Joints in glass unit masonry assemblies.
      f. Joints in exterior insulation and finish systems.
      g. Joints between metal panels.
      h. Joints between different materials listed above.
      i. Perimeter joints between materials listed above and frames of doors, windows, louvers, curtain wall and metal panel systems.
      j. Control and expansion joints in ceilings and other overhead surfaces.
      k. Other joints as indicated.
   2. Silicone Joint Sealant:
      a. Single component, non-sag, neutral curing, Class 100/50.
      b. Multicomponent: Silicone, Nonstaining, M, NS, 50, NT.
   4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant - Urethane:
      a. Single-Component:
         1) Non-Sag: Urethane, S, NS, 100/50, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
f. Other joints as indicated.


F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
   1. Joint Locations:
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
      c. Other joints as indicated on Drawings.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non traffic surfaces.
   1. Joint Location:
      a. Acoustical joints where indicated.
      b. Other joints as indicated.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of color.
SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior expansion control systems.

1.2 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.

C. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.

D. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
   1. Manufacturer and model number for each expansion control system.
   2. Expansion control system location cross-referenced to Drawings.
   3. Nominal joint width.
   5. Classification as thermal or seismic.
   7. Product options.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
   1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
   2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.
2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."

2. Component Importance Factor is 1.5.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

A. Center-Plate Floor Joint Cover: Assembly consisting of center plate that slides over metal frames fixed to sides of joint gaps.

1. Basis-of-Design Product: Subject to compliance with requirements, provide NBA by Balco, Inc.

2. Application: Floor to floor.

3. Installation: No bump.

4. Load Capacity:

   a. Uniform Load: 50 lb/sq. ft.

   b. Concentrated Load: 300 lb.

   c. Maximum Deflection: 0.0625 inch.

5. Fire-Resistance Rating: Not less than that indicated on Drawings.

6. Cover-Plate Design: Plain.

7. Exposed Metal:

   a. Aluminum: Mill.

B. Limitations: Obtain expansion control systems from single source from single manufacturer.

2.4 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

E. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
F. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

G. Moisture Barrier: Flexible elastomeric material, PVC, minimum 30 mils thick or EPDM, minimum 45 mils thick.

H. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

I. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.5 GENERAL FINISH REQUIREMENTS

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed 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 substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

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2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.

3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.

4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.

5. Install frames in continuous contact with adjacent surfaces.
   a. Shimming is not permitted.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.

2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.

3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer to both substrate surfaces before installing compression seals.

E. Foam Seals: Install with adhesive recommended by manufacturer.

F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.

G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

I. Moisture Barrier: Provide where indicated on Drawings. Provide drainage fittings where indicated on Drawings.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500
SECTIONS 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes:
   1. Hollow Metal Doors and Frames.

1.2 COORDINATION
A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.
C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS
A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
B. Thermal Performance Certification: For exterior door assemblies, submit certification required under Quality Assurance of this specification.
C. Qualification Data: For door inspector.
   1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
   2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
   3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
1.6 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.
   2. Inspect on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ceco Door Products; an Assa Abloy Group company.
   2. Curries Company; an Assa Abloy Group company.
   5. Mesker Door Inc.
   7. Republic Doors and Frames.
   8. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer regularly engaged in the manufacture of hollow metal doors and frames for not less than 5 years.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C Category A positive pressure fire doors.
1. Temperature-Rise Rating: Where indicated, and where steel doors are shown in stairwells and exit enclosures, provide doors that have a temperature-rise rating of 450 degrees F maximum in 30 minutes of fire exposure.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

B. Fire-Rated, Borrowed-Light Assemblies and Fire-Rated Window Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES
A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door Schedule.
   c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
   d. Edge Construction: Model 1, Full Flush.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polysiocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
   f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener or laminated mineral board core for fire-rated and temperature-rise-rated doors.
   g. Reinforcement: 14-gauge (0.068 inch) steel edge plate full height at hinge side of doors.

3. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
   b. Construction: Full profile welded.
   c. Reinforcement:
      1) 14-gauge (0.068 inch) steel plate full width head reinforcement.
      2) Reinforcement: 14-gauge (0.068 inch) steel edge plate full height at hinge side of frames.


2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES
A. General: Provide 1-3/4 inch doors of design specified, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.
   a. Provide 22-gauge steel stiffeners at 6 inches OC internally welded at 5 inches OC to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
   b. Thermal properties to rate at a fully operable minimum U-Factor 0.29 and R-Value 3.4, including insulated door, thermal-break frame and threshold.
      1) Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.8, including insulated door, kerf type frame, and threshold.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18-gauge (0.042 inch) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches.
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16-gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

2.5 ENERGY EFFICIENCY HOLLOW METAL FRAMES
A. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate from minimum 16-gauge galvannealed steel, with positive 3/8" vinyl thermal break and integral vinyl weatherstripping. Thermal break frames available as knock down types only.
   1. Manufacturers Basis of Design:
      a. CECO Door Products - Thermal Break SQT and SRT Series.
   2. Reinforcement:
      a. 14-gauge steel plate full width head reinforcement.
B. Weatherstripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weatherstripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.
   1. Manufacturers Basis of Design:
      a. CECO Door Products - Weatherstripped SQW Series.
      b. CECO Door Products - Weatherstripped SRW Series.
      c. Curries Company - Weatherstripped WC Series.
      d. Curries Company - Weatherstripped WM Series.
2.6 BORROWED LITES
   A. Fabricate of uncoated cold-rolled steel sheet, minimum thickness of 0.053 inch.
   B. Construction: Full profile welded.
   C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
   D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.7 HOLLOW-METAL PANELS
   A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.8 FRAME ANCHORS
   A. Jamb Anchors:
      1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
      2. Stud-Wall Type: Designed to engage stud, welded to back of frames, not less than 0.042 inch thick.
      3. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
      4. Type: Anchors of minimum size and type required by applicable door and frame standard and suitable for performance level indicated.
      5. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.

   B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
      1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
      2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
      3. Provide floor anchors for each jamb and mullion that extends to floor.

   C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

   D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
      1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.
2.9 MATERIALS

A. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.10 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer’s plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot-weld to face sheets no more than 5 inches OC. Fill spaces between stiffeners with glass- or mineral-fiber insulation.

2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.

3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer’s discretion.

4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.

6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating, or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt-welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

4. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch. Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames provide anchor clips or countersunk holes at bottoms of jambs.

5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick. Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches OC, to match coursing, and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick. Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches OC and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions; weld anchors to back of frames.

7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide flush stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.11 STEEL FINISHES
A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.12 ACCESSORIES
A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION
A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
a. At fire-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.


4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
      c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
      d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches OC and not more than 2 inches from each corner.

3.4 FIELD QUALITY CONTROL

A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after unacceptable.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113
SECTION 081216 – INTERIOR ALUMINUM FRAMES AND DOORS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Interior aluminum frames and doors.
   2. Interior aluminum-framed storefront and doors.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For aluminum frames:
   1. Include elevations, sections, and installation details for each wall-opening condition.
   2. Include details for each frame type, including dimensioned profiles and metal thicknesses.
   3. Include locations of reinforcements and preparations for hardware.
   4. Include details of anchorages, joints, field splices, connections, and accessories.
   5. Include details of moldings, removable stops, and glazing.
C. Samples: For each exposed product and for each color and texture specified, 6 inches square in size.
D. Samples for Verification: For each type of the following products:
   1. Framing Member and Finish: 12 inches long. Include trim.
   2. Corner Fabrication and Finish: 12-by-12-inch long, full-size window corner, including full-size sections of extrusions with factory-applied color finish.
   3. Door Finish: Manufacturer's standard-size unit, but not less than 3 inches square.
E. Product Schedule: For aluminum frames. Coordinate with door hardware schedule and glazing.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance Data: For aluminum frames to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 ALUMINUM FRAME
A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Frameworks, Inc.; an ASSA ABLOY Group company.
   2. RACO Interior Products, Inc.
   3. Versatrac Frames; a division of American Door Products Inc.
   4. Wilson Partitions; a division of Arcadia, Inc.
B. Source Limitations: Obtain aluminum frames and frame-manufacturer's doors from single source from single manufacturer.
C. Components:
1. Aluminum Framing: ASTM B 221 ( ), with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.
2. Door Frames: Extruded aluminum, reinforced for hinges, and strikes per hardware schedule.
3. Frame Reinforcement: Plate for regular arm, parallel arm and top jamb mounted closers.
4. Glazing Frames: Extruded aluminum, for glass thickness.
5. Trim: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in door stops, without exposed fasteners.
   a. Door Operation: Swinging.
   b. Stiles: 5-1/2 inches.
   c. Rails: 6-inch top rail and 6-inch bottom rail.

2.2 ALUMINUM-FRAMED STOREFRONT
A. Basis-of-Design Product: Subject to compliance with requirements, provide Trifab 450 by Kawneer North America or comparable product by one of the following:
   1. Kawneer North America; an Alcoa company.
   2. Oldcastle Building Envelope.
   3. TRACO
   4. Tubelite.
B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.
C. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   5. Recycled Content of Aluminum Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
D. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System: Retained mechanically with gaskets on four sides.
   3. Glazing Plane: As indicated.
E. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
F. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Trifab 450 by Kawneer North America or comparable product.

2. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

3. Door Design: Medium stile; 3-1/2-inch nominal width.
   a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.
   1. Provide exposed fasteners to match finish of members and hardware being fastened.
   2. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal.
   3. Provide Phillips flat-head machine screws for exposed fasteners.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals in black color.

D. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated; in black.

E. Glass: As specified in Section 088000 "Glazing."

F. Door Hardware: As specified in Section 087100 "Door Hardware."

2.4 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted and mitered connections.

C. Factory prepare aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."
   1. Locate hardware cutouts and reinforcements as required by fire-rated label for assembly.

D. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.
   1. Locate removable stops on the inside of spaces accessed by keyed doors.
E. Factory prepare and reinforce aluminum frames to receive door closer.
F. Fabricate components to allow secure installation without exposed fasteners.
G. Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
   1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
H. Doors: Reinforce doors as required for installing entrance door hardware.
I. Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.5 GENERAL FINISH REQUIREMENTS
A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES
A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Verify that wall thickness does not exceed standard tolerances allowed by throat size of indicated aluminum frame.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install aluminum frames plumb, rigid, properly aligned, and securely fastened in place; according to manufacturer’s written instructions.
B. Install frame components in the longest possible lengths with no piece less than 48 inches; components 96 inches or shorter shall be one piece.
   1. Fasten to suspended ceiling grid on maximum 48-inch centers, using sheet metal screws or other fasteners approved by frame manufacturer.
   2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
   3. Secure clips to extruded main-frame components and not to snap-in or trim members.
   4. Do not leave screws or other fasteners exposed to view when installation is complete.
C. Metal Protection:

ALUMINUM FRAMES

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1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

D. Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

E. Glass: Install glass according to Section 088000 "Glazing" and aluminum-frame manufacturer's written instructions.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length.
2. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
3. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
4. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   d. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Adjust operating door hardware to function smoothly as recommended by manufacturer.

C. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended in writing by frame manufacturer and according to AAMA 609 & 610.

D. Touch Up: Repair marred frame surfaces to blend inconspicuously with adjacent unrepaired surface so touchup is not visible from a distance of 48 inches as viewed by Architect. Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION 081216
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Solid-core doors with impact resistant laminate faces.
   3. Factory finishing flush wood doors.
   4. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 DEFINITIONS

1.3 ACTION SUBMITTALS
A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
B. Sustainable Design Submittals:
   1. Product Data for adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.
C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.
   4. Indicate doors to be factory finished and finish requirements.
   5. Indicate fire-protection ratings for fire-rated doors.
D. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   2. Corner sections of doors, 2 of each, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
      a. Provide samples for each species of veneer and solid lumber required.
      b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
   3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS
A. Warranty: Sample of special warranty.
B. Certification Letter: Submit letter on Contractor’s letter head stationary signed by Contractor indicating that all materials incorporated into this Project comply with requirements specified in this Specification and comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Qualification Data: For door inspector.
   1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
   2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
   3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
B. Source Limitations: Obtain flush wood doors from single manufacturer.
C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C Category A.
   1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
   2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

E. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

F. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

G. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Comply with requirements of referenced standard and manufacturer’s written instructions.
B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
C. Mark each door on top and bottom rail with opening number used on Shop Drawings.
D. Store doors flat on level raised platforms in clean, dry, well ventilated area protected from sunlight and weather. Cover but allow for air circulation.
1.7 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and
      weathertight, wet work in spaces is complete and dry, and HVAC system is operating and
      maintaining temperature between 60 and 90 deg F and relative humidity between 25 and
      55 percent during the remainder of the construction period.

1.8 WARRANTY
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or
      replace doors that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the
      following:
      1. Algoma Hardwoods, Inc.
      2. Eggers Industries.
      3. Lambton Doors.
      5. Oshkosh Architectural Door Company.
      6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL
   A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that
      do not contain urea formaldehyde.
   B. WDMA I.S.1-A Performance Grade: Heavy Duty.
   C. Structural-Composite-Lumber-Core Doors:
         a. Screw Withdrawal, Face: 700 lbf.
         b. Screw Withdrawal, Edge: 400 lbf.
   D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-
      protection rating indicated.
      1. Edge Construction: Provide edge construction with built-in intumescent seals concealed
         by outer stile. Comply with specified requirements for exposed edges.
      2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated
         without formed-steel edges and astragals. Provide stiles with built-in concealed
         intumescent seals. Comply with specified requirements for exposed edges.
   E. Mineral-Core Doors:
      1. Core: Noncombustible mineral product complying with requirements of referenced quality
         standard and testing and inspecting agency for fire-protection rating indicated.
      2. Blocking: Provide composite blocking with improved screw-holding capability approved
         for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting
         hardware.
3. **Edge Construction:** At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

### 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

#### A. Interior Solid-Core Doors:

1. **Grade:** Premium, with Grade A faces.
2. **Species:** White Maple, or to match existing where indicated.
3. **Cut:** Plain Sliced
4. **Match between Veneer Leaves:** Book
5. **Assembly of Veneer Leaves on Door Faces:** Balance
6. **Pair and Set Match:** Provide for doors hung in same opening.
7. **Room Match:** Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
8. **Project Match:** Provide doors of similar color and grain throughout the Project.
9. **Stiles and Tops:** Provide 1-7/16 inch two-ply stiles and tops with minimum 1/4-inch solid lumber outer plies. Veneered edges will not be accepted. Wood to match veneer.
10. **Core:** Structural composite lumber.
11. **Construction:** Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
12. **WDMA I.S.1-A Performance Grade:** Heavy Duty.

### 2.4 IMPACT RESISTANT WOOD DOORS

#### A. Laminate selection shall be one of standard products of C/S Group Chameleon, solid color. Color shall be integral throughout to prevent discoloration caused by scratching.

1. **Woodgrain pattern to give appearance of one entire wood veneer – book matching or slip matching appearance not acceptable.**

#### B. Stile edge of doors shall be replaceable in field and include 1/4-inch radius edges (square edges not permitted).

#### C. Stile edge guards of door shall be removable, non-face-fastened edge protection, flush with face of door and include 1/4-inch radius edges (square edges not permitted).

#### D. Top and bottom rails shall be factory sealed with approved wood sealer.

#### E. Doors shall be prefit and beveled at factory to fit openings. Prefit tolerances shall be in accordance with requirements of WDMA I.S. 1-A, latest edition.

#### F. Doors shall be machined in factory for mortised hardware items.

#### G. Interior Solid-Core Doors:

1. **Grade:** Premium.
2. **Vinyl Acrylic Faces:** High impact .040 inch solid color vinyl/acrylic
3. **Colors, Patterns, and Finishes:** As indicated.
4. **Stile edge guards shall be replaceable high impact 0.060 inch solid color vinyl/acrylic or 20 gauge stainless steel, type 304, #4 finish with coating stainless steel flush to face of door. Face fastened or glued edge protection is not permitted. Edge protection shall wrap edge of door.
5. **Impact Durability Performance:**
   a. **Cycle Slam WDMA TM-7, 1990:** 1,350,000 cycles
   b. **Hinge Loading WDMA TM-9, 1990:** 550 lb.

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6. Face Veneer Wear Index - Abrasion Resistance Testing - ASTM D4060-90: 28,000 cycles 
   Face Veneer Impact Resistance - ASTM D-4226: 86 in/lb
8. Crossbanding shall be 0.115 inch raw hardboard.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive 
   planed before faces and crossbands are applied. Faces are bonded to core using a 
   hot press.
10. 1-1/4 inch interior stile and replaceable custom hardwood stiles machined to mate.
11. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.5 LIGHT FRAMES
   A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, 
      cold-rolled steel sheet; factory primed, grey, for paint finish; and approved for use in doors of fire- 
      protection rating indicated.

2.6 FABRICATION
   A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of 
      referenced quality standard for fitting unless otherwise indicated.
      1. Comply with requirements in NFPA 80 for fire-rated doors.
   B. Factory machine doors for hardware that is not surface applied, including drilling pilot holes for 
      hinge screws and lock fronts. Locate hardware to comply with DHI-WDHS-3. Comply with final 
      hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware 
      templates.
      1. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for 
         pairs of fire-rated doors.
   C. Through bolt door hardware that is attached to the surface of the door with manufacture supplied 
      hardware with the exception of kick, amour, and edge guards.
   D. Openings: Cut and trim openings through doors in factory.
      1. Light Openings: Trim openings with moldings of material and profile indicated.
      2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with 
         applicable requirements in Division 08 Section "Glazing."

2.7 FACTORY FINISHING
   A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, 
      including fitting doors for openings and machining for hardware that is not surface applied, before 
      finishing.
      1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be 
         omitted on top and bottom edges, edges of cutouts, and mortises.
   B. Finish doors at factory.
   C. Transparent Finish: 
      1. Grade: Premium. 
      2. Finish: North American Architectural Woodworking Standards (NAAWS)/WI System. 12, 
         water based polyurethane.
      3. Staining: To match existing or custom stain to match PL-2.
      4. Effect: Open or filled as selected by the Architect.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
   1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
   2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Detail fabrication and installation of access doors and frames for each type of substrate.
C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
   2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS
A. Basis-of-Design Product: Subject to compliance with requirements, provide Milcor; Commercial Products Group of Hart & Cooley, Inc.; or a comparable product by one of the following:
   1. Access Panel Solutions.
   2. Babcock-Davis.
   5. Larsen’s Manufacturing Company.
   6. Milcor Inc.
   7. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Recessed Access Doors:
   1. Assembly Description: Fabricate door in the form of a pan recessed 1 inch for plaster infill. Provide frame with plaster bead for concealed flange installation.
   2. Locations: Plaster ceiling.
3. Door Size: As indicated on the drawing.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16-gauge.
5. Frame Material: Same material and thickness as door.

D. Flush Access Doors with Concealed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Door Size: As indicated on the drawings
4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gauge.
5. Provide gasketed seals when indicated.
6. Frame Material: Same material and thickness as door.

E. Fire-Rated, Flush Access Doors with Concealed Flanges:
1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
5. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gauge.
6. Frame Material: Same material, thickness, and finish as door.

2.3 MATERIALS
A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
D. Frame Anchors: Same type as door face.
E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION
A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
   1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded-metal lath and exposed casing bead welded to perimeter of frames.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder locks, furnish two keys per lock and key all locks alike.
   2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.5 FINISHES

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113
ACCESS DOORS AND FRAMES

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SECTION 083343 - ELEVATOR DOOR SMOKE CONTAINMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Smoke detector activated elevator door smoke containment screen and control system designed to provide a tight-fitting, smoke- and draft-control assembly.

1.2 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
   3. Include description of automatic closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
   5. Show locations of controls, locking devices and other accessories.
   6. Include diagrams for power, signal, and control wiring.

1.3 QUALITY ASSURANCE

A. Overall Standards:
   1. Manufacturer shall maintain a quality control program in accordance with ICC-ES Acceptance Criteria 77.

B. Electrical Components: Listed and labeled by Underwriters Laboratories (UL).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside, under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
PART 2 - PRODUCTS

2.1 MANUFACTURER
   A. Basis of Design Product: Subject to compliance with requirements provide products equivalent to:
      1. Model 400 by Smoke Guard, 287 Maple Grove, Boise, Idaho 83704 http://www.smokeguard.com/

2.2 PERFORMANCE REQUIREMENTS
   A. Air Leakage: Not to exceed 3 cfm per sf of door opening at 0.1 in (25 Pa) water pressure differential at ambient temperature and 400 degrees F tested per IBC 2006, 2009, and 2012.

2.3 COMPONENTS
   A. Screen:
      1. Film: Minimum 1 mil thick transparent polyimide film reinforced with minimum 100 denier Nomex yarn at .25 in each way.
   B. Housing: 20-gauge, powder coated, cold rolled steel container with dust cover and door with concealed hinges. Housings are 55, 64, or 73 inch in length plus 1-1/2 inches for a junction box on the left side.
   C. Auxiliary Rails: 16 gauge ASTM A 240/240M, Type 430, ferretic stainless steel, with a satin No. 4 finish.
      1. Size: 2 inches wide, 1 inch deep, unless otherwise indicated.
   D. Rewind Motor: NFPA 70, 90v DC.
   E. Release Mechanism: IAS (IAS is a trademark of International Accreditation Service) Accredited Testing Laboratory Labels for UL Standard 864
   F. Screen Rewind Switch: Include switch to rewind screen into housing.
   G. Label each smoke containment system with following information:
      1. Manufacturer’s name.
      2. Maximum leakage rating at specified pressure and temperature conditions.

2.4 FABRICATION
   A. Shop Assembly: Preassemble formed-metal items in shop to greatest extent possible to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
   B. Coordinate dimensions and attachment methods of formed-metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.
   C. Form metal to profiles required, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
   1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce ornamental formed-metal items as needed to attach and support other construction.

F. Coordinate with partition provider to assure required reinforcing or mounting plates are provided.

G. Where welding is required, shop weld joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
   1. Use welding procedures that will blend with and not cause discoloration of metal being joined.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates upon which work will be installed.
      1. Verify related work performed under other sections is complete and in accordance with Shop Drawings.
      2. Verify wall surfaces and elevator door frames are acceptable for installation of smoke containment system components.
      3. Verify existing field painted elevator door frames to be used for screen adherence have been repainted in accordance with smoke containment system manufacturer’s instructions.
   B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
   C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION
   A. Install smoke containment system components in accordance with manufacturer’s installation instructions.

3.3 DEMONSTRATION
   A. Demonstrate required testing and maintenance procedures to Owner’s Representative.
   B. Maintenance and Testing:
      1. Perform minimum semi-annual maintenance and testing on each smoke containment system as required by the manufacturer’s warranty, code agency evaluation reports, and as required by local authority having jurisdiction.
      2. Retain permanent record of tests.
   C. Future Painting: Paint elevator door frame and/or auxiliary rails in accordance with Operation and Maintenance Manual.
   D. Qualified Smoke Guard Inspector assesses unit after exposure to a fire event.

END OF SECTION 083343
SECTION 084123 - FIRE RATED GLASS AND FRAMING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Fire resistant rated door and framing systems for installation as full vision fire rated doors and interior openings.

1.2 SUBMITTALS
   A. Product Data:
   B. Shop Drawings:
      1. Include plans, elevations and details of product showing component dimensions; framed opening requirements, dimensions, tolerances, and attachment to structure
   C. Hardware schedule: list of manufacture supplied hardware and verification of cylinder size complying with Section 087100
   D. Samples: For following products:
      1. Two 8-inch by 10-inch samples for glass
      2. Sample of steel frame
      3. Verification of sample of selected finish
   E. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

1.3 QUALITY ASSURANCE
   A. Source Limitations for Glazing Accessories: Obtain framing system, glazing and glazing accessories from one source for each product and installation method indicated.
   B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 252. Assemblies must be factory-welded or come complete with factory-installed mechanical joints and must not require job site fabrication.
   C. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer’s listing.
   D. Regulatory Requirements: Comply with provisions of the following:
      1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.
   1. At delivery inspect all containers for damage.
   2. Examine glass and frame units for damage.
   3. List all damage to containers on the shipping company’s Bill of Lading.
   4. Report damage to manufacturer immediately.
   5. Store glazing materials and frame units in original packing containers.
   6. Do not expose glazing material of frame units to sunlight and weather.
   7. Do not store horizontally.
   8. Place glass and frames upright, no less than 6 degrees from vertical.
   9. Store all materials in dry conditions, off the ground.
  10. Protect from construction activities.
  11. Fully support glass units along entire length.
  12. Glass and frame units must be separated by non-abrasive pads such as cloth or cork.
  13. Do not stack containers.

1.5 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.
B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated design: For the performance requirements listed below requiring structural design provide data, calculations and drawings signed and sealed by an engineer licensed in the state where the project is located.
B. Performance: Glass must be rated to stop fire from either direction and must meet all testing requirements including the required hose-stream test (where fire-rating exceeds 20 minutes).

2.2 FIRE RATED DOOR AND WINDOW ASSEMBLY

A. Basis-of-Design Product: Subject to compliance with requirements, provide Fireframes Designer Series by Technical Glass Products or comparable product by one of the following:
   1. SAFTI FIRST Fire Rated Glazing Solutions.
B. Design Requirements
   1. Dimensions - Door and Framing:
      a. Door Framing Face Dimension: 1-15/16-inch.
      b. Depth of Door Framing: 1-15/16-inch.
      c. Door Style Face Dimension: 3-1/8-inch.
      d. Door Cross Rail (if applicable) Face: 3-9/16-inch.
      e. Depth of Stile, Header, Sill and Cross Rail: 1-15/16-inch.
   2. Construction: Narrow-profile, roll-formed steel architectural grade specialty fire doors.
a. Conventional break-shape type hollow metal steel fire-rated doors not acceptable.
b. Knock down frames are not permitted.

C. Steel Frames and Doors
   1. Fire Rating: 60 minutes.
   2. Frame: Profiled formed steel tubing.
   3. Fasteners: Type recommended by entrance and storefront system manufacturer.

D. Fire-resistant-rated glazing:
   1. Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; 5/16-inch total thickness; and complying with 16 CFR 1201, Category II.
      a. Products: Subject to compliance with requirements, provide FireLite Plus by Technical Glass Products (TGP) or comparable product.
      b. Surface Finish: Ground and polished on one side.
      d. Sound Transmission Class (STC): 38 dB.
   2. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory (UL® only), fire rating period, safety glazing standards, and date of manufacture.
   3. Glazing Accessories: Set glass using calcium silicate, or setting blocks.
   4. Glazing Gaskets, Compounds and Tapes: EPDM glazing gaskets and closed cell PVC tape or pure silicone sealant acceptable to entrance and storefront system manufacturer.

2.3 FABRICATION
   A. Furnish frame assemblies pre-welded.
      1. When necessary, splice frames too large for shop fabrication or shipping or to fit in available building openings.
      2. Fit with suitable fasteners.
      3. Knock-down frames are not permitted
   B. Field glaze door and frame assemblies.
   C. Factory prepare steel door assemblies and install all hardware.
   D. Fabrication Dimensions: Fabricate to fire-rated field dimensions.
   E. Obtain approved shop drawings prior to fabrication.

2.4 FINISHES, GENERAL
   A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   B. Finish frames after assembly.
   C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.5 FACTORY FINISHES
   A. Color-Coated Finish: Apply manufacturer's standard powder coating finish system complying with AAMA 2603 applied to factory-assembled frames before shipping, complying with
manufacturer's written instructions for surface preparation including pretreatment, application, and minimum dry film thickness.

1. **Color and Gloss:** As selected by Architect from manufacturer's full range.

### 2.6 DOOR HARDWARE

A. Furnish hardware with 60 minute fire door by the manufacturer.  

B. Select hardware from door manufacturer's standard recommended and approved hardware groups as specified in Division 8 Section – Door Hardware.

1. **Single In-Swing Doors with Mortise Locking**  
   a. **Item: Hanging devices**  
      1) Description: Weld-on pivots  
      2) Manufacturer: Technical Glass Products  
      3) Quantity: 3  
      4) Finish: Painted to match frame  
   b. **Item: Lever trim**  
      1) Description: Narrow escutcheon lever trim Set DSR2NN#P6-yy-630  
      2) Manufacturer: Technical Glass Products  
      3) Quantity: 1  
      4) Finish: 630 Satin stainless steel  
   c. **Item: Mortise lock**  
      1) Description: Mortise lock with panic function  
      2) Manufacturer: Technical Glass Products  
      3) Quantity: 1  
      4) Finish: 630 Satin stainless steel  
   d. **Item: Cylinder**  
      1) Description: European Profile Schlage C Keyway  
      2) Manufacturer: Technical Glass Products  
      3) Quantity: 1  
      4) Finish: 626 Satin chrome plated  
   e. **Item: Closing devices**  
      1) Description: TS 93 Surface Applied Closer  
      2) Manufacturer: DORMA  
      3) Quantity: 1  
      4) Finish: 689 Aluminum paint  
   f. **Item: Automatic door bottom**  
      1) Description: 420 APKL Smoke Seal  
      2) Manufacturer: Pemko  
      3) Quantity: 1  
      4) Finish: Mill finish aluminum  
   g. **Item: Weather seal**  
      1) Description: Perimeter gasket  
      2) Manufacturer: Technical Glass Products
2. Single Out-Swing Doors with Mortise Locking
   a. Item: Hanging devices
      1) Description: Weld-on pivots
      2) Manufacturer: Technical Glass Products
      3) Quantity: 3
      4) Finish: Painted to match frame
   b. Item: Lever trim
      1) Description: LX Series Control Trim Lever Set DSR1GN#-#-yyy-630
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 630 Satin stainless steel
   c. Item: Mortise lock
      1) Description: Mortise lock with panic function
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 630 Satin stainless steel
   d. Item: Cylinder
      1) Description: ANSI Mortise Schlage C Keyway
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 626 Satin chrome plated
   e. Item: Closing devices
      1) Description: TS 93 Surface Applied Closer
      2) Manufacturer: DORMA
      3) Quantity: 1
      4) Finish: 689 Aluminum paint
   f. Item: Automatic door bottom
      1) Description: 420 APKL Smoke Seal
      2) Manufacturer: Pemko
      3) Quantity: 1
      4) Finish: Mill finish aluminum
   g. Item: Weather seal
      1) Description: Perimeter gasket
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
   h. Provide 1 additional pivot for 90-minute rated doors
   i. Balance of hardware provided as specified in Section 087100 Door Hardware

3. Single Out-Swing Doors with Exit Device
   a. Item: Hanging devices
1) Description: Weld-on pivots  
2) Manufacturer: Technical Glass Products  
3) Quantity: 3  
4) Finish: Painted to match frame

b. Item: Exit device
   1) Description: F9700 Rim  
   2) Manufacturer: DORMA  
   3) Quantity: 1  
   4) Finish: 630 Satin stainless steel

c. Item: Lever trim
   1) Description: ZT08 Tubular lever handles  
   2) Manufacturer: DORMA  
   3) Quantity: 1  
   4) Finish: 630 Satin stainless steel

d. Item: Cylinder
   1) Description: ANSI Mortise Schlage C Keyway  
   2) Manufacturer: Technical Glass Products  
   3) Quantity: 1  
   4) Finish: 626 Satin chrome plated

e. Item: Closing devices
   1) Description: TS 93 Surface Applied Closer  
   2) Manufacturer: DORMA  
   3) Quantity: 1  
   4) Finish: 689 Aluminum paint

f. Item: Automatic door bottom
   1) Description: 420 APKL Smoke Seal  
   2) Manufacturer: Pemko  
   3) Quantity: 1  
   4) Finish: Mill finish aluminum

g. Item: Weather seal
   1) Description: Perimeter gasket  
   2) Manufacturer: Technical Glass Products  
   3) Quantity: 1

h. Balance of hardware provided as specified in Section 087100 Door Hardware

4. Active-Fixed In-Swing Pair of Doors with Mortise Locking
   a. Item: Hanging devices
      1) Description: Weld-on pivots  
      2) Manufacturer: Technical Glass Products  
      3) Quantity: 5  
      4) Finish: Painted to match frame

   b. Item: Lever trim
      1) Description: Narrow escutcheon lever trim Set DSR2NN#P6-yy-630  
      2) Manufacturer: Technical Glass Products
c. Item: Mortise lock
   1) Description: Mortise lock with panic function
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1
   4) Finish: 630 Satin stainless steel

d. Item: Cylinder
   1) Description: European Profile Schlage C Keyway
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1
   4) Finish: 626 Satin chrome plated

e. Item: Cylinder cover plates
   1) Description: Profile cylinder cover plate
   2) Manufacturer: Technical Glass Products
   3) Quantity: 2
   4) Finish: 626 Satin chrome plated

f. Item: Closing devices
   1) Description: TS 93 Surface Applied Closer
   2) Manufacturer: DORMA
   3) Quantity: 2
   4) Finish: 689 Aluminum paint

g. Item: Coordinator
   1) Description: GSR
   2) Manufacturer: DORMA
   3) Quantity: 1
   4) Finish: 689 Aluminum paint

h. Item: Flush bolt set
   1) Description: Automatic or semi-automatic flush bolt with dustproof recessed strike
   2) Manufacturer: Trimco
   3) Quantity: 1
   4) Finish: 626 Satin chrome plated

i. Item: Automatic door bottom
   1) Description: 420 APKL Smoke Seal
   2) Manufacturer: Pemko
   3) Quantity: 2
   4) Finish: Mill finish aluminum

j. Item: Weather seal
   1) Description: Perimeter gasket
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1

k. Balance of hardware provided as specified in Section 087100 Door Hardware
5. Active-Fixed Out-Swing Pair of Doors with Mortise Locking
   a. Item: Hanging devices
      1) Description: Weld-on pivots
      2) Manufacturer: Technical Glass Products
      3) Quantity: 6
      4) Finish: Painted to match frame
   b. Item: Lever trim
      1) Description: LX Series Control Trim Lever Set DSR1GN#-#-yyy-630
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 630 Satin stainless steel
   c. Item: Mortise lock
      1) Description: Mortise lock with panic function
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 630 Satin stainless steel
   d. Item: Cylinder
      1) Description: ANSI Mortise Schlage C Keyway
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 626 Satin chrome plated
   e. Item: Cylinder cover plates
      1) Description: Profile cylinder cover plate
      2) Manufacturer: Technical Glass Products
      3) Quantity: 2
      4) Finish: 626 Satin chrome plated
   f. Item: Closing devices
      1) Description: TS 93 Surface Applied Closer
      2) Manufacturer: DORMA
      3) Quantity: 2
      4) Finish: 689 Aluminum pain
   g. Item: Coordinator
      1) Description: GSR
      2) Manufacturer: DORMA
      3) Quantity: 1
      4) Finish: 689 Aluminum pain
   h. Item: Flush bolt set
      1) Description: Automatic or semi-automatic flush bolt with dustproof recessed strike
      2) Manufacturer: Trimco
      3) Quantity: 1
      4) Finish: 626 Satin chrome plated
   i. Item: Automatic door bottom
1) Description: 420 APKL Smoke Seal
2) Manufacturer: Pemko
3) Quantity: 2
4) Finish: Mill finish aluminum

j. Item: Weather seal
1) Description: Perimeter gasket
2) Manufacturer: Technical Glass Products
3) Quantity: 1

k. Balance of hardware provided as specified in Section 087100 Door Hardware

6. Active-Fixed Out-Swing Pair of Doors with Exit Device
a. Item: Hanging devices
1) Description: Weld-on pivots
2) Manufacturer: Technical Glass Products
3) Quantity: 6
4) Finish: Painted to match frame

b. Item: Exit device
1) Description: F9700 Rim
2) Manufacturer: DORMA
3) Quantity: 1
4) Finish: 630 Satin stainless steel

c. Item: Lever trim
1) Description: ZT08 Tubular lever handles
2) Manufacturer: DORMA
3) Quantity: 1
4) Finish: 630 Satin stainless steel

d. Item: Cylinder
1) Description: ANSI Mortise Schlage C Keyway
2) Manufacturer: Technical Glass Products
3) Quantity: 1
4) Finish: 626 Satin chrome plated

e. Item: Closing devices
1) Description: TS 93 Surface Applied Closer
2) Manufacturer: DORMA
3) Quantity: 2
4) Finish: 689 Aluminum paint

f. Item: Coordinator
1) Description: GSR
2) Manufacturer: DORMA
3) Quantity: 1
4) Finish: 689 Aluminum paint

g. Item: Flush bolt set
1) Description: Automatic or semi-automatic flush bolt with dustproof recessed strike
2) Manufacturer: Trimco
3) Quantity: 1
4) Finish: 626 Satin chrome plated

h. Item: Automatic door bottom
   1) Description: 420 APKL Smoke Seal
   2) Manufacturer: Pemko
   3) Quantity: 2
   4) Finish: Mill finish aluminum

i. Item: Weather seal
   1) Description: Perimeter gasket
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1

j. Balance of hardware provided as specified in Section 087100 Door Hardware

7. Active-Active Out-Swing Pair of Doors with Exit Device
   a. Item: Hanging devices
      1) Description: Weld-on pivots
      2) Manufacturer: Technical Glass Products
      3) Quantity: 6
      4) Finish: Painted to match frame

   b. Item: Exit devices
      1) Description: F9700 Rim
      2) Manufacturer: DORMA
      3) Quantity: 2
      4) Finish: 630 Satin stainless steel

   c. Item: Lever trim
      1) Description: ZT08 Tubular lever handles
      2) Manufacturer: DORMA
      3) Quantity: 2
      4) Finish: 630 Satin stainless steel

   d. Item: Cylinder
      1) Description: ANSI Mortise Schlage C Keyway
      2) Manufacturer: Technical Glass Products
      3) Quantity: 1
      4) Finish: 626 Satin chrome plated

   e. Item: Closing devices
      1) Description: TS 93 Surface Applied Closer
      2) Manufacturer: DORMA
      3) Quantity: 2
      4) Finish: 689 Aluminum paint

   f. Item: Automatic door bottom
      1) Description: 420 APKL Smoke Seal
      2) Manufacturer: Pemko
      3) Quantity: 2
4) Finish: Mill finish aluminum

g. Item: Auxiliary fire latch
   1) Description: Used with exit device without bottom rod
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1
   4) Finish: 630 Satin stainless steel

h. Item: Weather seal
   1) Description: Perimeter gasket
   2) Manufacturer: Technical Glass Products
   3) Quantity: 1

C. Balance of hardware provided as specified in Section 087100 Door Hardware

D. Provide power assisted hardware for use at any door that cannot meet the opening force(s) required by code noted in Part I above.
   1. High energy, power-operated doors must meet the requirements of ANSI/BHMA A156.10 and power-assisted low energy doors must comply with ANSI/BHMA 156.19

2.7 ACCESSORY MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation.

B. Provide openings plumb, square and within allowable tolerances.
   1. Provide 3/8 inch shim space at all walls

C. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

D. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. Follow manufacturer’s written instructions and approved shop drawings.

B. Install fully welded fire door in strict accordance with the approved shop drawings.

C. Install fire safing / fire stopping at edges of system

D. Install glazing in strict accordance with fire resistant rated glazing material manufacturer’s specifications.
   1. Field cutting or tampering is not permissible.

E. Do not install damaged frames or chipped glazing units.

F. Install plumb and true. Limit out of plumb or true to 1/8 inch in 10’-0” in any dimension.

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3.3 REPAIR AND TOUCH UP
   A. Limited to minor repair of small scratches. Use only manufacturer’s recommended products.
      1. Such repairs shall match original finish for quality or material and view.
   B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.4 ADJUSTING
   A. Adjust door function and hardware for smooth operation. Coordinate with other hardware suppliers for function and use of any other attached hardware.

3.5 PROTECTION AND CLEANING
   A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
      1. Do not clean with astringent cleaners. Use a clean “grit free” cloth and a small amount of mild soap and water or mild detergent.
      2. Do not use any of the following:
         a. Steam jets
         b. Abrasives
         c. Strong acidic or alkaline detergents, or surface-reactive agents
         d. Detergents not recommended in writing by the manufacturer
         e. Do not use any detergent above 77 degrees F
         f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
         g. Metal or hard parts of cleaning equipment must not touch the glass surface
   B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
   C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 084123
SECTION 084229.23 - SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes exterior and interior, sliding, power-operated automatic entrances.

1.2 DEFINITIONS
   A. AAADM: American Association of Automatic Door Manufacturers.
   B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
   D. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
   E. For automatic door terminology, refer to BHMA A156.10 for definitions of terms.

1.3 COORDINATION
   A. Coordinate sizes and locations of recesses in concrete floors for recessed sliding tracks that control automatic entrances. Concrete, reinforcement, and formwork requirements are specified elsewhere.
   B. Templates: Distribute for doors, frames, and other work specified to be factory prepared for installing automatic entrances.
   C. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of Project.
   D. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies.
   E. System Integration: Integrate sliding automatic entrances with other systems as required for a complete working installation.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrances.
      2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   B. Shop Drawings: For sliding automatic entrances.
      1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
      2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      3. Include diagrams for power, signal, and control wiring.
      4. Indicate locations of activation and safety devices.
      5. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
1.5 INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of automatic entrance. Include emergency-exit features of automatic entrances serving as a required means of egress.
   B. Product Test Reports: For each type of automatic entrance, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For automatic entrances, safety devices, and control systems to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE
   A. Manufacturer Qualifications: A manufacturer with Company Certificate issued by AAADM indicating that manufacturer has a Certified Inspector on staff.
   B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project and who employs a Certified Inspector.
      1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
   C. Certified Inspector Qualifications: Certified by AAADM.

1.8 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of automatic 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 operators, controls, and hardware.
         c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
      2. Warranty Period: Two years from date of Substantial Completion.
   B. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
      1. Deterioration includes, but is not limited to, the following:
         a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
         b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
         c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
      2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCE ASSEMBLIES
   A. Source Limitations: Obtain sliding automatic entrances from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Operating Temperature Range: Automatic entrances shall operate within minus 20 to plus 122 deg F.

D. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq. ft. of fixed entrance-system area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

E. Opening Force:
   1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
   2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for a breakaway door or panel to open.

F. Entrapment-Prevention Force:
   1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

2.3 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances, including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.

B. Sliding Automatic Entrance ASD-1:
   1. Single- and Biparting-Sliding Units:
      a. Basis-of-Design Product: Subject to compliance with requirements, provide Stanley Access Technologies; Dura-Glide 2000/3000 or a comparable product by one of the following:
         1) Besam Entrance Solutions; ASSA ABLOY.
         2) NABCO Entrances, Inc.
   2. Configuration: Single-sliding door with one sliding leaf or Biparting-sliding doors with two sliding leaves, transom, sidelite.
      a. Traffic Pattern: Two way.
      c. Mounting: Between jambs.
   3. Operator Features:
a. Power opening and closing.
b. Drive System: belt.
c. Adjustable opening and closing speeds.
d. Adjustable hold-open time between zero and 30 seconds.
e. Obstruction recycle.
f. On-off/hold-open switch to control electric power to operator, key operated.

4. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: 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.
   a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

5. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.

6. Controls: Activation and safety devices according to BHMA standards.
   a. Activation Device: Motion sensor mounted on each side of door header to detect pedestrians in activating zone and to open door.
   b. Safety Device: Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in presence zone and to prevent door from closing.
   c. Opening-Width Control: Two-position switch that in the normal position allows sliding doors to travel to full opening width and in the alternate position reduces opening to a selected partial opening width.

7. Finish: Finish framing, door(s), and header with Class I, color anodic finish.
   a. Color: Dark bronze.

C. Sliding Automatic Entrance ASD-2 Clean Room:

1. Single- Sliding Units:
   a. Basis-of-Design Product: Subject to compliance with requirements, provide Stanley Access Technologies; Dura-Glide 3000 Clean Room or a comparable product by one of the following:
      1) Besam Entrance Solutions; ASSA ABLOY.
      2) NABCOS Entrances, Inc.

   a. Traffic Pattern: Two way.
   c. Mounting: Between jambs.

3. Operator Features:
   a. Power opening and closing.
   b. Drive System: belt.
   c. Adjustable opening and closing speeds.
   d. Adjustable hold-open time between zero and 30 seconds.
4. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: 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.
   a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

5. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless-steel, ball-bearing-center roller wheels.
   a. Configuration: No threshold across door opening and recessed guide-track system at sidelites.

6. Controls: Activation and safety devices according to BHMA standards.
   a. Activation Device: Push-plate switch or Touchless switch on each side of door to activate door operator.
      1) (TPS-1): Stanley 4” x 1-3/4” push tom open, stainless steel plate, flush mounted.
      2) (ITLS-1): WIKK Access No Touch infrared switch, SFA NO TOUCH 32D (2.25” x 4.5” x 1.375”)
         a) Adjustable range to 4”, preset to 2”.
         b) Equivalent manufacturer and product: SECO-LARM, ModelSD-927PKC-NEQ
   b. Safety Device: Presence sensor mounted on each side of door header and two photoelectric beams mounted in sidelite jambs on one side of the door to detect pedestrians in presence zone and to prevent door from closing.

7. Finish: Finish framing, door(s), and header with Class I, color anodic finish.
   a. Color: Dark bronze.

2.4 ENTRANCE 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.

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.
   2. Stile Design: Medium stile, 3-1/2-inch nominal width.

C. Sidelite(s) and Transom: 1-3/4-inch-deep sidede(s) and transom with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design.
   1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door.

D. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable
access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

1. Mounting: Concealed, with one side of header flush with framing.
2. Capacity: Capable of supporting doors of up to 175 lb per leaf over spans of up to 14 feet without intermediate supports.
   a. Provide sag rods for spans exceeding 14 feet.

E. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Signage: As required by cited BHMA standard.
   1. Application Process: Door manufacturer's standard process.

2.5 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extrusions: ASTM B 221.

B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

C. Glazing: As specified in Section 088000 "Glazing."

D. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."

E. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107/C 1107M; of consistency suitable for application.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.6 DOOR OPERATORS AND CONTROLS

A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.
   1. Door Operator Performance: Door operators shall open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
   2. Electromechanical Operators: Concealed, self-contained, overhead units powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; complying with UL 325; and with manual operation with power off.

C. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed by their plastic housings; adjustable to provide detection-field sizes and functions required by BHMA A156.10.
1. Provide capability for switching between bi- and unidirectional detection.

D. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection-field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.

E. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

F. Push-Plate Switch: Momentary-contact door-control switch with flat push-plate actuator.
   1. Configuration: Rectangular push plate with 2-by-4-inch junction box.
      a. Mounting: Recess mounted, semi-flush in wall.
   2. Push-Plate Material: Stainless steel, as selected by Architect from manufacturer's full range.
   3. Message: "Push to Open."

G. Touchless Switch: Hands-free-activation door-control switch with flat motion sensor faceplate.
   1. Configuration: 2.77-by-4.56-inch (single gang) rectangular faceplate.
      a. Mounting: Recess mounted in wall.
   2. Faceplate Material: Stainless steel with backlight acrylic window, as selected by Architect from manufacturer's full range.
   3. Message: "Wave to Open."

H. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.

B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be as stipulated in "Performance Requirements" Article. Interrupt powered operation of door operator while in breakaway mode.
   1. Include one adjustable detent device mounted at the top of each breakaway panel to control breakaway force.
      a. Limit Arms: Limit swing to 90 degrees, spring loaded with adjustable friction damping.

C. Automatic Locking: Electrically controlled device mounted in header that automatically locks sliding door in closed position, preventing door panels from sliding manually. Provide fail-safe operation if power fails.
   1. Power Interruption: Lock shall be disengaged, allowing doors to slide manually.

D. Weather Stripping: Replaceable components.
   1. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
2.8 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

1. Form aluminum shapes 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 thermal and structural movements, wind loads, 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 automatic 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 sharp, 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. Fabricate exterior components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
7. Allow for thermal expansion of exterior units.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to 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.

1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors and breakaway sidelites.

G. Controls:

1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:
   b. Bottom Beam: 24 inches.
2.9 GENERAL FINISH REQUIREMENTS
   A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
   B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
   C. 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.

2.10 ALUMINUM FINISHES
   A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, 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 automatic entrances.
   B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic entrance installation.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA A156.10 for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
      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.
      2. 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.
      3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
   B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades 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.
      3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
      4. Level recesses for recessed thresholds using nonshrink grout.
   C. Door Operators: Connect door operators to electrical power distribution system.
   D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
   E. Glazing: Install glazing as specified in Section 088000 "Glazing."
F. Sealants: Comply with requirements specified in Section 079200 “Joint Sealants” to provide weathertight installation.
   1. Set thresholds, framing members and flashings in full sealant bed.
   2. Seal perimeter of framing members with sealant.

G. Signage: Apply signage on both sides of each door and breakaway sidelite, as required by cited BHMA standard for direction of pedestrian travel.

H. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 ADJUSTING

A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
   1. Adjust exterior doors for tight closure.

B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 CLEANING

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.
   1. Comply with requirements in Section 088000 "Glazing" for cleaning and maintaining glass.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic entrance Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
   2. Perform maintenance, including emergency callback service, during normal working hours.
   3. Include 24-hour-per-day, 7-day-per-week emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 084229.23
SECTION 084243 - MANUALLY OPERATED SLIDING ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes manually operated, sliding entrances.

1.2 COORDINATION
A. Recesses: Coordinate sizes and locations of recesses in concrete floors for recessed tracks. Concrete, reinforcement, and formwork requirements are specified elsewhere.
B. Templates: Distribute for doors, frames, and other work specified to be factory prepared for installing manually operated sliding entrances.

1.3 ACTION SUBMITTALS
A. Product Data: For each configuration of manually operated sliding entrance indicated.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For each manually operated sliding installation.
   1. Include plans, elevations, sections, hardware mounting heights, and attachment details.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 FIELD CONDITIONS
A. Field Measurements: Verify actual dimensions of openings to receive manually operated sliding entrances by field measurements before fabrication.

1.7 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of manually operated sliding 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 MANUFACTURERS, GENERAL
   A. Source Limitations: Obtain manually operated sliding entrances from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
   A. Opening Force: Not more than 5 lbf to fully open door.
   B. Air Leakage: Entrance assemblies for smoke control shall be listed and labeled for smoke and draft control by qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and having maximum air leakage according to NFPA 105 unless otherwise indicated.

2.3 SLIDING ENTRANCE ASSEMBLIES
   A. General: Provide manufacturer's manually operated sliding entrances indicated including door leaves, sidelites, framing, headers, carrier assemblies, roller tracks, and accessories required for a complete installation.
      1. Basis-of-Design Product: Subject to compliance with requirements, provide ProCare 8300 Series by Stanley Access Technologies or a comparable product by one of the following:
         a. Besam Entrance Solutions.
         b. Gildor, Inc.
         c. KM Systems, Inc.
         d. NABCO Entrances, Inc.
         e. Tormax Technologies, Inc.
   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 Entrance:
      1. Performance: Smoke-control assembly.
      2. Configuration: Single-sliding door, with one operable leaf and sidelite(s) as indicated on Drawings; with breakaway hardware for sliding leaf only.
      4. Floor Track Configuration: No track across sliding-door opening and at sidelites (trackless).
      5. Stile Design: Medium stile; 3-1/2-inch nominal width.
      6. Rail Design: As indicated on Drawings.
      10. Finish framing, door(s), sidelite(s), and header with Class II, clear anodic finish.

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.
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. Sidelites: 1-3/4-inch-deep sidelites 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.
   2. Muntin Bars: Horizontal tubular rail member for each sidelite; match stile design.
D. Glazing: As specified in Section 088000 "Glazing."
E. Headers: Fabricated from minimum 0.125-inch-thick, extruded aluminum, and extending full width of sliding 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.
   1. Capacity: Capable of supporting doors up to 100 lb per leaf over spans up to 14 feet without intermediate supports.
   2. Provide sag rods for spans exceeding 14 feet.
F. Carrier Assemblies and Overhead Roller Tracks: Assembly that allows vertical adjustment; consisting of nylon- or polyoxymethylene (POM)-covered, ball-bearing-center steel wheels operating on a continuous roller track or of ball-bearing-center steel wheels operating on a nylon- or POM-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 sliding entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.
B. Closer: BHMA A156.4, Grade 1, fully concealed spring closer, sized according to manufacturer's recommendations for door size, adjustable to comply with requirements for opening force.
C. Limit Arm: Provide to control doors and panels in the swing mode. Swing not to exceed 90 degrees.
D. Pulls: Recessed units on both sides of each operable door and surface-mounted, D-shaped pull for each swing-out panel. Pulls on sliding doors to be exposed and usable from both sides when sliding doors are in fully open position.
E. Manual Flush Bolts: BHMA A156.16, Grade 1, edge mortised, lever-extension type; located at bottom of each swing-out sidelite.
F. Positive Latch: BHMA A156.5, Grade 1, manufacturer's standard latch and strike with lever handles on each side of swinging door panels. Manual flush bolt latch at each swing-out sidelite.
G. Weather Stripping: Replaceable components.

MANUALLY OPERATED SLIDING ENTRANCES

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1. Compression Type: ASTM D 2000, molded neoprene or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701/702, wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

H. Weather Sweeps: Nylon brush sweep mounted to underside of door bottom.

2.6 FABRICATION

A. General: Factory fabricate sliding 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 sliding 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.
1. Provide sliding weather stripping, mortised into door, at perimeter of sliding surfaces and breakaway sidelites.

F. Electrical Grounding: Fabricate sliding entrances to be internally grounded, complying with requirements of authorities having jurisdiction.

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. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."

C. Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout complying with ASTM C 1107/C 1107M; of consistency suitable for application.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

C. 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.

2.9 ALUMINUM FINISHES

A. 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. Examine roughing-in for grounding systems to verify actual locations of electrical connections before automatic entrance installation.

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

3.2 INSTALLATION

A. Install sliding 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.
3. Level recesses for recessed floor tracks using shrinkage-resistant grout.
4. Air Leakage: Install entrance assemblies for smoke-control according to NFPA 105 and as indicated.

B. Field Glazing: Install glazing as specified in Section 088000 "Glazing."

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.

D. Grounding: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

MANUALLY OPERATED SLIDING ENTRANCES 084243 - 5

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3.3 ADJUSTING
   A. Adjust operating hardware and moving parts to function smoothly, and lubricate as recommended by manufacturer.
   B. Adjust force to open door panels.
   C. Test grounding system for compliance with requirements of authorities having jurisdiction.
   D. Adjust smoke-control doors for tight closure.

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.
   B. Comply with requirements in Section 088000 "Glazing" for cleaning and protecting glass.

END OF SECTION 084243
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes structural silicone glazed and conventionally glazed aluminum curtain walls installed as stick and unitized assemblies.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by preconstruction testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand 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.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified structural engineer licensed in the State of Wisconsin, using performance requirements and design criteria indicated.

C. Structural Frame Provisions for Loads from the Building Enclosure System:

1. See Provisions listed in Section 010110.

D. Structural Properties:

1. See Provisions listed in Section 010110.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Design per AAMA TIR A-11, 1996

2. Deflection Normal to Wall Plane:
   a. For spans 13'-6" and under, limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   b. For spans over 13'-6" limited to edge of glass in a direction perpendicular to glass plane not exceeding L/240 of the glass edge length for each individual glazing lite, plus 1/4 inch.
   c. At curtainwall jamb where sealant bead occurs, limit deflection to 1/2 of that allowed otherwise.
3. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

4. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 1755. Provide a system of Curtain Walls and Sealant joints that accommodates all load combinations and movement combinations listed in section 010110. If supplemental attachment to precast is desired to limit movement at jambs, coordinate with architectural precast concrete contractor.

F. Deflection of backpan: backpan may deflect during testing, but blow out of sealants is to be considered failure.

G. Test Performance: Meeting criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

1. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

J. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F.
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

K. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.

1. Thermal Transmittance (U-factor): Fixed vision glazing and framing areas shall have U-factor of not more than 0.40 Btu/sq. ft. x h x deg F as average of largest and smallest lites as determined according to NFRC 100.
2. Thermal Transmittance (U-factor): Non-vision zones shall have U-factor of not more than 0.167 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
3. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than that of the glass specified on the drawings as determined according to NFRC 200.
4. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft..
5. Condensation Resistance: Provide system which performs in accordance with the criteria outlined in section 010110.
L. 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. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

M. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi.
3. Design reviewed and approved by structural-sealant manufacturer.

N. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound transmission characteristics:


1.3 PRECONSTRUCTION TESTING

A. To be performed per Section 010110.

B. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility with and adhesion of each material that will come in contact with sealants and each condition.

1. Test a minimum five production-run samples each of metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed assemblies.
3. Perform tests under environmental conditions that duplicate those under which assemblies will be installed.

C. For materials that fail tests, determine corrective measures necessary to prepare each material to ensure compatibility with and adhesion of sealants including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

1.4 ACTION SUBMITTALS

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

B. Thermal modeling calculated by an NFRC Licensed Approved Calculation Entity.

1. Using LBNL Therm (current version), and LBNL Window (current version).
2. Using design exterior and interior conditions as described in spec section 010110.
3. Demonstrate predicted conformance with condensation resistance requirements outlined in spec section 010110.
4. Quantity of thermal models:
   a. Provide thermal models of 12 details selected by the architect.
   b. Provide thermal models of an additional 8 details.
5. Demonstrate conformance with U-value requirements of this section. For non-vision lites, calculate performance according to NFRC-100 Spandrel Addendum as presented at fall 2010 NFRC membership meeting.
   a. Average of smallest and largest non-vision lites.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations at 1/2-inch equals 1-foot scale, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
   2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
      a. Joinery, including concealed welds.
      b. Anchorage.
      c. Expansion provisions.
      d. Glazing.
      e. Flashing and drainage.
   3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.
      a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.
   4. Provide signature and seal by a structural engineer licensed in the State of Wisconsin stating compliance with Performance Requirements specified above.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
   1. Submit set of 2 samples of each specified aluminum finish showing extremes of color and appearance, minimum 4-inches long extrusions of specified alloys.
   2. Submit two 12-inch by 12-inch samples of each type of glazing specified.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds.
   2. Anchorage.
   5. Flashing and drainage.

G. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a structural engineer licensed in the State of Wisconsin. See requirements of section 011011 also.

H. Submit for approval to Structural Engineer of Record loads imposed on the primary structural frame due to the dead, live, and wind/seismic loads indicated on the Contract Documents. Submittal shall include location, magnitude and direction of imposed loads (basic, unfactored load cases), graphically represented in their appropriate locations on a copy of the Contract Document structural framing plans or elevations as appropriate clearly showing their relationship to the structure. Detail references indicating the connections applicable at each location shall be noted on the submittal drawings.
1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Mockup Submittals:
   1. Preconstruction Testing Program: As per Section 010110.
   2. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
   3. Photographs:
      a. Take a minimum of 10 photographs at locations and intervals as required by Architect.
      b. Submit digital color images on CD-R of mockup before, during, and after preconstruction testing.
   4. Record Drawings: Submit record drawings of preconstruction mockups prepared by preconstruction testing agency.

B. Performance Certification: Submit written certification, signed by curtain wall system manufacturer, attesting that the curtain wall system installed conforms to the requirements specified in the “Performance Requirements” article above and that the manufacturer’s standard system has been tested in accordance with specified tests, meeting all specified requirements.
   1. Where testing has not been accomplished, perform specified testing using an acceptable testing laboratory or agency and provide certified test results.
   2. Submit a separate certification for thermal performance.

C. Compatibility Certification - Operable Door Units: Submit written certification from curtain wall system manufacturer indicating that operable door units are fully compatible with the curtain wall system.

D. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

F. Field quality-control reports.

G. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Preconstruction Testing Agency Qualifications: Qualified according to ISO/IEC 17025 and accredited by ICC-ES for preconstruction testing indicated.

C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

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

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

F. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of structural-sealant-glazed curtain walls.

G. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PREINSTALLATION MEETINGS:

A. Preinstallation Conference: Conduct conference at Project site.

1.9 PROJECT CONDITIONS

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

1.10 WARRANTY

A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.

2. Warranty Period: 5 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide Kawneer 1600 or comparable product by one of the following:
   1. Permasteelisa.
   2. Pittco Architectural Metals, Inc.
   3. Crown Corr
   4. Harmon

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Thickness required to comply with performance requirements
         1) Form panel lines, breaks and angles to be sharp and true, with surfaces free from warp and buckle.
         2) Fabricate panels with sharply cut edges, with no displacement of face sheets
         3) Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to panels with structural silicone sealant or bond tape
         4) Dimensional tolerances:
            a) Panel bow: 0.8% maximum of panel length or width
            b) Squareness: 0.25” maximum
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   5. Welding Rods and Bare Electrodes: AWS A5.10.
   6. Recycled Content of Aluminum Products: Provide the maximum amount possible postconsumer recycled content plus one-half of preconsumer recycled content.
   7. Regional Materials: To the greatest extent possible, provide aluminum that has been extracted, harvested or recovered and manufactured within 500 miles of the Project.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36/.
   2. Galvanized Steel Sheet: ASTM A 1008.
      a. Backpans to be constructed of min. 18-gauge Steel sheet, galvanized per ASTM A653 G90.
2.3 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   2. Glazing System:
      a. Retained mechanically with gaskets on four sides.
      b. Structural Sealant Glazing System


B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch plus or minus that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

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

F. Framing Sealants: Manufacturer's standard sealants with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING

A. Glazing: Comply with Division 08 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: As recommended by manufacturer.
   1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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.
2.5 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

B. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and curtain wall system framing, provide systems of type and ratings indicated on Drawings and complying with requirements specified in Division 07 Section “Fire-Resistive Joint Systems.”

   1. Provide integrity ratings equal to, or exceeding, fire-resistance rating of floor or floor/ceiling assembly forming one side of joint and having the required joint width and movement classification and L-rating.

2.6 CLOSURE PANELS (SHADOW BOX):

A. Provide manufacturer's standard insulated metal panel. Unless otherwise indicated, panel shall be flat, with no deviation in any direction exceeding 1/16" in 2'-0" or 1/8" for the entire panel. Vent shadow box enclosure as determined by the curtain wall manufacturer and state of Wisconsin licensed structural engineer.

   1. Front Panel Sheets: Provide sheets not less than 0.125" thick. Finished surface color exposed to match curtainwall exterior mullion color. Confirm color code below with existing curtainwall finishes before production:
      a. Manufacturer: ICI
      b. Color: Match exterior mullion color.
      c. PPG “Bright Silver” UC110429LB
   
   
   3. Edge Condition: Aluminum, finish to match window wall.
   
   4. Panel Core: Mineral Wool, 3" thick, CW 90 density, unfaced

   5. Sealant at shadow box: Dow 791

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   6. Components curved to indicated radii.
D. Fabricate components that, when assembled, have the following characteristics:
   1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
   2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using shear-block system or screw-spline system.

F. Provide zero sight line door where indicated.

G. Factory-Assembled Frame Units:
   1. Rigidly secure non-movement joints.
   2. Seal joints watertight unless otherwise indicated.
   3. Install glazing to comply with requirements in Division 08 Section "Glazing."

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. High-Performance Organic Finish: Three-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, Finish and Gloss to match existing curtainwall. Confirm color codes below with existing curtainwall finishes before production:
      a. Exterior Finish: PPG “Bright Silver” UC110429LB.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 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. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

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 glazed aluminum curtain wall to exterior.

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

E. Install glazing as specified in Division 08 Section "Glazing."

3.3 ERECTION TOLERANCES

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

3.4 FIELD QUALITY CONTROL

A. See Requirements of Section 010110.
SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Commercial door hardware for the following:
   a. Swinging doors.
   b. Non-fire-rated sliding doors.
   c. Non-fire-rated folding doors.
   d. Other doors to the extent indicated.

2. Cylinders for doors and locking devices specified in other Sections.
3. Electrified door hardware.

1.2 GENERAL REQUIREMENTS

A. Provide items, articles, materials, operations and methods listed, mentioned or scheduled herein or on drawings, in quantities as required to complete project. Provide hardware that functions properly. Prior to furnishing hardware, advise Architect of items that will not operate properly, are improper for conditions, or will not remain permanently anchored.

1.3 SUBMITTALS

A. Hardware Schedule: Submit hardware schedule per Section 013300, in vertical format as illustrated by the Sequence of Format for the Hardware Schedule, as published by the Door and Hardware Institute. Schedules that do not comply will be returned for correction before review. Hardware schedule shall clearly indicate architect's hardware group and manufacturer of each item proposed. The schedule shall be reviewed prior to submission by a certified Architectural Hardware Consultant, who shall affix his or her seal attesting to the completeness and correctness of the schedule.

1. Provide illustrations from manufacturers' catalogs and data in brochure form.
2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions in the hardware schedule submittal.
3. When requested, provide listing of manufacturers' template numbers for each item of hardware in the hardware schedule submittal.
4. Furnish associated Contractors and Subcontractors with copies of final approved hardware schedule. Submit necessary templates and schedules as soon as possible to hollow metal, wood, aluminum, and other door & frame fabricators in accordance with schedule they require for fabrication.
5. Samples: Lever design or finish sample: Provide 3 samples, if requested by architect.

B. Closer Mounting: Indicate mounting description for each closer included in the submittal’s hardware groups - i.e., push side mount (parallel arm), pull side mount (regular arm), or push side top mount (top jamb).

C. Electrified Hardware: Provide "operational descriptions" for each electrified hardware group in the hardware schedule submittal. Descriptions should include operation of the doors for exit, entry, and/or fire or smoke alarm conditions. Use operational descriptions included in the specified electrified groups as a guide.
D. Wiring Diagrams: When requested after final approval of the hardware schedule submittal, provide complete and detailed system operation and elevation riser and wiring diagrams specially developed for each opening that requires electrified hardware, except openings where only magnetic hold-opens or door position switches are specified. Provide these diagrams with hardware delivery to the jobsite.

E. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware. Send installation instructions to site with hardware.

F. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

G. Contract Closeout Submittals: Comply with Section 017800, including specific requirements indicated.

1. Operating and maintenance manuals containing the following:
   a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.

2. Copy of final approved hardware schedule, edited to reflect "As installed."

3. Copy of final keying schedule. Froedtert locksmith review required.

4. As installed "Wiring Diagrams" for each opening connected to power, both low voltage and 110 volts.

5. One complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

H. Schedules shall be kept current with all changes to the project. If changes occur, project hardware schedules shall be maintained to reflect the changes as they are approved. Omitted items shall be deleted from openings, added and replaced items shall be included. Installation submittals shall be kept current as changes occur. Upon request, a complete updated hardware schedule shall be provided to the contractor. Supplemental submittals that include only the changed openings will not be acceptable.

I. Prior to final payment, provide a record copy of hardware schedules, including all revisions and updates. All openings shall be listed to reflect final installed configuration only.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Pre-Installation Conference: Prior to the installation of hardware, manufacturers' representatives for locksets, closers, and exit devices shall arrange and conduct a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Architect and Owner.
1.5 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (i.e. latch and locksets, hinges, closers) from single manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: Recognized architectural finish hardware supplier, with warehousing facilities, who has been providing hardware for period of not less than 3 years. The supplier shall be, or employ, a certified Architectural Hardware Consultant (AHC), who is registered in the continuing education program as administered by the Door and Hardware Institute. The hardware schedule shall be prepared and signed by a certified AHC.

C. Installer: Firm with 3 years of experience in installation of similar hardware to that required for this project, including specific requirements indicated.

D. Regulatory Label Requirements: Provide nationally recognized testing agency label or stamp on hardware for labeled openings. Where UL requirements conflict with drawings or specifications, hardware conforming to UL requirements shall be provided. Conflicts and proposed substitutions shall be clearly indicated in hardware schedule.

E. Accessibility Requirements: Doors to stairs (other than exit stairs), loading platforms, boiler rooms, stages and doors serving other hazardous locations shall have knurled or other similar approved marking of door lever handles or cross bars in accordance with local building codes.

F. Items of hardware not definitely specified herein but necessary for completion of the work shall be provided. Such items shall be of type and quality suitable to the service required and comparable to the adjacent hardware. Where size and shape of members is such as to prevent the use of types specified, hardware shall be furnished of suitable types having as nearly as practicable the same operation and quality as the type specified. Sizes shall be adequate for the service required.

G. Include such nuances as strike type, strike lip length, raised barrel hinges, mounting brackets, blade stop spacers, special templates, fasteners, shims, and coordination between conflicting products. All doors shall be provided with a stop.

H. Self-drilling screws are not acceptable for any hardware components. Only the fasteners supplied with the hardware are to be used.

I. Post Installation Fire-Door Inspections: At the time of completion, the hardware supplier shall provide a certified Fire Door Assembly Inspector (FDAI) to perform a walk-thru inspection of every fire-rated opening on the project. The FDAI shall provide a detailed, opening-by-opening, written document for the owner that ensures all of the specified component parts of the fire-rated assembly have been properly installed and are functioning as designed, in accordance with the criteria of a fire door assembly as per NFPA 80 2007 edition.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver hardware to jobsite in manufacturer's original packaging, marked to correspond with the approved hardware schedule. Do not deliver hardware until suitable locked storage space is available. Check hardware against reviewed hardware schedule. Store hardware to protect against loss, theft, or damage.

B. Deliver hardware required to be installed during fabrication of hollow metal, aluminum, wood, or stainless steel doors prepaid to the respective manufacturer.
1.7 WARRANTY
A. Guarantee workmanship and material provided against defective manufacture. Repair or replace defective workmanship and material appearing within period of one year after Substantial Completion.
B. Provide a minimum ten year factory warranty on door closer body against defects in material and workmanship from date of occupancy of Project.
C. Replace shortages and incorrect items with correct material at no additional cost to Owner.
D. Factory direct order number shall be provided for each shipment of locks, closers and exit devices with warranty, prior to final payment.
E. At completion of project, qualified factory representative shall inspect closer installations. After this inspection, letter shall be sent to Architect reporting on conditions, verifying that closers have been properly installed and adjusted.

PART 2 - PART 1 PRODUCTS

2.1 BUTTS AND HINGES
A. Acceptable Manufacturers and Types: Hager – Bommer, Ives are also acceptable

<table>
<thead>
<tr>
<th>Hanger</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB1262</td>
<td>Type 1 (hvy.wt. swing clear)</td>
</tr>
<tr>
<td>BB1279</td>
<td>Type 2 (std.wt. ball-bearing)</td>
</tr>
<tr>
<td>BB1191</td>
<td>Type 3 (std.wt. rust-resistant)</td>
</tr>
<tr>
<td>BB1168</td>
<td>Type 4 (hvy.wt. ball-bearing)</td>
</tr>
<tr>
<td>BB1199</td>
<td>Type 5 (hvy.wt. rust-resistant)</td>
</tr>
</tbody>
</table>

B. Application:
1. Exterior out-swinging doors
   a. Type 5 x NRP
   b. Continuous-geared (Refer to Article 2.4.)
2. Exterior in-swinging doors and vestibule doors
   a. Type 4
   b. Continuous-geared (Refer to Article 2.4.)
3. Interior doors with closers: Type 2 or 4
4. Doors over 36 inches wide (ANY LOCATION): Continuous-geared (Refer to Article 2.4)
5. Provide NRP (non-removable pins) at out-swinging doors that are lockable or locked.
6. Shim: 0.20 inch thick steel banding.

C. Size:
1. 2-1/4 inch Doors  5 inch by 5 inch
2. 1-3/4 inch Doors  4-1/2 inch by 4-1/2 inch
3. 1-3/8 inch Doors  3-1/3 inch by 3-1/2 inch
D. Quantity:
   1. 2 – hinges per leaf for openings through 60 inches in height.
   2. 1 – additional hinge per leaf for each additional 30 inches in height or fraction thereof.
   3. 4 – hinges for Dutch doors up to 90 inches in height.
   4. When hardware group assignment on opening schedule includes modifier “X”, provide additional hinge to those previously specified.

E. Drill 5/32 inch hole and use No. 12, 1-1/4 inch steel threaded to the head wood screws for hinges on wood doors.

2.2 ELECTRIC POWER TRANSFERS
A. Acceptable manufacturers: Von Duprin – Securitron is also acceptable
   
<table>
<thead>
<tr>
<th>Von Duprin EPT-2/EPT-10</th>
</tr>
</thead>
</table>

B. Provide electric power transfer as specified in hardware groups.
C. All EPT’s are to be installed in the upper portion of the door and frame assembly.

2.3 CONTINUOUS-GEARED HINGES
A. Acceptable manufacturers: Select –Ives, is also acceptable
   
   | Select SL24HD |
   | SL11HD Owner approval required |
   | SL-41HD |
   | SL-24LL (MRHC building only) |

B. Provide model of continuous hinges as appropriate for the type, inset, and thickness of door where specified. Coordinate hinge types with the door supplier.
C. Coordinate EPT prep cutout with door and frame manufacturer.
D. All continuous hinges to be provided with template machine screws.
E. DO NOT use self-reaming thread (SRT) screws. All mounting/installation holes shall be drilled with centering bit and tapped for the proper size fasteners. Specify “TF” when ordering hinges to receive machine screws.
F. When hardware group assignment on opening schedule includes modifier “Y”, provide continuous-geared hinge to those previously specified.
G. Shim: 0.20 inch thick steel banding continuous length matching hinge.

2.4 PIVOT SETS
A. Acceptable Manufacturer and Series: Rixson – Ives, ABH is also acceptable
   
   | Rixson 117 |
   | 147/H147/117-1/2 |
   | 195 |
   | L147/L117 |
   | M19/ML19 |

   | ⅝" Offset, std. duty |
   | ¾" Offset, hvy. duty (int) |
   | ¾" Offset, hvy. duty (ext) |
   | ¾" Offset, lead-lined |
   | Intermediate & lead-lined |
B. Pivot sets shall be complete with oil-impregnated top pivot, unless indicated otherwise. For offset pivoted doors, provide one intermediate pivot for doors less than 91 inches high, two intermediate pivots for doors between 91 inches and 121 inches high. Intermediate pivots shall be spaced equally and not less than 25 inches or not more than 35 inches on center for doors over 121 inches high.

C. Provide pivot sets when specifically indicated in Hardware Groups per manufacturers’ requirements for door location (interior or exterior) height, width, and weight, or unless indicated otherwise.

2.5 FLUSH BOLTS AND DUSTPROOF STRIKES

A. Acceptable Manufacturers: Ives – Trimco, Rockwood are also acceptable.

B. Provide automatic, semi-automatic (constant/self-latching), or manual flush bolts for inactive door of pairs as indicated in the hardware group(s) and as required for metal or wood doors. Whenever bottom bolts are utilized, provide dustproof strike DP1/DP2 as required for sill conditions.

1. At exterior openings provide top and bottom bolt configuration for inactive door of pair, unless indicated otherwise.

2. As indicated for non-labeled openings provide manual flush bolt (FB358/FB457/FB458) or semi-automatic/constant-latching flush bolt (FB51/FB61), as designated in hardware group. Provide top bolt only, unless indicated otherwise. Locate centerline of top bolt not more than 78 inches above finished floor – provide extensions as necessary.

3. At labeled openings provide automatic flush bolts (FB31P/FB41P). When allowed by fire-rating criteria and door manufacturer, provide top bolt only with appropriate fire bolt (FB32/FB42), unless indicated otherwise.

2.6 LOCKSETS – CYLINDRICAL (HEAVY DUTY)

A. Acceptable Manufacturer and Series: Schlage – No substitutions (Owner’s standard).

B. Provide heavy-duty cylindrical locks unless indicated otherwise with functions specified in Hardware Groups and with the following provisions:

1. Cylinders: Provide Medeco cylinders integrated with existing Froedtert Hospital key system as directed by Owner.


3. Strikes: Provide wrought boxes and strikes with proper lip length to protect trim but not to project more than 1/8 inch beyond trim, frame or inactive leaf. Where required, provide open back strike and protected to allow practical and secure operation.

4. Verify all lock functions with representatives of Froedtert Hospital prior to ordering locks.

5. ANSI functions – cylindrical locks.

<table>
<thead>
<tr>
<th>Function</th>
<th>ANSI #</th>
</tr>
</thead>
<tbody>
<tr>
<td>passage</td>
<td>F75</td>
</tr>
<tr>
<td>privacy</td>
<td>F76</td>
</tr>
<tr>
<td>office</td>
<td>F82</td>
</tr>
<tr>
<td>classroom</td>
<td>F84</td>
</tr>
<tr>
<td>storeroom</td>
<td>F86</td>
</tr>
</tbody>
</table>
2.7 EXIT DEVICES
A. Acceptable Heavy-Duty Manufacturers and Models: Von Duprin – No Substitutions (Owner’s standard).

<table>
<thead>
<tr>
<th>Von Duprin</th>
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</thead>
<tbody>
<tr>
<td>99 Series</td>
</tr>
<tr>
<td>33A Series</td>
</tr>
</tbody>
</table>

B. Provide heavy-duty exit device series and functions as specified in Hardware Groups, unless standard-duty is indicated. All exit devices shall be UL listed for panic. Exit devices for labeled doors shall be UL listed as "Fire Exit Hardware".

C. Where lever trim is specified, provide lever design to match lockset levers.

D. Provide cylinder dogging feature for non-rated heavy-duty exit devices with pull or locked lever outside trim.

E. Cylinders: Provide cylinders as required for specified locking function and cylinder dogging integrated with existing Medeco core key system.

F. Provide keyed removable mullions (including keyed cylinders), as specified in the Hardware Groups.

G. Provide Quiet Electric Latch Retraction at electrified doors.

2.8 HOSPITAL LATCHES
A. Acceptable Manufacturers and Series: ABH “Quiet Glide”. Sargent is also acceptable.

<table>
<thead>
<tr>
<th>ABH</th>
</tr>
</thead>
<tbody>
<tr>
<td>6800Q</td>
</tr>
<tr>
<td>Glynn Johnson</td>
</tr>
<tr>
<td>HL6</td>
</tr>
</tbody>
</table>

B. In addition to the Glynn Johnson hospital latches listed above for the base bid, provide an alternate price for the following Trimco Cuverro hospital latches in lieu of Glynn Johnson;

<table>
<thead>
<tr>
<th>Trimco</th>
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</thead>
<tbody>
<tr>
<td>1562AP</td>
</tr>
</tbody>
</table>

C. Provide hospital latches, as specified, with push & pull paddle down (unless designated otherwise) and with covers engraved "Push" and "Pull."

D. Provide 5 inch backset for hospital latches, unless noted otherwise.

2.9 ELECTRIC STRIKES
A. Acceptable Manufacturers and Series: Von Duprin – No Substitutions (Owner’s standard) for base bid.

<table>
<thead>
<tr>
<th>Von Duprin</th>
</tr>
</thead>
<tbody>
<tr>
<td>6200 Series</td>
</tr>
</tbody>
</table>

B. Provide electric strikes designed for use with latch/lock type shown at each specified opening.

C. Electric Strikes shall be UL Listed as Burglary-Resistant Electric Door Strikes and, where required, shall be UL Listed as Electric Strikes for Fire Doors and Frames. Provide fail-secure (non fail-safe) type electric strikes, unless specified otherwise.
D. Provide power supply, transformer, and rectifier for each strike as required, unless indicated otherwise. Verify voltage with electrical contractor.

E. Provide spacer plates and accessories as required for installation to suit details.

2.10 KEYING

A. Integrate keying of new locks/cylinders with existing high-security Medeco BiLevel key system as directed by Owner. Factory-key all cylinders with manufacturer retaining permanent keying records. If requested, provide Owner with copy of bitting list via Owner acceptable delivery method.

B. Contractor to contact owner to receive letter of authorization for high-security key system.

C. A keying meeting shall be scheduled to determine specific Owner and building keying requirements. Attendees shall include Owner’s representative(s) and lock/cylinder manufacturer supplier and/or representative. Advise Architect and Contractor of scheduled date, time, place, and attendees.

D. If requested, submit proposed keying schedule to Architect and meet with Owner and Architect to review schedule.

E. Provide construction masterkeying. Permanent cylinders shall be installed/activated upon completion of the project.

F. Provide 6 masterkeys for each masterkey set. Provide 3 change keys for each lock. Stamp keys "DO NOT DUPLICATE."

G. All keys shall be delivered to the designated Owner’s representative via method determined and agreed upon by the Owner at the keying meeting.

2.11 DOOR TRIM

A. Acceptable Manufacturers and Types: Rockwood – Ives, Burns, Hiawatha are also acceptable.

<table>
<thead>
<tr>
<th>Burns</th>
<th>Hiawatha</th>
<th>Rockwood</th>
<th>Hager</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>200H</td>
<td>70E</td>
<td>30S-6x16</td>
</tr>
<tr>
<td>54</td>
<td>200F</td>
<td>70C</td>
<td>30S-4x16</td>
</tr>
<tr>
<td>422</td>
<td>1081LBP</td>
<td>47</td>
<td>130S</td>
</tr>
<tr>
<td>39C</td>
<td>658A</td>
<td>BF157A</td>
<td>12J</td>
</tr>
<tr>
<td>26C</td>
<td>536B</td>
<td>111</td>
<td>4J</td>
</tr>
<tr>
<td>25B</td>
<td>523A</td>
<td>107</td>
<td>3G</td>
</tr>
<tr>
<td>301/302</td>
<td>DES-1A/DES-2A</td>
<td>304/305</td>
<td>182H/182K</td>
</tr>
</tbody>
</table>

B. Push Plates: Minimum of 0.050 inch thick, beveled 4 edges.

1. Hiawatha type 200H - 6 inches by 16 inches, unless otherwise indicated.
2. Where width of door stile prevents use of 6 inch wide plate, provide push plate one inch less than width of stile but not less than 4 inches wide.

C. Push Bars:

1. Hiawatha type 1081LBP, unless otherwise indicated.
2. Length of push bars shall be sufficient to mount each end on center of door stile. Push bars on flush doors shall be 3 inches less than door width.
3. When possible, mount back-to-back with pulls.

D. Pulls:
1. Hiawatha Series 658A, unless otherwise indicated.
2. When possible, mount back-to-back with push bars.

E. Kick Plates and Armor Plates:
1. Interior openings specified with kick plates or armor plates shall receive vinyl/alloy products as provided by Section 102600 – Wall and Door Protection.
2. Kick or armor plates installed on rated doors shall be installed with embossed UL emblem showing
3. At single doors provide width 1-1/2 inches less than door width on push side. If indicated for pull side, provide 1 inch less than door width. If edge guards are specified, see edge guard paragraph below for sizing requirements.
4. At pairs of doors provide width 1 inch less than door width on both doors. If edge guards are specified, see edge guard paragraph below for sizing requirements.
5. Provide kick plate height of 10 inches and armor plate height of 34 inches, unless otherwise indicated.

F. Edge Guards: Minimum .050 inch thick, stainless steel:
1. Hiawatha type DES-1A/DES-2A, or as noted in Hardware Groups.
2. Coordinate edge guard height with armor plate.
3. When edge guards are specified in conjunction with kick and/or armor plates, coordinate widths of protection products with door widths to result in a continuous smooth surface with no more than 1/8 of an inch between the edges of edge guards and the edges of kick/armor plates. Overlapping of edge guards and kick/armor plates will not be permitted.

2.12 COORDINATORS
A. Acceptable Manufacturers: Provide products as indicated below and designated in hardware groups. Acceptable Manufacturer: Door Controls International.

2.13 DOOR CLOSERS
A. Acceptable Manufacturers and Types of Exposed Closers: LCN – No Substitutions (Owner’s standard).

<table>
<thead>
<tr>
<th>LCN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4010 / 4110 series</td>
<td>Exterior Doors</td>
</tr>
<tr>
<td>4040/4040 EDA</td>
<td>Interior Doors</td>
</tr>
</tbody>
</table>

B. Provide heavy-duty closers, unless indicated otherwise in Hardware Groups, adjustable to meet maximum opening force requirements of ADA.

C. Provide drop plates, brackets, or adapters for arms as required to suit details.

D. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors, unless indicated otherwise.

E. Provide back-check for closers.

F. Provide mechanical holder arms where indicated (at non-rated openings).

G. Provide closers for doors as noted in Hardware Groups and, in addition, provide closers for labeled doors whether or not specifically noted in group.

H. DO NOT use self-reaming thread (SRT) screws. All mounting/installation holes shall be drilled with centering bit and tapped for the proper size fasteners.

DOOR HARDWARE

Copyright 2024 by the American Institute of Architects. Warning: This AIA MasterSpec based document is protected by U. S. Copyright Law and International Treaties. It was created by CannonDesign for Froedtert Health to establish guidelines, standards, product selections, and installation requirements for Froedtert Health. Froedtert Health must hold a valid, current MasterSpec license to transmit this to a firm other than CannonDesign; additionally, the firm in receipt of this document must hold a valid, current MasterSpec license. Project teams are obligated to validate content to be applicable and current when publishing project specifications.
I. Provide through-bolting for wood doors and steel doors with a reinforcing backing plate. Steel doors with a steel reinforcing backing plate can be drilled and tapped for fasteners supplied.

J. Provide a minimum of 5 fasteners to secure closer to head of frame when used with spacer block.

K. Provide closers meeting the requirements of UBC 7-2 and UL 10C positive pressure tests.

L. Where modifier “Z” is indicated, provide closer with telephone cylinder (TEL) option.

M. Order closers with code (TBMS) (Through bolt machine screws) for through bolt machine and wood screw packs.

N.

2.14 OVERHEAD STOPS

A. Acceptable Manufacturers and Types: Glynn-Johnson – Rixson, Sargent, ABH are also acceptable.

<table>
<thead>
<tr>
<th>Glynn-Johnson</th>
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</thead>
<tbody>
<tr>
<td>450 series</td>
</tr>
<tr>
<td>410 series</td>
</tr>
<tr>
<td>90 series</td>
</tr>
<tr>
<td>100 series</td>
</tr>
</tbody>
</table>

B. Provide series type as indicated in hardware sets.

C. A closer stop arm is an acceptable option instead of overhead stops at interior doors with parallel arm closer mountings.

D. Provide overhead stops only when specifically indicated.

E. Provide hold-open function where indicated at non-label doors.

F. Provide through-bolting for all fire-rated/label, wood doors and steel doors with a reinforcing backing plate. Steel doors with steel reinforcing backing plates can be drilled and tapped for fasteners supplied.

2.15 WALL STOPS AND HOLDERS

A. Acceptable Manufacturers: Ives – Burns, Hager are also acceptable.

B. Provide wall bumper (WS407CCV) with backing in wall for each door leaf except where wall stops (WS11/WS11X) are specified in the Hardware Groups, or where opening conditions require the use of an overhead stop. (Refer to Part 2 – OVERHEAD STOPS)

C. Provide overhead stops (Refer to Part 2 – OVERHEAD STOPS) only where specifically indicated.

D. Provide heavy-duty base stop & holder function (WS20/WS20X) where indicated for non-label doors.

E. Floor or base stops shall be used only where definitely specified or absolutely unavoidable.
2.16 WEATHERSTRIP AND THRESHOLDS

A. Acceptable Manufacturers: National Guard – Hager, Pemko, Reese, Zero are also acceptable.

B. Refer to drawings for special details. Provide accessories, shims and fasteners.
   1. Only fasteners supplied by the vendor are to be used to attach seals.
   2. Provide self-tapping fasteners for products being applied to hollow metal doors and frames.

C. Where weatherstrip and thresholds are assigned by hardware group modifier “W”, provide the following.
   1. Thresholds: 425E at exterior locations and 513 at interior locations, unless detailed otherwise.
      a. Refer to drawings for special details. Provide accessories, shims and fasteners.
      b. Where thresholds occur at openings with one or more mullions, they shall be cut for the mullions and extended continuously for the entire opening.
   2. Door Bottom/Sweep: 200N, unless detailed otherwise (both doors of pairs)
   3. Weatherstrip: 152V frame-applied, unless detailed otherwise
   4. Rain Drip: 16_x full frame width, unless detailed otherwise
   5. Astragal: A605 split type (for each door of pairs with both doors active) or 5050 gasket (applied to fixed astragal by door supplier for active/inactive pairs), unless detailed otherwise.

2.17 GASKET

A. Acceptable Manufacturers: National Guard – S88 Series – Hager, Pemko, Reese, Zero are also acceptable.

B. Refer to drawings for special details. Provide accessories, shims and fasteners.

C. Where smoke gasket is specified or required by fire-rating criteria, provide 5050, unless detailed otherwise.

D. Provide gaskets for 20-minute doors and for doors designated for smoke and draft control as required by local codes. Include gasket for meeting edges of pairs, when required by door manufacturer.

E. Where frame-applied intumescent seals are required by the wood door manufacturer, provide gaskets that comply with Wisconsin Enrolled Building Code and UL 10C positive pressure testing.

2.18 SPECIAL GASKET

A. Acceptable Manufacturers: National Guard – Hager, Pemko, Reese, Zero are also acceptable.

B. Provide accessories, shims and fasteners.
   1. Only fasteners supplied by the vendor are to be used to attach seals.
   2. Provide self-tapping fasteners for products being applied to hollow metal doors and frames.
   3. Cutting or notching of gasket for stop-mounted hardware shall not be permitted. Provide special brackets, as needed, for stop-applied hardware. (Zero 770SPB, etc.)
   4. Adjust backset of lockset (cylindrical), as required to accommodate special stop-mounted gasket and to avoid conflict between lock trim and special gasket.
C. Where gasket is assigned by hardware group modifier “G”, provide the following.
   1. Gasket: 5050 self-adhesive frame-applied to jambs and head
   2. Door Bottom/Sweep: 200N, unless detailed otherwise (both doors of pairs)
   3. Astragal: A605 split type (for each door of pairs with both doors active) or 5050 gasket
      (applied to fixed astragal by door supplier for active/inactive pairs), unless detailed
      otherwise.

D. Where STANDARD-LEVEL sound control gasket is assigned by hardware group modifier “G”,
   provide the following.
   1. Jambs & Head (self-adhesive): 5050
   2. Door Bottom/Sweep: 200N
      a. Install/adjust door bottom/sweep as close to floor as possible without dragging
         throughout the complete door swing cycle to maximize reduction of door undercut.
   3. Threshold (only if indicated or drawn): 411 (¼" tall x 3" wide, smooth top)
      a. Refer to drawings for special details. Provide accessories, shims and fasteners.
      b. Where thresholds occur at openings with one or more mullions, they shall be cut for
         the mullions and extended continuously for the entire opening width.

4. Astragal (meeting edges of pairs):
   a. SPLIT-type (both doors active, brush-type): A605_ (SET)
   b. OVERLAPPING-type at active/inactive: 5050 applied to fixed astragal by door
      supplier
   c. Double-Egress Pair:
      1) Non-rated: Refer to special notes for assigned door.
      2) Fire-rated: Refer to special notes for assigned door.

E. Where MODERATE-LEVEL sound control gasket is assigned by hardware group modifier “J”,
   provide the following.
   1. Jambs & Head (adjustable, frame stop-mounted): 107S_
   2. Automatic Door Bottom (surface-mounted, push-side): 222N_
   3. Threshold (¼" tall x 3" wide, smooth top): 411_
      a. Refer to drawings for special details. Provide accessories, shims and fasteners.
      b. Where thresholds occur at openings with one or more mullions, they shall be cut for
         the mullions and extended continuously for the entire opening width.

4. Astragal (meeting edges of pairs):
   a. SPLIT-type (both doors active, brush-type): A605_ (SET)
   b. OVERLAPPING-type at active/inactive: 5050 applied to fixed astragal by door
      supplier
   c. Double-Egress Pair:
      1) Non-rated: Refer to special notes for assigned door.
      2) Fire-rated: Refer to special notes for assigned door.
F. Where HIGH-LEVEL sound control gasket is assigned by hardware group modifier “S”, provide the following.
   1. Jambs & Head (frame stop-mounted): 103N_
   2. Door Bottom (surface-mounted, push-side): 420N_
   3. Threshold: Pemko 151_ (¼” tall x 3” wide, smooth top)
      a. Refer to drawings for special details. Provide accessories, shims and fasteners.
      b. Where thresholds occur at openings with one or more mullions, they shall be cut for the mullions and extended continuously for the entire opening width.

G. Astragal (meeting edges of pairs):
   1. SPLIT-type (both doors active, adjustable/spring-loaded set): 140P_
   2. OVERLAPPING-type at active/inactive: 109N_
   3. Double-Egress Pair:
      a. Non-rated: Refer to special notes for assigned door.
      b. Fire-rated: Refer to special notes for assigned door.

2.19 MAGNETIC HOLDERS
   A. Acceptable Manufacturers and Types: LCN – Rixson is also acceptable.

   | LCN SEM7830/SEM7850 |

   B. Where magnetic holders are specified in the door schedule, provide LCN SEM7850, unless indicated otherwise.
      1. Verify voltage with Electrical.

   C. Provide through-bolting at door mounted hold open magnets/ armatures using manufacturer supplied bolts and screws.

   D. Mount to door and wall at a height not to exceed 84” above finished floor. Provide solid wood blocking inside wall.

   E. Interface with access control system.

2.20 DOOR POSITION SWITCHES
   A. Acceptable Manufacturers and Types: NASCOM - GE, Securitron are also acceptable.

   | NASCOM N1178 | ¾” recessed surface-mount |

   B. Coordinate door and frame preparations with door and frame suppliers.

   C. Switches shall be installed in frame head approximately 4” from latching edge of door.

2.21 LATCH PROTECTORS
   A. Acceptable Manufacturers and types: Rockwood – Don Jo is also acceptable.

   | Rockwood 320-32D |

   B. Latch protectors shall be stainless steel of the type applicable for the specified latch.
2.22 FASTENERS
A. Including, but not limited to; wood or machine screws, special screws, bolts, special bolts, nuts, expansion shields, anchors, and other accessory items of proper type, material, and finish required for complete operational installation of hardware.
B. Use Phillips head for exposed screws. Do not use aluminum screws to attach hardware.
C. Only fasteners supplied by the vendor are to be used to attach hardware to doors and frames.
D. All continuous hinges to be provided with template machine screws.

2.23 TYPICAL FINISHES AND MATERIALS
A. Finishes, unless otherwise specified:
   1. Butts: Outswinging Exterior Doors:
      a. US32D (BHMA 630) on Stainless Steel
   2. Butts: Interior Doors and Inswinging Exterior Doors:
      a. US26D (BHMA 652) on Steel
   3. Continuous Geared Hinges:
      a. US28 (BHMA 628) on Aluminum
   4. Continuous Stainless Steel:
      a. US32D (BHMA 630) on Stainless Steel
   5. Pivots:
      a. US26D (BHMA 626) on Brass or Bronze
   6. Flush Bolts:
      a. US26D (BHMA 626) on Brass or Bronze
   7. Exit Devices:
      a. US26D (BHMA 626) on Brass or Bronze
         b. US32D (BHMA 630) on Stainless Steel
   8. Locks and Latches:
      a. US26D (BHMA 626) on Brass or Bronze
   9. Push Plates, Pulls and Push Bars:
      a. US32D (BHMA 630) on Stainless Steel
   10. Coordinators:
       a. USP (BHMA 600) on Steel
   11. Kick Plates, Armor Plates, and Edge Guards:
       a. US32D (BHMA 630) on Stainless Steel
   12. Overhead Stops and Holders:
       a. US26D (BHMA 626) on Brass or Bronze
   13. Closers: Surface mounted.
a. Sprayed Lacquer or Powder Coat to Match

14. Latch Protectors:
   a. US32D (BHMA 630) on Stainless Steel

15. Miscellaneous Hardware:
   a. US26D (BHMA 626) on Brass or Bronze

PART 3 - PART 2 EXECUTION

3.1 EXAMINATION
   A. Examine doors, frames, and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION
   A. Install finish hardware in accordance with reviewed hardware schedule and manufacturer's printed instructions. Prefit hardware before finish is applied, remove and reinstall after finish is completed. Install hardware so that parts operate smoothly, close tightly and do not rattle.
   B. Installation of hardware shall comply with NFPA 80 and NFPA 101 requirements.
   C. Set units level, plumb and true to line and location. Adjust and reinforce attachment to substrate as necessary for proper installation and operation.
   D. Predrill, fastener holes using centering bit and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
   E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant, forming tight seal between threshold and surface to which set. Securely and permanently anchor thresholds, using countersunk non-ferrous screws to match color of thresholds (stainless steel screws at aluminum thresholds).
   F. Lead Protection: Lead wrap hardware penetrating lead-lined doors. Levers and roses to be lead lined. Apply kick and armor plates with 3M adhesive #1357, as recommended by 3M Co., on lead-lined doors.

3.3 FIELD QUALITY CONTROL
   A. After installation has been completed, provide services of qualified hardware consultant to check Project to determine proper application of finish hardware according to schedule. Also check operation and adjustment of hardware items. A representative of EFS is to accompany the qualified hardware consultant during the inspection.
   B. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 ADJUSTING AND CLEANING
   A. At final completion, hardware shall be left clean and free from disfigurement. Make final adjustment to door closers and other items of hardware. Where hardware is found defective repair or replace or otherwise correct as directed.
   B. Adjust door closers to meet opening force requirements of Uniform Federal Accessibility Standards.
C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of space or area, return to work during week prior to acceptance or occupancy, and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors.

D. Instruct Owner’s personnel in proper adjustment and maintenance of door hardware and hardware finishes.

E. Clean adjacent surfaces soiled by hardware installation.

3.5 PROTECTION

A. Provide for proper protection of items of hardware until Owner accepts Project as complete.

3.6 TYPICAL ROOM DOOR HARDWARE

A. Provide the following assigned hardware groups for typical room entry doors, unless indicated otherwise.

1. Patient Room
   a. Single (105.07)
   b. Pair (115.07)

2. Exam room (10)

3. Office (12)

4. Staff toilet (single occupant)
   a. Non-rated (11)
   b. Rated corridor with closer (31)

5. Patient toilet (single occupant)
   a. Non-rated (11)
   b. Rated corridor with closer (31)
   c. Inswing/emergency rescue (reverse swing) (19.32)

6. Patient Room toilet (single occupant)
   a. Non-rated (11)
   b. Rated corridor with closer (31)
   c. Inswing/emergency rescue (reverse swing) (19.32)

7. Soiled/Clean utility with card reader access (121 DP)

8. Meds with card reader access (34 EP)

9. Equipment (121 D)

10. Double-Egress cross-corridor A (NON-RATED) (130.01) right hand swing

11. Double-Egress cross-corridor B (RATED) right hand swing
   a. Electronic hold-opens & latched (132.01 H)
   b. Electronic dogging (295.01)

12. Mechanical/Electrical
   a. Typical with card entry (34 DEGP)
   b. Outswing over 1200 AMPS with card entry (56 DEGP)

13. Communications/Electrical closet with card entry
   a. Non-rated (14 EP)
   b. Rated (34 EP)
14. Staff locker room with card entry (34 EP)
15. Staff break room with card reader access (121 P)
16. Public toilet (multiple occupant) with automatic operator
   a. NON-RATED (420.01)
   b. RATED (401.01)

17. Stair
   a. To stair – lockable for re-entry (53)
   b. To stair – required for fail-safe re-entry (223.01)
   c. Discharge from stair – panic exit with various entry functions (50, 51, 53, 54, 56)

3.7 HARDWARE GROUP MODIFIERS

A. Hardware Group modifiers added to numeric hardware group assignments on the schedule of openings indicate a variation to the group as defined below.

   "A" – Add armor plate to push side of door (both leaves of pairs and both sides of double-acting doors). Omit kickplate if previously scheduled. Provided by Section 102600 – Wall Protection.

   "D" – Set delay for specified closer(s) to 5 – 7 seconds, unless indicated otherwise. Add delayed-action feature to specified closer(s), if required to attain specified delay time. **DO NOT exceed 10-second delay, unless specifically indicated otherwise.**

   "E" – Add fail-secure (non-fail-safe) electric strike, unless noted otherwise. Refer to Part 2 - ELECTRIC STRIKES. For pairs of doors without a mullion, also provide a continuous current electric hinge. See electrical for voltage requirements. Connection by Electrical. Electronic access control(s), power supply (for electric strike), request-to-exit device(s), and monitoring/alarm(s) are provided by Security Contractor, unless noted otherwise. Refer to security documents for location(s) and type(s) of electronic control(s).

   **OPERATIONAL DESCRIPTION:** Door is normally closed and mechanically locked on the outside. Manual exit is possible at all times. Electronic access control system secures and releases electric strike to control entry. When secured, presenting authorization temporarily releases electric strike to allow entry. **Power off secures electric strike (fail-secure entry).**

   **NOTE 1:** At fire-rated openings or openings requiring positive-latching, fire-alarm event secures electric strike.

   "G" – Provide STANDARD-LEVEL sound control gasket seal for jambs, head, door bottom, and meeting edges of pairs. Refer to Part 2 – SPECIAL GASKET.

   "H" – Add electronic hold-open device (both leaves of pairs, unless indicated otherwise). Refer to Part 2-MAGNETIC HOLDERS. **(Provide electronic closer/holder device(s) ONLY if wall holders are not applicable for the opening conditions).** Refer to Part 2-ELECTRONIC CLOSER/HOLDERS.

   Electronic hold-open devices are energized by fire-alarm system at fire-rated openings, and/or electronic access control system. Electronic hold-open devices are de-energized (released) by:
   1) Momentary pushbutton release switch located near/behind door(s).
   2) Fire-alarm event (at all fire-rated openings).
3) Electronic access control system. Refer to security documents for location(s) and type(s) of control(s).

See electrical for voltage requirements.

Connections (and pushbutton momentary release switch located near/behind doors) are provided by Electrical.

NOTE 1: When assigned to hardware groups 1 and/or 2, electronic holding device shall be provided by the associated door/frame assembly manufacturer/supplier.

NOTE 2: When assigned to hardware groups that include automatic door operators, a remote hold-open switch is provided by automatic door operator manufacturer/supplier. Refer to automatic door operator specification for type of switch and to plan for location.

"J" – Provide MODERATE-LEVEL sound control gasket seal for jambs, head, door bottom, and meeting edges of pairs. Refer to Part 2 – SPECIAL GASKET.

"L" – Add lead-lining to cylindrical hardware, including roses/escutcheons on locks. Substitute for hinges previously specified, Rixson L117 pivot set (or approved equivalent) and ML19 intermediate pivots spaced per manufacturers’ recommendations. Lead-lined astragal at pairs is provided by door supplier. Refer to Radiation Protection specification section.

NOTE: Installation of hardware must not compromise/penetrate lead-lining in door(s) or frame.

"M" – Add mechanical holder function for non-rated doors (both leaves of pairs, unless indicated otherwise). Provide holder feature for closer or for overhead stop, unless noted otherwise. Refer to Part 2 – CLOSERS and Part 2 – OVERHEAD STOPS.

NOTE 1: When holders are indicated at multiple occupant public restrooms, provide heavy-duty base stops & holders (Ives WS20/WS20X, or approved equivalent). Refer to Part 2 - WALL STOPS AND HOLDERS.

NOTE 2: When specifically indicated, provide heavy-duty automatic wall holders (Ives WS45/WS45X, or approved equivalent). Refer to Part 2 - WALL STOPS AND HOLDERS.

NOTE 3: When assigned to hardware groups 1, 2, and/or for "integrated opening assemblies", the mechanical holder function shall be provided by the associated door/frame assembly manufacturer/supplier.

"P" – Add door position switch/contact for doors being monitored/alarmed (both leaves of pairs). Refer to Part 2 - DOOR POSITION SWITCHES. Connection by Electrical.

NOTE: When assigned to hardware groups 1 or 2, door position switch is to be provided by the associated door supplier/manufacturer.

"S" – Provide HIGH-LEVEL sound control gasket seal for jambs, head, door bottom, and meeting edges of pairs. Refer to Part 2 – SPECIAL GASKET.

"W" – Add weatherstrip, sweep(s) and rain drip (where applicable). For pairs with fixed astragal by door supplier, furnish gasket strip similar to Pemko S88D. For pairs with both doors active, provide split astragal similar to Pemko 18041_P for each leaf. (Refer to Part 2 – WEATHERSTRIP & THRESHOLDS.) At aluminum assemblies, add thresholds and sweep(s) only – integral weatherstrip is provided by door manufacturer.

"Y" – Add continuous hinge at hollow metal frames with hollow metal doors receiving automatic door operators.

"Z" – Add telephone cylinder (TEL) to closer function.
3.8 HARDWARE GROUPS

A. Provide required door hardware for each specified opening to comply with requirements of this section in its entirety (Parts 1, 2, and 3). Included are desired/intended functions, acceptable manufacturers and models, systems coordination, etc. for a complete installed opening.

B. Refer to the openings schedule for hardware group and modifier(s) assigned to each door opening. Ignore hardware groups and modifiers not assigned on the openings schedule.

C. Refer to hardware groups attached to the end of the opening schedule for specialty groups/applications not included here.

GROUP 1 – Hardware by door supplier
All Hardware by Door Supplier (or as varied by assigned modifier).

GROUP 10 – Passage, no closer
Hinges
1 each Latchset Passage Function
Function: Latchbolt is retracted by lever on either side.
1 each Stop (as required by opening conditions)

GROUP 11 – Privacy function, no closer
Hinges
1 each Lockset Privacy function
Function: Latchbolt is retracted by lever on either side unless inside turn lever (mort) or push button (cyl) locks outside lever. Turn lever is released and push button is released by rotating inside lever or by closing door. Outside emergency release mechanism unlocks outside lever (via turning emergency turn-button).
1 each Stop (as required by opening conditions)

GROUP 11.01 – Privacy function, no closer
Hinges
1 each Lockset Schlage ND44S Privacy function (no substitution)
Function: Latchbolt is retracted by lever on either side unless push button locks outside lever. Push button is released by rotating inside lever or by closing door. Outside emergency release mechanism (emergency turn button) unlocks outside lever.
1 each Stop (as required by opening conditions)

GROUP 12 – Office, no closer
Hinges
1 each Lockset Office function
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by inside turn button (cyl) or toggle on lock front (mort). Key outside retracts latchbolt. Deadlocking latchbolt.
1 each Stop (as required by opening conditions)

GROUP 13 – Classroom function, no closer
Hinges
1 each Lockset Classroom Function
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by key. Key outside locks or unlocks outside lever. Deadlocking latchbolt.
1 each Stop (as required by opening conditions)
GROUP 14 – Storeroom, no closer

Hinges
1 each Lockset

Storeroom function
Function: Latchbolt is retracted by inside lever only. Outside lever is always LOCKED. Key outside retracts latchbolt. Deadlocking latchbolt.
1 each Stop (as required by opening conditions)

GROUP 19.32 – Privacy with Emergency Release/Rescue hardware & privacy seal

1 set Pivots (center-hung) EP-5 (McKinney)
1 each Double Lip Strike/Stop CSS-9
1 each Lockset Privacy function
Function: Latchbolt is retracted by lever on either side unless inside push button (cyl) or turn lever (mort) locks outside lever. Push button is released by turning inside lever or by closing door.
Outside emergency release unlocks outside lever.
1 set Privacy Gasket (applied to door) 5060 (full height at hinge & latch edges)
1 each Stop (as required by opening conditions)
NOTE: If the door is able to swing in the primary opening direction far enough to strike the pivot jamb of the frame before striking a wall, provide a double-acting concealed overhead stop.

GROUP 28 – Pair closet, roller latches with pulls

Hinges
2 each Pulls 3/4-inch round, 8-inch center-to-center
2 each Roller Latches (mount at head) RL 32 (or approved equivalent)
2 each Stops (as required by opening conditions)

GROUP 30 – Passage with closer

Hinges
1 each Latchset Passage Function
Function: Latchbolt is retracted by lever on either side.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 31 – Privacy with closer

Hinges
1 each Lockset Privacy function
Function: Latchbolt is retracted by lever on either side unless inside push button (cyl) or turn lever (mort) locks outside lever. Push button or turn lever is released by depressing inside lever or by closing door. Outside emergency release unlocks outside lever.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 32 – Office with closer

Hinges
1 each Lockset Office function
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by inside turn button (cyl) or toggle on lock front (mort). Key outside retracts latchbolt. Deadlocking latchbolt.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)
GROUP 33 – Classroom with closer
Hinges
1 each Lockset
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by key. Outside key locks or unlocks outside lever. Deadlocking latchbolt.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 34 – Storeroom with closer
Hinges
1 each Lockset
Function: Latchbolt is retracted by inside lever only. Outside lever is always LOCKED. Key outside retracts latchbolt. Deadlocking latchbolt.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 40 – Passage with closers, pair with automatic flushbolts
Hinges
1 set Flushbolts (automatic)
1 each Latchset
Function: Latchbolt is retracted by lever on either side.
1 each Coordinator
2 each Closers
2 each Kickplates
2 each Stops (as required by opening conditions)
Astragal provided by Door Manufacturer/Supplier (unless indicated otherwise).

GROUP 42 – Office with closers, pair with automatic flushbolts
Hinges
1 each Lockset
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by inside turn button (cyl) or toggle on lock front (mort). Key outside retracts latchbolt. Deadlocking latchbolt.
1 each Coordinator
1 set Flushbolts (automatic)
2 each Closers
2 each Kickplates
2 each Stops (as required by opening conditions)

GROUP 43 – Classroom with closers, pair with automatic flushbolts
Hinges
1 set Flushbolts (automatic)
1 each Lockset
Function: Latchbolt is retracted by lever on either side unless outside lever is locked by key. Key outside locks or unlocks outside lever. Deadlocking latchbolt.
1 each Coordinator
2 each Closers
2 each Kickplates
2 each Stops (as required by opening conditions)
Astragal (if required for fire-rating or if indicated) is provided by Door Manufacturer/Supplier.
GROUP 44 – Storeroom with closers, pair with automatic flushbolts
Hinges
1 set Flushbolts (automatic)
1 each Lockset
Storeroom Function
Function: Latchbolt is retracted by lever inside only. Outside lever is always LOCKED. Key outside
retracts latchbolt. Deadlocking latchbolt.
1 each Coordinator
2 each Closers
2 each Kickplates
2 each Stops (as required by opening conditions)
Astragal provided by Door Manufacturer/Supplier (unless indicated otherwise).

GROUP 50 – Exit only
Hinges
1 each Exit Device 8810 or 12-8810 / 99EO or 99EO-F
Function: Latchbolt is retracted by inside push rail. No outside operation.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 51 – Exit/panic with passage lever
Hinges
1 each Exit Device 99L-BE or 99L-BE-F
Function: Latchbolt is retracted by inside push rail and outside lever.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 53 – Exit/panic with lockable lever
Hinges
1 each Exit Device 99L or 99L-F
Function: Latchbolt is retracted by outside lever and inside push rail, unless outside lever is locked
by key outside. Key locks and/or unlocks outside lever.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 54 – Exit/panic with pull & cylinder
Hinges
1 each Exit Device 8804 x 862 or 12-8804 x 862 / 99NL-OP x 8190 or
99NL-OP-F x 8190
Function: Latchbolt is retracted by key outside and push rail inside. Outside access by pull when
latchbolt is retracted or when device is dogged (at non-rated devices only).
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)
GROUP 56 – Exit/panic with locked lever
Hinges
1 each Exit Device 99L-NL or 99L-NL-F
Function: Latchbolt is retracted by inside push rail or by outside lever only when key is in cylinder and turned.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 100.01 – Single push-plate & pull with closer
Hinges
1 each Push Plate (6-in x 16-in with beveled edges)
1 each Pull 3/4-inch diameter with 8-inch centers
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)

GROUP 105.07 – Hospital latch (push side–down, pull side–up), continuous hinge, no closer
1 each Continuous Hinge (Refer to specification Part 2)
1 each Hospital Latch (5-inch backset, unless indicated otherwise)
Function: Latchbolt is retracted by paddle, either side.
1 each Stop (as required by opening conditions)

GROUP 110.01 – Pair push-plates & pulls with closers
Hinges
2 each Push-Plates (6-in x 16-in with beveled edges)
2 each Pulls (3/4-in diam. with 8-in centers)
2 each Closers
2 each Kick-Plates
2 each Stops (as required by opening conditions)

GROUP 115.07 – Hospital latch (push side–down, pull side–up), pair with constant-latching/semi-automatic flushbolts, continuous hinges, no closers
2 each Continuous Hinges (Refer to specification Part 2)
1 each Hospital Latch (5-inch backset, unless indicated otherwise)
Function: Latchbolt is retracted by paddle, either side.
1 set Flushbolts (constant-latching/semi-automatic)
2 each Stops (as required by opening conditions)
NOTE: Confirm compliance of manual flushbolts with local authority-having-jurisdiction.

GROUP 121 – access control lock with closer
Hinges
1 each Lockset
Function: Latchbolt is retracted by inside lever at all times. Key outside retracts latchbolt. Outside lever is LOCKED, except when in “passage” mode or if valid user credentials are presented/ entered.
1 each Cylinder/Core
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)
Card Reader
Electric strike
DPS request to exit

**GROUP 130.01 – Double-egress pair (non-rated & non-latching)**
- Hinges
- 2 each Push Plates (6-in x 16-in x .050 with beveled edges)
- 2 each Closers
- 2 each Kickplates
- 2 each Stops (as required by opening conditions)
- 1 each Overlapping Astragal (only where indicated)

**GROUP 132.01 – Double-egress pair surface vertical rod panics/exits-only (less bottom rods)**
- Hinges
- 2 each Exit Devices 9927EO-LBR or 9927EO-F-LBR
- Function: Push rail retracts latchbolt. No pull side operation.
- 2 each Closers
- 2 each Kickplates
- 2 each Stops (as required by opening conditions)
- 1 each Overlapping Astragal (only where indicated or required for code compliance)

**GROUP 154 – Aluminum narrow-stile exit/panic with pull & cylinder**
- 1 each Continuous Hinge
- 1 each Exit Device 35A-NL-OP x 8190
- Function: Latchbolt is retracted by outside key and inside pushrail. Outside access by pull when latchbolt is retracted or when device is dogged.
- 1 each Closer

**NOTE:** At door SG01.1 security contractor will provide local exit alarm, control devices, and signage to deter use of door except for emergency exit. Refer to security documents for details, and also for information regarding provisions for “future” card reader for entry.
GROUP 223.01 – Stair Exit/Panic with electric lock lever (fail-safe) via fire alarm unlock

Hinges
1 each Electric Hinge (or power transfer, as required by exit device)
1 each Electrified Exit Device 8875 x ET or 12-8875 x ET / E99L or E99L-F
Function: Latchbolt is retracted by inside push rail, outside key, or outside lever when not locked electronically (fail-safe). Power off unlocks outside lever.
1 each Closer
1 each Kickplate
1 each Stop (as required by opening conditions)
1 each Power Supply (for electric lock, if not included by fire-alarm release system)
1 each Door Position Switch/Contact
Alarms (if utilized) and request-to-exit switch (if required for monitoring or alarm) are provided by Security Contractor.
Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed, latched, and electronically locked on the pull-side by the fire alarm system. Key is required for entry. Manual exit is allowed at all times. Fire alarm event unlocks outside lever for immediate passage (for floors designated/required for re-entry in compliance with fire code criteria).

GROUP 295.01 – Double-egress pair with surface vertical rod panics/exits only (less bottom rods) & electric latch retraction (dogging) via electronic access control system and/or fire alarm connection

Hinges
2 each Electric Hinges (or power transfers, as required by exit devices)
2 each Electrified Exit Devices 12-56-NB8710 / QEL9927EO-F-LBR
Function: Latchbolts are retracted electronically or by inside pushrail. No pull side operation.
2 each Closers
2 each Kickplates
2 each Stops (as required by opening conditions)
1 each Astragal (if indicated, required by door manufacturer, or for code compliance)
1 each Power Supply (for exit devices)
Connection by Electrical.

OPERATIONAL DESCRIPTION: Manual egress in either/both directions of travel is possible at all times. Doors are normally closed with latchbolts electronically retracted (dogged) via electronic access control system and/or fire alarm connection. Interruption of power and/or fire alarm event releases/extends latchbolts to positively latch both doors.

GROUP 401.01 – Passage lever latch with automatic operator & electric strike (fail-secure, positive-latching)

Hinges
1 each Latchset Passage function
Function: Latchbolt is retracted by lever on either side.
1 each Electric Strike (fail-secure)
1 each Automatic Operator (by Section 087113)
2 each Touchless wave sensor (by Section 087113)
1 each Kickplate
1 each Stop (as required by opening conditions)
1 each Power Supply (for electric strike, if not included with automatic operator assembly)
Connection by Electrical.

OPERATIONAL DESCRIPTION: Door is normally closed & latched. Manual exit and entry are possible at all times by rotating either lever. Depressing wall actuator switch on either side of opening temporarily releases the electric strike and then opens the door automatically.
Interruption of power or fire-alarm event (at fire-rated openings) secures the electric strike and deactivates the automatic operator to close and positively-latch the door.

**GROUP 420.01 – Single push/pull door with automatic operator**

**Hinges**
- 1 each Push-Plate (6-in x 16-in with beveled edges)
- 1 each Pull-Plate (3/4-in diam. with 8-in ctrs and 4-in x 16-in plate)
- 1 each Automatic Operator (by Section 087113)
- 2 each Touchless wave sensor (by Section 087113)
- 1 each Kickplate
- 1 each Stop (as required by opening conditions)

Connection by Electrical.

**OPERATIONAL DESCRIPTION:** Door is normally closed (no latching). Manual or automatic travel is possible at all times in both directions. Depressing either actuator switch opens door automatically.

END OF SECTION 087100
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Power door operators for swinging doors.
   2. Low-energy door operators for swinging doors.

1.2 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.
B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
C. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
D. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.3 COORDINATION

A. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control automatic door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.
B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
D. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies.
E. Connect to the fire alarm system when door is required to be auto closing or self-latching.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: For automatic door operators.
   1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
   2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Indicate locations of activation and safety devices.
   4. Include diagrams for power, signal, and control wiring.
5. Include plans, elevations, sections, and attachment details for guide rails.

C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard size.

1.6 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.
B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS
A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Basis-of-Design: Subject to compliance with requirements, provide M-Force Automatic Swing Door Opener by Stanley Access Technologies or comparable product by one of the following:
   1. Besam Entrance Solutions.
   2. LCN Closers; an Ingersoll-Rand company.
   3. Nabco Entrances Inc.
   4. SARGENT Manufacturing Company.

2.2 AUTOMATIC DOOR OPERATORS, GENERAL
A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
   1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to automatic door operator when door is in emergency breakaway position, to return door to closed position after breakaway, and to automatically reset.
   2. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
   3. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load as indicated on the drawings.
B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
C. Hinges: See Section 087100 "Door Hardware" for hinge type for each door that door operator shall accommodate.
D. Housing for Overhead Concealed Operators: Fabricated from minimum 0.125-inch-thick, extruded or formed aluminum and extending full width of door opening including door jambs to
conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

E. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch thick extruded or formed aluminum; manufacturer's standard width; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.

F. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

G. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

H. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Provide a terminal strip in an enclosed box near or above door that indicates connections for security and fire alarm equipment and for electrified hardware items associated with proper door operation, as indicated by hardware group operational description.

J. Smoke Detector: Provide smoke detector to de-activate automatic mode on labeled assemblies.

2.3 POWER DOOR OPERATORS

A. Standard: BHMA A156.10.

B. Performance Requirements:

1. Opening Force:
   a. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails; not more than 15 lbf required to open door to minimum required width.
   b. Power-Operated Swinging Doors: Not more than 30 lbf required to manually open door if power fails.
   c. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for breakaway door or panel to open.

2. Entrapment-Prevention Force: Not more than 40 lbf required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf required to prevent stopped door from moving in direction of closing.

C. Configuration: Operator to control pair of swinging doors.

1. Traffic Pattern: One way.

D. Operator Mounting: Surface.

E. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.

F. Operating System: Electromechanical.

G. Microprocessor Control Unit: Solid-state controller.

H. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening and closing force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Adjustable limit switch.
8. Obstruction recycle.
9. Automatic door re-open if stopped while closing.
10. On-off/hold-open switch to control electric power to operator; key operated.

I. Controls: Activation and safety devices as indicated on Drawings and according to BHMA standards.
   1. Activation Device: Motion sensor mounted on ingress side of door header to detect pedestrians in activating zone and to open door.
   2. Activation Device: Control mat installed on ingress side of door to detect pedestrians in activating zone and to open door.
   3. Activation Device: Push-plate switch to activate door operator.
   4. Activation Device: Touch-less switch to activate door operator. Refer to Drawings for locations.
   5. Safety Device: Presence sensor mounted on door header to detect pedestrians in presence zone and to prevent door from closing.
   6. Safety Device: One photoelectric beam mounted in guide rails to detect pedestrians in presence zone and to prevent door from closing.

J. Exposed Finish: Class II, clear anodic finish.

2.4 LOW-ENERGY DOOR OPERATORS FOR SWINGING DOORS

A. Standard: BHMA A156.19.

B. Performance Requirements:
   1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
   2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.

C. Configuration: Operator to control single swinging door.
   1. Traffic Pattern: Two way.
   2. Operator Mounting: Surface.
   3. Location: Corridor side unless otherwise indicated on drawings.

D. Configuration: Operator to control pair of swinging doors.
   1. Traffic Pattern: Two way.
   2. Operator Mounting: Surface.

E. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.

F. Operating System: Electromechanical.

G. Microprocessor Control Unit: Solid-state controller.

H. Features:
1. Adjustable opening and closing speed.
2. Adjustable opening and closing force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator; key operated.

I. Activation Device: Push-plate switch on each side of door to activate door operator.
1. Where indicated on drawings, provide narrow style jamb-mounted actuator switch.
2. Where indicated on drawings, provide manufacturer’s standard 6 inch square bollard prepared for specified actuator to be located at 38 inch centerline above finished floor with finish to match doors and frames.
   a. Surface mount (including anchoring base, anchors, and instructions) or in-ground mount (1 foot minimum recess and instructions), as indicated on plan or required by mounting conditions.
   b. Accommodate access control, if specified.

J. Where indicated, provide radio frequency controlled actuators.

K. Where indicated, provide square switch adapter cuff.
1. Wikk No. BP4X4 ADT RFBLK, or equivalent.

L. Exposed Finish: Class II, clear anodic finish.

2.5 MATERIALS
A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extrusions: ASTM B 221
   2. Sheet: ASTM B 209
B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer’s standard thickness.
C. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
D. Provide through-bolting for all fire-rated/label, wood doors and steel doors with a reinforcing backing plate. Steel doors with steel reinforcing backing plates can be drilled and tapped for fasteners supplied.

2.6 CONTROLS
A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed in plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.
   1. Provide capability for switching between bidirectional and unidirectional detection.
   2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.
C. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.

D. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

E. Control Mats: 1/2-inch-thick, synthetic-rubber or flexible-plastic mat in safety-ribbed surface pattern, with extruded-aluminum frame; with pressure switches for low-voltage control wiring; and in accordance with performance requirements in BHMA A156.10.
   1. Frame: Recessed to fit flush with floor, with concealed anchors.
   2. Size: As indicated, but not smaller than required by BHMA A156.10, including Appendix A.
   3. Color: As selected by Architect from full range of industry colors and color densities.

F. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
   1. Configuration: Round push plate with 4-by-4-inch junction box.
      a. Mounting: As indicated on Drawings
   2. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.

G. Touchless Switch: Hands-free activation door-control switch with flat motion sensor face-plate with contrasting-colored, engraved message.
   1. Configuration: 2.77-by-4.56-inch (single gang) rectangular face plate.
      a. Mounting: Recess mounted in wall.
   2. Face-Plate Material: Stainless steel with backlight acrylic window.
   3. Message: "Wave to Open."

H. Wireless or Remote Radio-Control Switch: Radio-control system consisting of header-mounted receiver and wall-mounted transmitter switch.
   1. Wall-Mounted Transmitter Switch: One red-button, momentary-contact actuator enclosed in 4-by-4-inch junction box. Provide blue plastic cover engraved with "Press Button to Open" in white text and with international symbol of accessibility.

I. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.7 FABRICATION

A. Factory fabricate automatic door operators to comply with indicated standards.

B. Form aluminum shapes before finishing.

C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.

D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.
2.8 ACCESSORIES

A. Signage: As required by cited BHMA standard for type of door and its operation.
   2. Provide sign materials with instructions for field application when operators are installed.

2.9 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, 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, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.
D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch and less than 3/4 inch with door in any position.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
   1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
   2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
C. Access-Control System: Connect operators to access-control system as specified in Section 281300 "Access Control."
D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Certified Inspector: Owner will engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

C. Automatic door operators will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust automatic door operators to function smoothly and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
   1. Adjust operators on exterior doors for weathertight closure.

B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

D. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087113
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors.
   2. Glazed curtain walls.
   3. Storefront framing.
   5. Interior borrowed lites.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.3 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Sustainable Design Submittals:
   1. Submit product data for glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.

C. Glass Samples: For each type of the following products; 12 inches square.
   1. Tinted glass.
   2. Coated glass.
   3. Fire-resistive glazing products.
   4. Insulating glass.

D. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For installers.
   B. Preconstruction adhesion and compatibility test report.
   C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass, glazing sealants and glazing gaskets.
      1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
   D. Source quality-control reports: For tempered glass; including the following:
      1. Traceability of glass; source of supply and evidence of batching.
      2. Dates of toughening/heat soaking.
      3. Certification that 100 percent of the glass units have been heat soak tested in a calibrated oven.
      4. Records of latest heat soak oven calibration date.
      5. Records to include details of all units that failed during the heat soak test.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
   B. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.
   C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
   D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
   F. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.
G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

H. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Install glazing in mockups specified in other sections of the Project Manual to match glazing systems required for Project, including glazing methods.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      2. Review temporary protection requirements for glazing during and after installation.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
   B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS
   A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
      1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY
   A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
      1. Warranty Period: 10 years from date of Substantial Completion.
   B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
      1. Warranty Period: 10 years from date of Substantial Completion.
   C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within
specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 or International Building Code by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings
   a. Wind Design Data: As indicated on Drawings.
   b. Basic Wind Speed: As indicated on the drawings.
   c. Importance Factor: As indicated on the drawings.
   d. Exposure Category: As indicated on the drawings
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Glass Type Factors for Wired, Patterned, and Sandblasted Glass:
   a. Short-Duration Glass Type Factor for Patterned Glass: 1.0.
   b. Long-Duration Glass Type Factor for Patterned Glass: 0.6.
5. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
6. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
7. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II. Provide at the locations indicated on the Drawings and as follows:

1. Doors: Glazing in all fixed and operable panels of swinging, sliding and bifold doors.
   a. Exceptions:
      1) Glazed openings which a 3-inch sphere is unable to pass.
      2) Decorative glazing.
      3) Curved glazing panels in revolving doors.

2. Adjacent to Door Locations: Glazing in an individual fixed or operable panel adjacent to a door where the nearest vertical edge of the glazing is within a 24-inch arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60-inches above the walking surface.
   a. Exceptions:
      1) Decorative glazing.
      2) Where there is an intervening wall or other permanent barrier between the door and glazing.
      3) Where access through the door is to a closet or storage area 3 feet or less in depth.

3. Window Locations: Glazing in an individual fixed or operable window that meets all the following criteria:
   a. The exposed area of an individual pane is greater than 9 square feet.
   b. The bottom edge of glazing is less than 18-inches above the floor.
   c. The top edge of glazing is greater than 36-inches above the floor.
   d. One or more walking surfaces are within 36-inches, measured horizontally and in a straight line, of the plane of the glazing.
   e. Exceptions:
      1) Decorative glazing.
      2) Where a horizontal rail is installed on the accessible side of the glazing that can withstand a horizontal load of 50 pound per linear foot without contacting the glass and is not less than 1 1/2 inches in cross sectional height.
      3) Outboard panes insulating glass units or multiple glazing where the bottom exposed edge of the glass is 25 feet or more above grade, roof, walking surface or other horizontal or less than 45-degree sloped surface adjacent to the glass.

4. Guards and Railings: Glazing in guards and railings, including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface.

5. Wet Surfaces: Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom edge of the glazing is less than 60-inches measured vertically above any standing or walking surface.
   a. Exception: Glazing that is more than 60 inches measured horizontally from the water’s edge of a bathtub, hot tub, spa, whirlpool, or swimming pool.
6. Adjacent to Stairways and Ramps: Glazing where the bottom exposed edge of the glazing is less than 60-inches above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps.
   a. Exceptions:
      1) The side of the stairway, landing or ramp has a guardrail and the plane of the glass is greater than 18 inches from the railing.
      2) Glazing 36 inches or more measured horizontally from the walking surface.

7. Adjacent to bottom Stairway Landing: Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 60-inch horizontal arc that is less than 180 degrees from the bottom tread nosing.
   a. Exception: Glazing that is protected by a guardrail and the plane of the glass is greater than 18 inches from the guard.

8. Fire Department Access Panels: Tempered glass. For insulating glass units, all panes to be tempered glass.

2.2 SOURCE QUALITY CONTROL
   A. Manufacturer Testing: Test the occurrence of spontaneous glass breakage due to nickel sulfide inclusions of tempered glass.
         a. Calibration: Heat soak oven to be calibrated within one year of heat soak testing.
      2. Tests: 100 percent of tempered glass units located in exterior the exterior building enclosure; including but not limited to the facade, sloped glazing, skylights, and roof windows.

2.3 GLASS PRODUCTS, GENERAL
   A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1. PPG
      2. Guardian
      3. Pilkington
   B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
      1. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
   C. Strength:
      1. Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article.
      2. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article.
      3. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick of thickness indicated.
   2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

E. Recycled Content of Glass and Glazing Products: Provide the maximum amount of recycled material possible.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

B. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

C. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

D. 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.
   2. For uncoated glass, comply with requirements for Condition A.
   3. For coated vision glass, comply with requirements for Condition C (other coated glass).

   1. Basis-of-Design Product: Subject to compliance with requirements, provide product as indicated on the drawings:
   2. Ceramic Coating Color: As selected by Architect from manufacturer's full range.

F. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B, Type I, Quality-Q3, and complying with other requirements specified.
   2. Tint Color: As indicated on drawings.
   3. Ceramic Coating Color: As selected by Architect from manufacturer's full range.

G. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Refer to drawings.
   4. Provide polished edges.
2.5 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. As indicated on the drawings.
2. Any glass substitutions are to match the performance values of the specified glass.
3. Any glass substitutions are to match the color of the specified glass to the satisfaction of the architect.
4. All exterior tempered glass panes are to be heat soaked after fabrication.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer’s standard primary and secondary.
2. Desiccant: Molecular sieve or silica gel, or blend of both.
3. Warm Edge Spacer:
   a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      1) 3Seal Insulating Glass Spacer by J.E. Berkowitz.
      2) TGI Warm Edge Spacer by Technoform Group.
   b. Provide letter of acceptance of use of warm edge spacer with glass materials by glass manufacturer including documentation of edge system structural adequacy for applications in Project.

C. Glass Type: Low-e-coated, clear insulating glass.
1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Heat-strengthened float glass or as required to meet performance requirements.
7. Provide safety glazing labeling.

2.6 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Technical Glass Products; Premium FireLite Plus
   b. Schott North America, Inc.; Pyran Star.
   c. Vetrotech Saint-Gobain; SGG Keralite FR-R.
C. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Technical Glass Products; FireLite Plus.
      c. Vetrotech Saint-Gobain; SGG Keralite FR-L.

2.7 SPECIALTY GLASS UNITS
A. Vision Control, Between the Glass Blinds, Tempered Glass Panel with Interior Blinds:
   1. Outdoor lite: 6 mm clear tempered glass
   2. Interspace: Manufacturers standard.
   3. Blinds: Built-In horizontal aluminum mini-blinds with controls available at each side with a magnetic slide controller, tilt control, attached to the internal glass in the unit.
   4. Blind operation: One side or two side as indicated on drawings.
      a. Manufacturer:
         1) Unicel, Architectural.
         2) BetweenGlassBlinds
         3) Window Accessory Company Inc.
   5. Blind color: As selected by Architect.
   6. Indoor lite: 6 mm clear tempered glass
   7. Factory-assembled units, consisting of glass, sealed panes separated by dehydrated interspaces, qualified according to ASTM E 2190, and complying with other requirements specified.

2.8 ELECTRICALLY-CHARGED SWITCHABLE PRIVACY GLASS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
   1. Polytronix, Inc.
   2. Glaspro.
   3. Pulp Studio.
B. Standard: Provide switchable glass units complying with ASTM C 1036.
C. Materials and Components
   2. Lamination Layers: Two layers of 0.030 PVB (polyvinyl butyral).
   3. Switchable Film: Switchable glass manufacturer’s recommended sheet with electrical wiring and related components.
   4. Electrical Devices and Components: Provide switchable glass manufacturer’s recommended devices and components for applications shown on Drawings, including but not limited to power supply/transformer, wall switch, and other recommended components.

2.9 RADIATION PROTECTION GLAZING
A. Refer to Section 134900 – Radiation Protection
B. Provide where indicated on the drawings
2.10 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.11 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   d. Pecora Corporation; 890.
   e. Sika Corporation, Construction Products Division; SikaSil-C990.
   f. Tremco Incorporated; Spectrem 1.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Omniseal 50.
   b. Dow Corning Corporation; 756 SMS or 791 or 795 or 995.
   c. GE Advanced Materials - Silicones; SilGlaze II SCS2800 or SilPruf NB SCS9000 or SilPruf SCS2000 or UltraPruf II SCS2900
   e. Pecora Corporation; 864 or 895 or 898.
D. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.12 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 804.3 tape, where indicated.
   2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.13 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Smoke Curtain Glazing Channel: Model B5BBSC by CR Laurence

2.14 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.
D. Do not attempt to cut, seam, nip or abrade tempered glass.

2.15 FIRE-PROTECTION-RATED GLAZING TYPES

A. Glass Type: 20-minute fire-rated glazing without hose-stream test; monolithic ceramic glazing or laminated ceramic glazing.
   1. Provide safety glazing labeling.
B. Glass Type: 45-minute, 60-minute, 90-minute, or 120-minute fire-rated glazing; monolithic ceramic glazing or laminated ceramic glazing.
   1. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.
B. Inspect each glass unit immediately before installation. Do not install units with edge damage or face imperfections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
   1. Where glass is installed in other building components, comply with requirements of component manufacturer for installation of glass in the applicable building component.
B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 FIRE-PROTECTION-RATED GLAZING INSTALLATION

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

3.5 ELECTRICALLY-CHARGED SWITCHABLE PRIVACY GLASS INSTALLATION

A. Comply with switchable glass manufacturer’s requirements and recommendations for installation of switchable glass as indicated on Drawings.

B. Inspect each pieces of glass immediately prior to start of switchable glass installation. Do not install glass improperly sized, with damaged edges, or scratched, abraded, or otherwise deficient.

C. Locate sill setting blocks at quarter points of all glass panes unless otherwise recommended by switchable glass manufacturer.
   1. Use blocks of durometer, size, and thickness recommended by switchable glass manufacturer.
   2. Provide glass lap and edge clearances in accordance with switchable glass manufacturer’s recommendations.

D. Set glass to produce greatest possible uniformity in appearance.
1. Wet-seal exterior glazing and wet interior condition glazing and make impervious to moisture with provision for weeping of condensation infiltrating system. Pressure-glazed systems not acceptable.

2. Place electrical connection to allow access by electrician with electrical connections exiting at head of framing system in wet environment conditions.

E. Cut and seal joints in glazing gaskets in accordance with switchable glass manufacturer’s recommendations, providing watertight and airtight seal at corners and other locations where joints required.

F. Interior Butt Glazing

3.6 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Where indicated, apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where fixed stop is located on exterior.

3.7 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
E. Install gaskets so they protrude past face of glazing stops. Where sealant is indicated with gaskets, slightly recess gasket to receive sealant.

3.8 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate air pockets and voids, other than expansion voids, and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

D. Promptly after installation, clean and trim excess glazing materials from the glass, stops and frames and eliminate stains and discolorations.

3.9 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000
SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Film-backed glass mirrors qualifying as safety glazing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

C. Samples: For each type of the following:
   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
   1. Warranty Period: Five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Avalon Glass and Mirror Company.
2. Binswanger Glass.
3. D & W Incorporated.
4. Glasswerks LA, Inc.
5. Guardian Industries Corp.
8. Virginia Mirror Company, Inc.
9. Walker Glass Co., Ltd.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.

1. Nominal Thickness: 6.0 mm.

C. Safety Glazing Products: For film-backed mirrors, provide products that comply with 16 CFR 1201, Category II.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   
a. Franklin International.
b. Laurence, C. R. Co., Inc.
c. Palmer Products Corporation.
d. Royal Adhesives & Sealants, LLC.

2. Adhesive shall have a VOC content of 70 g/L or less.
2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Andscot Company, Inc.
      2) Laurence, C. R. Co., Inc.
      3) Stylmark, Inc.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch and in height, respectively, and a thickness of not less than 0.04 inch.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Andscot Company, Inc.
      2) Laurence, C. R. Co., Inc.
      3) Stylmark, Inc.


B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.
   1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
   2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION
A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION
A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
   1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
B. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   1. Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
   2. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION
A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
B. Do not permit edges of mirrors to be exposed to standing water.
C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300
SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

2. Blank-off panels for louvers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

   2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Windborne-debris-impact-resistance test reports.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

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


2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Sight Proof, Drainable-Blade Louver:

1. Basis of Design Product: Subject to compliance with requirements, provide Model B5157 by Construction Specialties Inc or a comparable product by one of the following:

   a. Airolite Company, LLC (The)
   b. Greenheck Fan Corporation
   c. Reliable Products, Inc
   d. Ruskin Company; Tomkins PLC

2. Louver Depth: 5 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Blade Spacing: As per the model number.
5. Mullion Type: Exposed.
6. Louver Performance Ratings:

   a. Free Area: Not less than 50%.
   b. Point of Beginning Water Penetration: Not less than 1000 fpm.
   c. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 700-fpm free -area intake velocity.
   d. Air Performance: Not more that 0.15-inch wg (37-Pa) static pressure drop at 900- fpm free-area exhaust velocity.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Exterior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches from each corner and at 12 inches OC.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Mill finish unless otherwise indicated.
3. Type: Rewireable frames with a driven spline or insert.

D. Louver Screening for Aluminum Louvers:
1. Bird Screening: Aluminum, 5/8-inch square mesh, 0.063-inch wire.

2.5 BLANK-OFF PANELS
A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
   1. Aluminum sheet for aluminum louver, not less than 0.050-inch nominal thickness.
B. Insulated, Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.
   1. Thickness: 1 inch.
   2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
   3. Insulating Core: Rigid, glass-fiber-board insulation.
   4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
   5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
   7. Attach blank-off panels with clips.

2.6 MATERIALS
A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION
A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern.
   2. Horizontal Mullions: Provide horizontal Mullions at joints.
C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.
E. Include supports, anchorages, and accessories required for complete assembly.
F. Provide vertical mullions of type and at spacing indicated, but not more than is recommended by manufacturer, or 72 inches OC, whichever is less.
1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Provide subsills made of same material as louvers for recessed louvers.
H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES
A. Finish louvers after assembly.
B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than percent 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 and Gloss: To match the Composite Metal Panel; confirm color codes match existing building louvers before production.

PART 3 - EXECUTION

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

3.2 PREPARATION
A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION
A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
C. Form closely fitted joints with exposed connections accurately located and secured.
D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.
3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119
PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes fluid-applied, resin-based, membrane-forming systems that control the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation.

1.2 DEFINITIONS
   A. MVE: Moisture vapor emission.
   B. MVER: Moisture vapor emission rate.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Product Test Reports: For each MVE-control system, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.7 FIELD CONDITIONS
   A. Environmental Limitations: Comply with MVE-control system manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.
      1. Store system components in a temperature-controlled environment and protected from weather and at ambient temperature of not less than 65 deg F and not more than 85 deg F at least 48 hours before use.
      2. Maintain ambient temperature and relative humidity in installation areas within range recommended in writing by MVE-control system manufacturer, but not less than 65 deg F or more than 85 deg F and not less than 40 or more than 60 percent relative humidity, for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
      3. Install MVE-control systems where concrete surface temperatures will remain a minimum of 5 deg F higher than the dew point for ambient temperature and relative humidity conditions in installation areas for 48 hours before installation, during installation, and for 48 hours after installation unless longer period is recommended in writing by manufacturer.
WARRANTY

A. Manufacturer's Special Warranty: Provide manufacturer's written warranty guaranteeing the integrity of the MVE-Control System to be free of manufacturing defects, remain adhered to substrate, and not be affected by moisture or alkalinity and covering coating failure caused by concrete moisture vapor emission and alkalinity.

1. Warranty covers cost of MVE-Control System, preparation and installation of compounds and all labor charges associated to repair or replace materials in areas exhibiting failure caused by concrete moisture vapor emission and alkalinity damage, including replacing floor covering materials and removing, storing, and reinstalling all equipment and furnishings.

2. Period of Warranty: Not less than 20 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete that exhibits the following conditions:

1. MVER: Maximum 15 lb of water/1000 sq. ft. when tested according to ASTM F 1869.

2. Relative Humidity: Maximum 90 percent when tested according to ASTM F 2170 using in situ probes.

B. Water-Vapor Transmission: Through MVE-control system, maximum 0.10 perm when tested according to ASTM E 96/E 96M.

C. Tensile Bond Strength: For MVE-control system, greater than 200 psi with failure in the concrete according to ASTM D 7234.

2.2 MVE-CONTROL SYSTEM

A. MVE-Control System - Epoxy: ASTM F 3010-qualified, fluid-applied, two-component, epoxy-resin, membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated and acceptable to manufacturers of floor covering products indicated, including adhesives.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. ARDEX Americas; MC Rapid Moisture Control System.

   b. KOSTER American Corporation; Koster VAP I 2000 UFS.

   c. MAPEI Corporation; Planiseal VS.

2. Substrate Primer: Provide MVE-control system manufacturer's concrete-substrate primer if required for system indicated by substrate conditions.

3. Cementitious Underlayment Primer: If required for subsequent installation of cementitious underlayment products, provide MVE-control system manufacturer's primer to ensure adhesion of products to MVE-control system.

2.3 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product recommended in writing by MVE-control system manufacturer and with minimum of 3000-psi compressive strength after 28 days when tested according to ASTM C 109/C 109M.
B. Crack-Filling Material: Resin-based material recommended in writing by MVE-control system manufacturer for sealing concrete substrate crack repair.

C. Cementitious Underlayment: If required to maintain manufacturer’s warranty, provide MVE-control system manufacturer’s hydraulic cement-based underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Preinstallation Testing:
   1. Testing Agency: Engage a qualified testing agency to perform tests.
   2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Install MVE-control system in areas where pH readings are less than 7.0 and in areas where pH readings are greater than 8.5.
   3. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. in 24 hours.
      b. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
   4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. area of MVE-control system to prepared concrete substrate and test according to ASTM D 7234.
      a. Proceed with installation only where tensile bond strength is greater than 200 psi with failure in the concrete.

B. Concrete Substrates: Prepare and clean substrates according to MVE-control system manufacturer’s written instructions to ensure adhesion of system to concrete.
   1. Remove coatings and other substances that are incompatible with MVE-control system and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control system manufacturer. Do not use solvents.
   2. Provide concrete surface profile complying with ICRI 310.2R by shot blasting using apparatus that abrades the concrete surface with shot, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
   3. After shot blasting, repair damaged and deteriorated concrete according to MVE-control system manufacturer’s written instructions.
   4. Protect substrate voids and joints to prevent resins from flowing into or leaking through them.
5. Mechanically prepare cracks and control, construction, saw cuts and expansion joints.
6. Vacuum the prepared cracks and joints again to remove all dust, steel shot and contaminants.
7. Fill surface depressions and irregularities with patching and leveling material.
8. Fill surface cracks, grooves, control joints, and other nonmoving joints with crack-filling material.
9. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control system manufacturer after surface preparation, but not less than 24 hours.

C. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION
A. General: Install MVE-control system according to ASTM F 3010 and manufacturer's written instructions to produce a uniform, monolithic surface free of surface deficiencies such as pin holes, fish eyes, and voids.
   1. Install primers as required to comply with manufacturer's written instructions.
B. Do not apply MVE-control system across substrate expansion, isolation, and other moving joints.
C. Cure MVE-control system components according to manufacturer's written instructions. Prevent contamination or other damage during installation and curing processes.
D. After curing, examine MVE-control system for surface deficiencies. Repair surface deficiencies according to manufacturer's written instructions.
E. Install cementitious underlamination over cured membrane if required to maintain manufacturer's warranty and in thickness required to maintain the warranty.

3.4 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage a qualified testing agency to perform installation inspections.
B. Installation Inspections: Inspect substrate preparation and installation of system components to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control system is installed without deficiencies.
   1. Verify that surface preparation meets requirements.
   2. Verify that component coats and complete MVE-control-system film thicknesses comply with manufacturer's written instructions.
   3. Verify that MVE-control-system components and installation areas that evidence deficiencies are repaired according to manufacturer's written instructions.
C. MVE-control system will be considered defective if it does not pass inspections.

3.5 PROTECTION
A. Protect MVE-control system from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control system manufacturer.
B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control system membrane.

END OF SECTION 090561.13
SECTION 092400 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Exterior portland cement plasterwork on metal lath.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.
D. Samples for Verification: For each type of textured finish coat indicated; 12 by 12 inches, and prepared on rigid backing.

1.3 QUALITY ASSURANCE
A. Preinstallation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.5 PROJECT CONDITIONS
A. Comply with ASTM C 926 requirements
B. Exterior Plasterwork:
   1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   2. Apply plaster when ambient temperature is greater than 40 deg F.
   3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

PART 2 - PRODUCTS

2.1 METAL LATH
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
      b. CEMCO.
      c. Clark Western Building Systems.
      d. Dietrich Metal Framing; a Worthington Industries company.
2. Flat Rib Lath: Rib depth of not more than 1/8 inch, 2.75 lb/sq. yd.

B. Wire-Fabric Lath:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Davis Wire Corporation; a Heico Wire Group company.
   b. Jaenson Wire Company.
   c. Keystone Steel & Wire Co.

2.2 ACCESSORIES
A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   b. CEMCO.
   c. Clark Western Building Systems.
   d. Dietrich Metal Framing; a Worthington Industries company.
   e. MarinoWARE.
   f. Phillips Manufacturing Co.


4. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.
   a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
   b. Small nose cornerbead with perforated flanges; use on curved corners.
   c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
   d. Bull nose cornerbead, radius 3/4 inch minimum, with expanded flanges; use at locations indicated on Drawings.

5. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

6. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

7. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

8. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch wide; with perforated flanges.

C. Mineral Wool Board Insulation: Refer to Section 072100 Thermal Insulation.
2.3 MISCELLANEOUS FRAMING
   A. Fiberglass Thermal Isolation Clip: Cascadia Clip by Cascadia Windows.
   B. Zee Clips: 0.079-inch minimum thickness.

2.4 MISCELLANEOUS MATERIALS
   A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
   B. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
   C. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
   D. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

2.5 CONTINUOUS SOFFIT VENTS
   A. Continuous Extruded-Aluminum Soffit Vents:
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         b. Airolite Company, LLC.
         c. Construction Specialties, Inc.
         d. Greenheck Fan Corporation.
         e. Industrial Louvers, Inc.
         f. Louvers & Dampers, Inc.
         g. Nystrom Building Products.
         h. Reliable Products, Inc.
         i. Ruskin Company; Tomkins PLC.
      2. Continuous extruded-aluminum soffit vent and frame, not less than 0.125-inch nominal thickness, assembled by welding; with 18-by-14 mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.

2.6 PLASTER MATERIALS
   A. Portland Cement: ASTM C 150, Type I.
   B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
   C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
   D. Sand Aggregate: ASTM C 897.
   E. Perlite Aggregate: ASTM C 35.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Bonsal American; Marblesil Stucco Mix.
   d. Florida Stucco; Florida Stucco.
   e. ParexLaHabra, Inc.; Exterior Stucco Color Coat.
   g. QUIKCRETE; QUIKCRETE Finish Coat Stucco, No. 1201.
   h. Shamrock Stucco LLC; Exterior Stucco.
   i. SonoWall, BASF Wall Systems, Inc.; Thoro Stucco.
   j. USG Corporation; Oriental Exterior Finish Stucco.


2.7 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:
   a. Scratch Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
   b. Brown Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:

1. Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
2. Portland and Masonry Cement Mix: For cementitious material, mix 1 part Portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.

D. Job-Mixed Finish-Coat Mixes:

1. Portland Cement Mix: For cementitious materials, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLING METAL LATH
A. Expanded-Metal Lath: Install according to ASTM C 1063.
   1. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.

3.4 INSTALLING ACCESSORIES
A. Install according to ASTM C 1063 and at locations indicated on Drawings.
B. Reinforcement for External Corners:
   1. Install lath-type, external-corner reinforcement at exterior locations.
   2. Install cornerbead at interior and exterior locations.
C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:
   1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
      a. Horizontal and other Non-Vertical Surfaces: 100 sq. ft.
   2. At distances between control joints of not greater than 18 feet OC.
   3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
   4. Where control joints occur in surface of construction directly behind plaster.
   5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION
A. General: Comply with ASTM C 926.
   1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
   2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
   3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
B. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 inch thick.
   1. Portland cement mixes.
C. Ceilings; Base-Coat Mix: Scratch coat for two-coat plasterwork, 1/4 inch thick on concrete.
   1. Portland cement mixes.
D. Plaster Finish Coats: Apply to provide float finish to match Architect’s sample.

3.6 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 092400
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes the following:
   1. Interior gypsum board.

1.2 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
C. Certification Letter: Submit letter on Contractor’s letterhead stationary signed by Contractor indicating that all materials incorporated into this Project comply with requirements specified in this Specification or are accepted equivalent products.

1.3 QUALITY ASSURANCE
A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1.4 STORAGE AND HANDLING
A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS
A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install interior products until installation areas are enclosed and conditioned.
   1. For project schedule conditions where consideration of Pre Dry-In installation of interior products is needed, follow the recommendations of USG's White Paper "Pre-Dry-In-Construction: The evolution of construction starts from within". This document delineates the limited acceptable use of moisture and mold resistant gypsum board panels under carefully controlled procedures and conditions.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL
   A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD
   A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. American Gypsum Co.
         b. BPB America, Inc.
         c. G-P Gypsum.
         d. Lafarge North America Inc.
         e. National Gypsum Company.
         f. PABCO Gypsum.
         g. Temple-Inland.
         h. USG Corporation.
   B. Regular Type:
      1. Thickness: 1/2 inch.
      2. Long Edges: Tapered.
   C. Type X:
      1. Thickness: 5/8 inch.
      2. Long Edges: Tapered.
   D. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
      1. Thickness: 1/4 inch.
      2. Long Edges: Tapered.
   E. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
      1. Thickness: 1/2 inch.
      2. Long Edges: Tapered.
   F. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces. For use on the Interior Surfaces of the Exterior Wall
      1. Core: 5/8 inch, Type X.
      2. Long Edges: Tapered.
2.3 SPECIALTY GYPSUM BOARD

A. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
   a. National Gypsum Company; SoundBreak XP.
   b. Quiet Solution; Quiet Rock.
   c. Temple-Inland Building Products by Georgia-Pacific; Comfort Guard Sound Deadening Board.

2. Core: 1/2 inch, Type X.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Custom Building Products; Wonderboard.
   b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   c. USG Corporation; DUROCK Cement Board.

2. Thickness: 1/2 inch.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint: One-piece, V-shaped slot with removable strip covering slot opening.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
2.6 JOINT TREATMENT AND FINISH MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
   2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
   3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Sound Damping Outlet Putty: Type: Noise dampening putty
   1. Size: 7" x 7" pad
   2. Thickness: 1/8"; 3.17mm
   3. Weight: 6 oz. pad
   4. Color: Blue-green
   5. Density: 1oz/in3
   6. Tensile Strength (ASTM D412): 135 PSI
7. Compression set B: 13% max
8. TCA Robinson test (ASTM C627): Light Commercial

F. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
G. Thermal Insulation: As specified in Division 7 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.
B. Install ceiling/soffit panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
E. Form control and expansion joints with space between edges of adjoining gypsum panels and V-shaped trim.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inchwide joints to install sealant.
G. Attach gypsum panels to framing provided at openings and cutouts.
H. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inchwide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
I. Floors: Install gypsum board 5/8 inch above floor level. Seal joint between gypsum board and floor with sealant.
J. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
   1. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
   2. Materials shall be as required by gypsum board system manufacturer to achieve laboratory Sound Transmission Class (STC) ratings.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
   1. Space fasteners in panels that are tile substrates a maximum of 8 inches OC, unless otherwise recommended by manufacturer or referenced standards.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Regular Type: As indicated on Drawings.
   2. Type X: As indicated on Drawings.
   3. Ceiling Type: As indicated on Drawings.
   4. Moisture- and Mold-Resistant Type: As indicated on Drawings.
   5. Tile Backer: As specified.

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.
D. Curved Surfaces:
   1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch long straight sections at ends of curves and tangent to them.
   2. For double-layer construction, fasten base layer to studs with screws 16 inches OC. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches OC.

3.4 APPLYING TILE BACKING PANELS
   A. Cementitious Backer Units: ANSI A108.11, on walls to receive large format tile
   B. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

3.5 INSTALLING TRIM ACCESSORIES
   A. Control Joints: Install control joints with V-shaped trim at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.
      1. Control Joint to be installed continuously from bottom of partition to underside of structure above.
   B. Interior Trim: Install in the following locations:
      1. Cornerbead: Use at outside corners.
      2. LC-Bead: Use at exposed panel edges.
      3. L-Bead: Use where indicated.
      4. U-Bead: Use at exposed panel edges.
      5. Curved-Edge Cornerbead: Use at curved openings.
   C. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD
   A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
   B. Prefill open joints and damaged surface areas.
   C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
   D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
      1. Level 2: Panels that are substrate for tile.
      3. Level 4: Where exposed.
      4. Level 5: Where indicated on the drawings.
3.7 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.

3.8 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.9 STENCILING OF RATED WALLS

A. Provide 4" high red numbers and letters at a maximum spacing of 10'-0" measured from the beginning and end of the text and to be located 6" above the finished ceiling to the bottom of the text. Start and end each hourly rated wall with the appropriate stencil. Provide the hourly rating text as follows:
   1. 1 HR
   2. 2 HR
   3. 3 HR
   4. 4 HR
   5. 1 HR Fire/Smoke
   6. 2 HR Fire/Smoke
   7. Smoke Barrier

B. Provide text in "Arial" font.

END OF SECTION 092900
SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Porcelain tile.
   2. Crack isolation membrane.
   3. Waterproof membrane.
   4. Metal edge strips.

1.2 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction (DCOF): For tile installed on walkway surfaces, provide products with the following values as determined by testing per ANSI B101.3. Apply Non-Slip Tile Treatment where manufacturers test data does not meet specified requirements.
   1. Level, interior, wet per test: 0.43
   2. Interior, inclines, stairs, landings: 0.45
   3. Staff kitchens, interior showers, areas where food or grease can occur: 0.60
   4. Exterior level surface: 0.65
   5. Exterior sloped surface: 0.80

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
C. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Full-size units of each type of trim and accessory.
   3. Metal edge strips in 6-inch lengths.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Maintenance Procedures: Manufacturers recommended maintenance procedures and products, including process to maintain specified slip resistance.
C. Product Test Reports: For tile-setting, grouting product and certified porcelain tile.
   1. Provide test reports by independent third party of each product type certifying it meets specified slip resistant values.
D. Field quality-control reports.
1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this section from a single manufacturer:
   1. Thresholds.
   2. Waterproof membrane.
   3. Crack isolation membrane.
   4. Metal edge strips.

D. Installer Qualifications: Engage experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with record of successful in-service performance.

E. Preinstallation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

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

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements unless otherwise indicated.
B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
   1. Where tile is indicated for installation on exteriors, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS
A. Decorative Tile: All-purpose edge glass type units with manufacturer's standard back-mounting.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on drawings.

B. Ceramic Tile Type: Architectural Paver Tile.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated on drawings:
   2. Face Size: As indicated in drawings.
   3. Thickness: As indicated in drawings.
   4. Face: As indicated in drawings.
   5. Tile Color and Pattern: As indicated by manufacturer's designations in drawings.
   6. Grout Color: As indicated by manufacturer's designations in drawings.

C. Dynamic Coefficient of Friction (DCOF): For resilient sheet installed on walkway surfaces, provide products with the following values as determined by testing per ANSI A326.3.
   1. Level, interior, wet: 0.43
   2. Interior stairs, landings: 0.50
   3. Interior inclines: 0.65
   4. Staff kitchens, interior showers, areas where food or grease can occur, level: 0.55
   5. Exterior level surface: 0.60
   6. Exterior sloped surface: 0.65

2.3 CRACK ISOLATION MEMBRANE
A. General: Manufacturer’s standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
   1. Products: Subject to compliance with requirements, provide one of the following:
b. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
c. MAPEI Corporation; Mapelastic AquaDefense.

2.4 WATERPROOF MEMBRANE
A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Bonsal American, an Oldcastle company; B 6000 Waterproof-Crack Isolation Membrane with B 6000 Mesh.
   b. Bostik, Inc.; Hydroment Blacktop 90210.
   c. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
   e. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.

C. Chlorinated Polyethylene Sheet: Non-plasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Noble Company (The); Noble Deck.

2. Nominal Thickness: 0.040 inch.

2.5 SETTING MATERIALS
1. Manufacturer: Subject to compliance with requirements, provide product indicated on drawings.
   a. Custom Building Products
   b. Laticrete International, Inc.
   c. MAPEI Corporation.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.
3. Latex Additive: Manufacturer's standard, acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Dry Set Mortar for Large and Heavy Tile (LHT), Latex-Portland Cement Mortar: Comply with requirements in TCNA Handbook for Ceramic, Glass, and Stone Tile Installation. Provide product that is approved by manufacturer for application thickness of 5/8 inch
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Ardex Americas.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. Custom Building Products.
e. Laticrete International, Inc.
f. MAPEI Corporation.

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

C. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Bonsal American; an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. Laticrete International, Inc.
   e. MAPEI Corporation.

2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health’s “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.”

2.6 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Ardex Americas.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. Custom Building Products.
   e. Laticrete International, Inc.
   f. MAPEI Corporation.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

B. A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less, provide unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Bonsal American; an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. Laticrete International, Inc.
   e. MAPEI Corporation.

2. Grout Release Liquid: Manufacturers standard
C. Grout Sealer: Provide grout sealer compatible with grout materials as recommended by grout manufacturer.

2.7 ACCESSORIES
A. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic, designed specifically for applications.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      b. Ceramic Tool Company, Inc.
      c. Schluter Systems L.P.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.8 MIXING MORTARS AND GROUT
A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
B. Add materials, water, and additives in accurate proportions.
C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors composed of tiles 8 by 8 inches or larger.
   b. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor or base are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor or base align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: As indicated on the drawings.
G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION
   A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer’s written instructions to produce membrane of uniform thickness and bonded securely to substrate.
   B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.5 WATERPROOFING INSTALLATION
   A. Install waterproofing to comply with ANSI A108.13 and manufacturer’s written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
   B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 FIELD QUALITY CONTROL
   A. Upon completion of waterproof membrane work and prior to tile installation, plug drain or dam areas and fill with water. After 24 hours, inspect for leakage. Make necessary adjustments to stop leakage and re-test until watertight.
   B. Provide third party independent testing lab to evaluate in-place flooring compliance with specified slip resistance values.
      1. Provide 3 tests for each area up to 1000 square feet and 1 additional test for each additional 500 square feet.

3.7 CLEANING AND PROTECTING
   A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
      1. Remove latex-Portland cement grout residue from tile as soon as possible.
      2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
      3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
   B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
   C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
   D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.
3.8 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
   1. Tile Installation F125A: Thin-set mortar on crack isolation membrane; TCA F125A.
      a. Tile Type: porcelain.
      b. Thin-Set Mortar: Dry-set-portland cement mortar. Use medium bed at the Lobby Level.
      c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations, Metal Studs or Furring:
      a. Tile Type: porcelain tile.
      c. Grout: Polymer-modified sanded.

C. Interior Floor Installations, Concrete Subfloor, Showers:
   1. Ceramic Tile Installation: TCNA F122/F122A; thinset mortar on waterproof membrane.
      a. Ceramic Tile Type: as indicated on drawings.

D. Shower Receptor:
   1. Tile Installation: TCNA B415; thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board.
      a. Ceramic Tile Type: pressed floor tile.

E. Shower Base: Set in leveling bed of cement grout.

END OF SECTION 093000
SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes acoustical panels and exposed suspension systems for ceilings.
B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 DEFINITIONS
A. AC: Articulation Class.
B. CAC: Ceiling Attenuation Class.
C. LR: Light Reflectance coefficient.
D. NRC: Noise Reduction Coefficient.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
   2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS
A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Structural members to which suspension systems will be attached.
   3. Method of attaching hangers to building structure.
   4. Size and location of initial access modules for acoustical panels.
   5. Items penetrating finished ceiling and ceiling-mounted items including the following:
      a. Lighting fixtures.
      b. Diffusers.
      c. Grilles.
      d. Speakers.
      e. Sprinklers.
      f. Access panels.
      g. Perimeter moldings.
   6. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
   7. Minimum Drawing Scale: 1/8 inch = 1 foot.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE
   A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-
      accredited laboratory, with the experience and capability to conduct the testing indicated.
      NVLAP-accredited laboratories must document accreditation, based on a "Certificate of
      Accreditation" and a "Scope of Accreditation" listing the test methods specified.
   B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension
      system through one source from a single manufacturer.
   C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the
      following requirements:
      1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-
         burning characteristics complying with ASTM E 1264 for Class A materials as determined
         by testing identical products per ASTM E 84:
         a. Flame-Spread Index: 25 or less.
         b. Smoke-Developed Index: 450 or less.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Deliver acoustical panels, suspension system components, and accessories to Project site in
      original, unopened packages and store them in a fully enclosed, conditioned space where they
      will be protected against damage from moisture, humidity, temperature extremes, direct sunlight,
      surface contamination, and other causes.
   B. Before installing acoustical panels, permit them to reach room temperature and a stabilized
      moisture content.
   C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS
   A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and
      weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and
      ambient temperature and humidity conditions are maintained at the levels indicated for Project
      when occupied for its intended use.
      1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before
         beginning acoustical panel ceiling installation.

1.9 COORDINATION
   A. Coordinate layout and installation of acoustical panels and suspension system with other
      construction that penetrates ceilings or is supported by them, including light fixtures, HVAC
      equipment, fire-suppression system, and partition assemblies.
PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings by Armstrong World Industries, Inc.

B. Edge/Joint Detail: As indicated on the drawings

C. Thickness: Varies, see drawings.

D. Modular Size: As indicated on the drawings

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

a. Type: Cast-in-place or Postinstalled expansion anchors.

b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without
failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

G. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

H. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings by Armstrong World Industries, Inc.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30coating designation, with prefinished 15/16-inch-wide metal caps on flanges.

2. End Condition of Cross Runners: Butt-edge type.
3. Face Design: Flat, flush.
5. Cap Finish: Painted white

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30coating designation, with prefinished 15/16-inch-wide metal caps on flanges.

2. Face Design: Flat, flush.
3. Face Finish: Painted white.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings and the following.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer’s standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. Provide manufacturer’s standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.

2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.


C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer’s extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer’s designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.

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


   a. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils.

4. Armstrong Axiom Classic Straight Trim, extruded aluminum, height (2 through 16 inches) as indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. Non-Fire-Resistance-Rated Indirect Hung Suspension System:

   2. Structural Classification: Heavy-Duty System.
a. Carrying Channels: 1-1/2" steel channels, hot-rolled or cold-rolled, no less than 0.475 lbs. per lin. ft., spaced 4'-6" o.c., maximum.

B. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

C. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
   6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   7. Do not attach hangers to steel deck tabs.
   8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

D. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
      b. Install panels with pattern running in one direction parallel to long axis of space.
      c. Install panels in a basket-weave pattern.
   2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113
ACOUSTICAL PANEL CEILINGS

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SECTION 095450 - WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes strip wood ceilings and suspension systems, as indicated on Drawings and as specified herein.

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project Site.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include installation instructions, catalog cuts and other product literature.
B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:
   1. Wood Strips: Minimum of three (3) sets of 12-inch-long Samples of each type, species and finish specified, showing full range of color and finish variations.
   2. Suspension System Members: 12-inch-long Sample of each type.
   3. Exposed Molding and Trim: Set of 12-inch-long Samples of each type, finish, and color.
C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved
   1. Grill pattern.
   2. Joint pattern.
   3. Ceiling suspension members.
   4. Method of attaching hangers to building structure.
   5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access strips.
   6. Ceiling perimeter and penetrations through ceiling; trim and moldings.
   7. Minimum Drawing Scale: 1/4 inch = 1 foot.

1.4 INFORMATIONAL SUBMITTALS
A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each wood ceiling.
B. Qualifications: For Installer.
C. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Wood Ceiling Components: Quantity of each wood panel, carrier, accessory, and exposed molding and trim, equal to Two (2) percent of quantity installed.
1.7 QUALITY ASSURANCE
   A. Source Limitations: Obtain each set of wood strips and suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.
   B. Installer Qualifications: Installer shall have not less than Three (3) years of successful experience in the installation of wood ceiling systems on projects of similar scope, scale and complexity to those of this Project.
   C. Fire Rating: Complying with ASTM E 1264 for Class 1 (A) materials, as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Delivery of Materials: Deliver wood strips, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
   B. Inspection: Promptly inspect delivered materials, file freight claims for damage during shipment, and order replacement materials as required. Any damaged materials shall be promptly removed from the job site.
   C. Storage: Materials shall be stored flat and level in a fully enclosed space. Wood Grills shall be stored off the floor.
   D. Handling: Handle wood grills, suspension system components, and accessories carefully to avoid racking, distortion, or physically damaging units and finishes in any way.

1.9 PROJECT CONDITIONS
   A. Environmental Limitations: Do not install wood ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   B. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer’s absolute limits. Allow materials to reach ambient temperature and humidity for a minimum of Forty-Eight (48) hours (72 hours recommended), prior to starting installation.

1.10 COORDINATION
   A. Coordinate layout and installation of wood ceiling strips and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.11 WARRANTY
   A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under law, or other provisions of the Contract Documents, and shall be in addition to, and run concurrent with, other rights or warranties made by Contractor under requirements of the Contract Documents.
B. Special Warranty: Manufacturers standard or custom warranty against defects in manufacturing and workmanship, in which manufacturer agrees to repair or replace components of wood ceiling system that do not comply with requirements or that fail in manufacturing of materials or workmanship of installations within specified warranty period.

1. Warranty Period: One (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WOOD CEILINGS

A. Basis of Design: Subject to compliance with the requirements provide the following product(s); type as indicated on drawings.

1. 9 Wood; 1200 Dowel Grille
2. 9 Wood; 4000

B. Suspended Wood Panel Grill Ceiling System: Made from either prime-grade all-natural wood or veneered wood strips, with selected finish. Standard Panel Grilles shall be assembled 1' wide - in nominal lengths of 2' to 10' in 1' increments. Actual lengths are 1" (25mm) shorter to allow for a reveal between panels; i.e., an 8' panel is 7'-11". Wood strips shall be manufactured without finger-joints and fastened together with black dowels. The dowels shall be positioned 5-1/2" (140mm) from the ends and 12" (305 mm) on center, with interconnecting male-to-female dowel attachment for support of the system. Provide panel gril

1. Wood Species: Hemlock.
2. Wood Slice: Quarter Sliced.
5. Sound Attenuation Blankets/ Pads: Mineral or glass fiber, as indicated on Drawings, but not less than 1-inch thick, with black facing, Owens Corning Select Sound Board.
6. Hanger Type: Dowel Clips.

C. Flat Veneer Panels: Comprised of a quarter sliced maple face veneer, applied to a 3/4" thick core material. All dimension tolerances to be ± 1/8".

1. Wood Species: Hemlock.
2. Wood Slice: Quarter Sliced.
5. Hanger Type: C-Type.

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 636 requirements.

B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
D. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
   3. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Main Carriers/ Cliprails: Factory finished with matte-black baked finish.
   1. Main Carriers: Aluminum, not less than 0.240-inch rolled sheet, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, complying with ASTM B 209.
   2. Main Carriers: Steel, not less than 0.0209-inch nominal thickness, cold-rolled sheet, with factory-applied protective coating, complying with ASTM C 635.
      a. Hot-Dip Galvanized Steel: ASTM A 653/A 653M, not less than G60 (Z180) zinc coating.

F. Carrier Splices: Same metal, profile, and finish as indicated for carriers.

G. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished with matte-black baked finish.

2.3 WOOD FINISH REQUIREMENTS
   A. All Wood Strips shall be factory-finished with clear sealers, wood stains, or semi-transparent color treatments as selected, only upon written approval of Architect based upon accepted finish samples.
   B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates, areas, and conditions, including structural framing and substrates to which wood ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of wood ceilings.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Measure each ceiling area and establish layout of wood ceiling to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width or -length strips at borders, and comply with layout shown on reflected ceiling plans and Coordination Drawings.
   B. Ceiling Layout: The contractor shall measure ceiling areas and establish the layout of the hangers and cliprails, in accordance with installation instructions.
C. Coordination: The contractor shall furnish the layout for supports that shall be installed for suspension of ceilings. He shall furnish concrete inserts, steel deck hanger clips, or similar devices for installation, in time to coordinate the work.

3.3 INSTALLATION

A. General: The contractor shall install materials in accordance with manufacturer’s printed instructions. The contractor will comply with applicable regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members, and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Where used, secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
5. Where used, secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
12. Fine level grid to 1/8 inch in 10 feet from specified elevation(s), square and true.
13. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

C. Where indicated, use leveling device to lay out and install perimeter trim of type indicated on Drawings at perimeter of wood ceiling area.

1. Unless otherwise indicated on Drawings, screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
D. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

1. Locate main suspension tees, or cliprails, perpendicular to wood strip direction, 4" from one wall for the first tee or cliprail, continuing 24" maximum, on center, ending within 4" of the opposite wall.

2. Wire hangers shall be installed 4' on center, along each tee or cliprail. The wire hangers shall be attached to inserts, screw eyes, or other connecting devices that are secure and appropriate for suspending the ceiling and that will not deteriorate or fail with age or elevated temperatures.

E. All penetration cuts (can lights, sprinkler heads, etc) shall be made using templates or hole saws. No free hand cuts shall be made. All field cut conditions shall be sanded smooth to remove burrs and field applied finished with manufacturers provided finish to seal edges.

F. Wood Grill Installation: Screw or snap wood grill onto tees or cliprails in strict accordance with the manufacturers written instructions. Installation shall proceed, in sequence, from one wall to the opposite side.

1. Once panel grills are installed, rollout sound attenuation blanket on the back side of the grill. Abut joint tightly.

G. Flat Veneer Panel Installation: Screw or snap wood grill onto tees or cliprails in strict accordance with the manufacturers written instructions. Installation shall proceed, in sequence, from one wall to the opposite side. Panels are to be field-trimmed to fit site conditions.

H. HVAC and Light Fixture Suspensions: Must be supported independently of wood ceiling.

3.4 CLEANING

A. Contractor shall make final adjustments to level or contours.

B. Upon completion of ceiling installation, all wood ceilings and borders shall be cleaned free of dirt, dust, grease, oils, and fingerprints.

C. All work that cannot be successfully cleaned or repaired, shall be removed and replaced.

END OF SECTION 095450
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Resilient base.
   2. Rubber stair accessories.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.3 QUALITY ASSURANCE
A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Coordinate mockups in this Section with mockups specified in other Sections.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 FIELD CONDITIONS
A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
C. Install resilient products after other finishing operations, including painting, have been completed.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 THERMOPLASTIC-RUBBER BASE, PROFILE

A. Basis of Design: Subject to compliance with requirements, provide products indicated on the drawings.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
   2. Style: Millwork
   3. Profile: Mandalay
   4. Location: As indicated on Drawings.

C. Thickness: 0.325 inch.

D. Height: 4 1/2 inches.

E. Lengths: 8 feet.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: As indicated on the drawings.

2.3 THERMOPLASTIC-RUBBER BASE

A. Basis of Design: Subject to compliance with requirements, provide products indicated on the drawings.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
   2. Style and Location:
      a. Style A, Straight: Provided in areas with carpet.
      b. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Colors: As indicated on the drawings.

2.4 THERMOPLASTIC-RUBBER BASE, COVE, TALL

A. Basis of Design: Subject to compliance with requirements, provide products indicated on the drawings.
B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
   2. Style and Location:
      a. Style B, Cove: Provide in areas with resilient floor coverings.
C. Thickness: 0.125 inch.
D. Height: 6 inches.
E. Lengths: Coils in manufacturer’s standard length.
F. Outside Corners: Preformed.
G. Inside Corners: Preformed.
H. Colors: As indicated on the drawings.

2.5 RUBBER MOLDING ACCESSORY
A. Basis of Design: Subject to compliance with requirements, provide products indicated on the drawings.
B. Description: Transition strips.
C. Profile and Dimensions: As indicated.
D. Colors and Patterns: As indicated on drawings.

2.6 RUBBER STAIR ACCESSORIES
A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
B. Stair Treads: ASTM F 2169.
   1. Type: TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
   2. Class: 2 (pattern; embossed, grooved, or ribbed).
   4. Nosing Height: 2 inches.
   5. Thickness: 1/4 inch and tapered to back edge.
   6. Size: Lengths and depths to fit each stair tread in one piece.
   7. Integral Risers: Smooth, flat; in height that fully covers substrate.

2.7 INSTALLATION MATERIALS
A. Adhesives: Water-resistant type recommended by resilient product manufacturer for resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less, except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.
B. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

C. Examine substrates for presence of Moisture Vapor Emission Control system. Do not perform destructive testing on substrates with Moisture Vapor Emission Control systems installed.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 8.5 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:
   1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
   2. Tightly adhere to substrates throughout length of each piece.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513
SECTION 096516 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes:
      1. Unbacked rubber sheet flooring.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Sustainable Design Submittals:
      1. Product Data: For adhesives and chemical-bonding compounds, documentation including printed statement of VOC content.
   C. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
      1. Show details of special patterns.
   D. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 6-by-9-inch sections.
      1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
   E. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of resilient sheet flooring required.
   F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
   G. Product Schedule: For resilient sheet flooring.

1.3 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Maintenance Procedures: Manufacturers recommended maintenance procedures and products, including process to maintain specified slip resistance.
   C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
      1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore certification.

C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health’s "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Dynamic Coefficient of Friction (DCOF): For resilient sheet installed on walkway surfaces, provide products with the following values as determined by testing per ANSI A326.3.
   1. Level, interior, wet: 0.43
   2. Interior stairs, landings: 0.50
   3. Interior inclines: 0.65
   4. Staff kitchens, interior showers, areas where food or grease can occur, level: 0.55
   5. Exterior level surface: 0.60
   6. Exterior sloped surface: 0.65

2.2 UNBACKED VINYL SHEET FLOORING

A. Basis of Design Products: Subject to compliance with requirements, provide indicated on the drawings

C. Thickness: 0.080 inch.
D. Wearing Surface: As per the product selected.
E. Sheet Width: As standard with manufacturer.
F. Seamless-Installation Method: Heat welded or Chemically bonded.
G. Colors and Patterns: As indicated on the drawings.

2.3 UNBACKED RUBBER SHEET FLOORING
   1. Type: Type I (homogeneous rubber sheet).
   2. Thickness: 3mm
   3. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240.
B. Wearing Sheet: 4.0 feet Seamless
C. Colors and Patterns: As indicated on the drawings

2.4 INSTALLATION MATERIALS
A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
   1. To a VOC content of 50 g/L or less.
C. Integral-Flash-Cove-Base Accessories:
   1. Cove Strip: 1-inch radius provided or approved by resilient sheet flooring manufacturer.
   2. Cap Strip: Square metal cap provided or approved by resilient sheet flooring manufacturer.
D. Transitions Strips: As required for the application by Schluter Systems

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. Examine substrates for presence of Moisture Vapor Emission Control system. Do not perform destructive testing on substrates with Moisture Vapor Emission Control systems installed.
3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer’s written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer’s written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Floor Marking: Use chalk or chalk lines covered with clear acrylic spray; do not use floor marking paints, markers, or other marking methods that are incompatible with flooring material and allow markings to show through installed flooring material.
   1. If substrate has floor marking paints, markers of other marking methods incompatible with flooring and that may allow markings to show through installed flooring material, remove markings using mechanical methods recommended by flooring manufacturer.
   2. Do not install flooring until incompatible floor markings on substrate have been removed and substrate is acceptable to flooring manufacturer for installation of flooring materials.

E. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
   1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer’s written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:
   1. Maintain uniformity of flooring direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
   3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:
   1. Heat-Welded Seams, unless otherwise noted: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
   2. Chemically Bonded Seams, as indicated on drawings: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

J. Integral-Flash-Cove Base: Cove resilient sheet flooring to dimension indicated up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.4 FIELD QUALITY CONTROL

A. Provide third party independent testing lab to evaluate in-place flooring compliance with specified slip resistance values.
   1. Provide 3 tests for each area up to 1000 square feet and 1 additional test for each additional 500 square feet

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:
   1. Remove adhesive and other blemishes from surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516
SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Rubber sheet flooring.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Show installation details and locations of the following:
   1. Border tiles.
   2. Floor patterns.
   3. Layout, colors, widths, and dimensions of game lines and markers.
   4. Locations of floor inserts for athletic equipment installed through flooring.
   5. Seam locations for sheet flooring.
C. Samples for Verification: For each type, color, and pattern of flooring indicated, 6-inch-square Samples of same thickness and material indicated for the Work.
   1. Seam Samples: For each vinyl sheet flooring color and pattern required; with seam running lengthwise and in center of 6-by-9-inch. Sample applied to a rigid backing and prepared by Installer for this Project.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance Data: For flooring to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.
B. Store materials to prevent deterioration. Store rolls upright.

1.5 FIELD CONDITIONS
A. Adhesively Applied Products:
   1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
   2. After post-installation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
   3. Close spaces to traffic during flooring installation.
   4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.
B. Install flooring after other finishing operations, including painting, have been completed.
1.6 COORDINATION
   A. Coordinate layout and installation of flooring with floor inserts for gymnasium equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 RUBBER SHEET FLOORING
   A. Basis-of-Design Product: Subject to compliance with requirements, provide, Taraflex Multi-Use by Gerflor or comparable product by one of the following:
      1. Aacer Flooring, LLC.
      2. Action Floor Systems, LLC.
      3. Horner Flooring Company, Inc.
      4. Johnsonite; a Tarkett company.
      5. Mondo America Inc.
      6. Nora systems, Inc.
   B. Description: Rubber athletic flooring provided as rolled goods for adhered installation.
   C. Material: Rubber wear layer and rubber shock-absorbent layer, vulcanized together.
   D. Traffic-Surface Texture: Smooth.
   E. Roll Size: Not less than 48 inches wide by longest length that is practical to minimize splicing during installation.
   F. Thickness: 1/4 inch
   G. Color and Pattern: 6381 Maple
   H. Border: Interlocking, beveled-edge tiles, of same material as floor tile; with bevels that transition from thickness of floor tile to surface below it; with straight outside edges; and for use where flooring corners and edges do not abut vertical surfaces.

2.3 ACCESSORIES
   B. Adhesives: Water-resistant type recommended in writing by manufacturer for substrate and conditions indicated.
      1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

C. Examine substrates for presence of Moisture Vapor Emission Control system. Do not perform destructive testing on substrates with Moisture Vapor Emission Control systems installed.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.
   3. Moisture Testing:
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
         1) Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
      b. Perform relative humidity test using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
   1. Do not install flooring until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust.

G. Proceed with installation only after unsatisfactory conditions have been corrected.
3.3 FLOORING INSTALLATION, GENERAL
   A. Comply with manufacturer's written installation instructions.
   B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
   C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
   D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.4 SHEET FLOORING INSTALLATION
   A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
   B. Lay out sheet flooring as follows:
      1. Maintain uniformity of flooring direction.
      2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
      3. Match edges of flooring for color shading at seams.
      4. Locate seams per approved Shop Drawings.
   C. Adhered Flooring: Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
      1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
   D. Sheet Flooring Seams: Prepare and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.5 CLEANING AND PROTECTING
   A. Perform the following operations immediately after completing flooring installation:
      1. Sweep and vacuum flooring thoroughly.
      2. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
   B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
      1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096566
SECTION 096710 – CONCRETE SEALER

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Fluid-applied Sealer for Concrete

1.2 REFERENCES
   A. ASTM D4258 - Standard Practice for Cleaning Concrete
   B. ASTM D4259 - Standard Practice for Abrading Concrete
   C. ASTM D4260 - Standard Practice for Etching Concrete

1.3 SUBMITTALS
   A. Product Data: Manufacturer’s data sheets on each coating product should include:
      1. Product characteristics
      2. Surface preparation instructions and recommendations
      3. Primer requirements and finish specification
      4. Storage and handling requirements and recommendations
      5. Application methods
      6. Cleanup information
   B. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer’s color samples available.
   C. Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 MOCK-UP
   A. Finish surfaces for verification of products, colors, & sheens
   B. Finish area designated by Architect
   C. Provide samples that designate prime & finish coats
   D. Do not proceed with remaining work until the Architect approves the mock-up samples

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Delivery: Deliver manufacturer’s unopened containers to the work site. Packaging shall bear the manufacturer’s name, label, and the following list of information:
      1. Product name, and type (description)
      2. Application & use instructions
      3. Surface preparation
      4. VOC content
      5. Environmental handling
      6. Batch date
      7. Color number

CONCRETE SEALER

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B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer’s instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not apply coatings under environmental conditions outside manufacturer’s absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Base-of-Design Manufacturer: Advanced Chemical Technologies, Inc.

B. Other Manufacturers: Subject to compliance with requirements, submit substitution request for product matching the approved base-of-design product.

2.2 CONCRETE SEALER, MEDIUM-DUTY

A. Surfaces to Be Coated:
   1. New cast-in-place concrete.
   2. Existing cast-in-place concrete.

B. Concrete Sealer:
   3. VOC Content: <350 g/L

2.3 MATERIALS - GENERAL REQUIREMENTS

A. Paints and Coatings - General:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer’s instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers:
   1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.4 ACCESSORIES

A. Coating Application Accessories:
   1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer’s specifications.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin application of coatings until substrates have been properly examined and prepared. Notify Architect or Specifier of unsatisfactory conditions before proceeding.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Proceed with work only after conditions have been corrected, and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

3.2 SURFACE PREPARATION

A. Surface must be clean, dry, and in sound condition, and free of all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

B. Follow the ASTM methods listed below for concrete preparation:
   1. ASTM D4258 Standard Practice for Cleaning Concrete.
   2. ASTM D4259 Standard Practice for Abrading Concrete.
   3. ASTM D4260 Standard Practice for Etching Concrete.

C. Poured Concrete:
   1. New concrete:
      a. For surface preparation, refer to SSPC-SP13/NACE 6.
      b. Surfaces must be clean, dry, sound and offer sufficient profile to achieve adequate adhesion.
      c. Remove all form release agents, curing compounds, salts, efflorescence, laitance, and other foreign matter by sandblasting, shotblasting, mechanical scarification, or suitable chemical means. Refer to ASTM D4260.
      d. Rinse thoroughly to achieve a final pH between 8.0 and 10.0. Allow to dry thoroughly prior to coating.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendation.

B. Do not apply to wet or damp surfaces.

C. Wait at least 28 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 28 days.

D. Do not proceed unless surface and air temperature is between 40 deg F and 110 deg F. Do not apply if frost, ice, or standing water are visible on the surface to be treated.

E. Test new concrete for moisture content.

F. Apply coatings using methods recommended by manufacturer.

G. Uniformly apply coatings without runs, or sags, without brush marks, and with consistent sheen.

H. Apply coatings at spreading rate required to achieve the manufacturer's recommended dry film thickness.
3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer’s recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 097610
SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes resinous flooring systems.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product. Include manufacturer's technical data, application
      instructions, and recommendations for each resinous flooring component required.
   B. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to
      a rigid backing by Installer for this Project.

1.3 INFORMATIONAL SUBMITTALS
   A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified
      requirements.
   B. Maintenance Procedures: Manufacturers recommended maintenance procedures and products,
      including process to maintain specified slip resistance.
   C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An authorized representative who is trained and approved by
      manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials in original packages and containers, with seals unbroken, bearing
      manufacturer’s labels indicating brand name and directions for storage and mixing with other
      components.

1.7 FIELD CONDITIONS
   A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for
      substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting
      resinous flooring application.
   B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent
      lighting conditions during resinous flooring application.
   C. Close spaces to traffic during resinous flooring application and for 24 hours after application
      unless manufacturer recommends a longer period.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flammability: Self-extinguishing according to ASTM D 635.

B. Dynamic Coefficient of Friction (DCOF): For resinous flooring installed on walkway surfaces, provide products with the following values as determined by testing per ANSI A326.3:
   1. Level, interior, wet per test: 0.43
   2. Interior stairs, landings: 0.50
   3. Interior inclines: 0.65
   4. Staff kitchens, interior showers, areas where food or grease can occur, level: 0.55
   5. Exterior level surface: 0.60
   6. Exterior sloped surface: 0.65

2.2 MANUFACTURERS

A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. Basis of Design Products: Subject to compliance with requirements, provide product indicated on the drawings

C. System Characteristics:
   2. Wearing Surface: Textured for slip resistance.
   3. Overall System Thickness: 1/16 inch to 1/8 inch.

D. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

E. Waterproofing Membrane: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

F. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

G. Body Coats:
   1. Resin: Epoxy.
   2. Type: Clear.
   4. Number of Coats: One.
   5. Aggregates: Colored quartz (ceramic-coated silica).

H. Topcoats - Sealing or Finish Coats:
   1. Resin: Epoxy.
   2. Type: Clear.
3. Finish: Matte.

I. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 11,000 psi minimum according to ASTM C 579.
2. Tensile Strength: 1,800 psi minimum according to ASTM C 307.
3. Flexural Modulus of Elasticity: 4,000 psi minimum according to ASTM C 580.
4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation according to MIL-D-3134J.
5. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch according to MIL-D-3134J.
6. Abrasion Resistance: 0.09 gr maximum weight loss according to ASTM D 4060.

2.4 EQUIPMENT ROOM FLOOR RESINOUS COATING

A. Resinous Coating: Manufacturer's standard, seamless, high solids and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. Basis of Design Product: Subject to compliance with requirements, provide Resuflor Topfloor SL23 (formerly Trafficote 105) by Sherwin Williams or comparable product.

C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

D. Waterproofing Membrane: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

F. Body Coats:
   1. Resin: Epoxy.
   2. Formulation Description: High solids.
   4. Number of Coats: One.
   5. Thickness of Coats: 1/16 inch.

G. Grout Coat:
   1. Resin: Epoxy.
   2. Formulation Description: High solids.
   3. Type: Pigmented.
   4. Thickness of Coat: 1/16 inch.

H. Topcoats: Sealing or finish coats.
   1. Resin: Epoxy.
   2. Formulation Description: High solids.
   3. Type: Clear.
   4. Number of Coats: One.
   5. Thickness of Coats: 8 mils.
I. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:

1. Compressive Strength: 12,000 psi minimum in accordance with ASTM C579.
2. Tensile Strength: 1,900 psi minimum in accordance with ASTM C307.
3. Flexural Modulus of Elasticity: 4,000 psi minimum in accordance with ASTM C580.
4. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation in accordance with MIL-D-3134J.
5. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch in accordance with MIL-D-3134J.
6. Abrasion Resistance: 90-100 maximum weight loss in accordance with ASTM D4060.
7. Hardness: 70/65, Shore D in accordance with ASTM D2240.

2.5 INSTALLATION MATERIALS

A. Anti-Microbial Additive: Incorporate antimicrobial chemical additive to control growth of most bacteria, fungi, algae and actinomycetes.

B. Aluminum top cap for cove base in color as selected by the Architect from manufacturer's standards.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrates for presence of Moisture Vapor Emission Control system. Do not perform destructive testing on substrates with Moisture Vapor Emission Control systems installed.

B. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

C. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
   a. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture vapor emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
   b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
   c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
D. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
   1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

E. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION
A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Waterproofing Membrane: Apply waterproofing membrane over entire substrate surface, in manufacturer's recommended thickness.
   1. Apply waterproofing membrane to integral cove base substrates.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
   1. Integral Cove Base: 4 inches high.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
   1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 FIELD QUALITY CONTROL
A. Provide third party independent testing lab to evaluate in-place flooring compliance with specified slip resistance values.
   1. Provide 3 tests for each area up to 1000 square feet and 1 additional test for each additional 500 square feet

3.4 PROTECTION
A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723
PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes
      1. Modular, carpet tile.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
      2. Include installation recommendations for each type of substrate.
   B. Shop Drawings: Show the following:
      1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
      2. Carpet tile type, color, and dye lot.
      3. Type of subfloor.
      4. Type of installation.
      5. Pattern of installation.
      6. Pattern type, location, and direction.
      7. Pile direction.
      8. Type, color, and location of insets and borders.
      9. Type, color, and location of edge, transition, and other accessory strips.
     10. Transition details to other flooring materials.
   C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
      2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
   D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
      1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
      2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mock-ups of a minimum of (8) production carpet tiles for each tile and pattern installation method specified; final approval from the Architect and Owner is required prior to proceeding with carpet installation.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Fire-Test-Response Characteristics: Provide carpet tiles with following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify carpet tile with appropriate markings of applicable testing and inspecting agency.

2. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E648.
3. Flame Spread: 25 or less per ASTM E84.
4. Smoke Developed: 450 or less per ASTM E84.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Carpet and Rug Institute, (CRI) 104 Commercial Carpet.

1.6 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings:

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. The use of Tac Tile adhesive on Interface products is not allowed.
C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Examine substrates for presence of Moisture Vapor Emission Control system. Do not perform destructive testing on substrates with Moisture Vapor Emission Control systems installed.

C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   3. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Level subfloor within 1/4 inch in 10 feet noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.

D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
E. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

F. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813
SECTION 097723 - FABRIC-WRAPPED PANELS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes shop-fabricated, fabric-wrapped wall panels.

1.2 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include fabric facing, panel edge, core material, and mounting indicated.
B. Shop Drawings: For panel assembly and installation.
   1. Include plans, elevations, sections, and mounting devices and details.
   2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
   3. Include details at cutouts and penetrations for other work.
   4. Include direction of fabric weave and pattern matching.
C. Samples for Verification: For the following products:
   1. Fabric: Full-width by approximately 36-inch long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
   2. Panel Edge: 12-inch long Sample(s) showing each edge profile, corner, and finish.
   3. Core Material: 12-inch square Sample at corner.
   5. Assembled Panels: Approximately 36 by 36 inches, including joints and mounting methods.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance Data: For each type of panel to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Comply with fabric and panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.6 FIELD CONDITIONS
A. Environmental Limitations: Do not install panels until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Lighting: Do not install panels until a permanent level of lighting is provided on surfaces to receive the panels.
C. Air-Quality Limitations: Protect panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify panel locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Fire-Test-Response Characteristics: Panels shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 FABRIC-WRAPPED WALL PANELS

A. Fabric-Wrapped Wall Panel: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Acoustical Panel Systems (APS, Inc.).
   b. Acoustical Solutions, Inc.
   c. Armstrong World Industries.
   d. MBI Products Company, Inc.
   e. Wall Technology, Inc.; an Owens Corning company.

2. Panel Shape: Flat.

3. Mounting: Edge mounted with splines secured to substrate.
   a. Finish Color at Exposed Edges: Match color of facing material.

4. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.

5. Core: Manufacturer's standard.
   a. Core-Face Layer: Manufacturer's standard tackable, impact-resistant, high-density board.

6. Edge Construction: Manufacturer's standard chemically hardened core with no frame.

7. Corner Detail in Elevation: Square with continuous edge profile indicated.

8. Reveals between Panels: reveals as indicated on Drawings.

10. Nominal Overall Panel Thickness: 1 inch.
11. Panel Width: As indicated on Drawings.
12. Panel Height: As indicated on Drawings.

2.3 MATERIALS
A. Core Materials: Manufacturer's standard.
   1. Glass-Fiber Board: ASTM C 612; of type standard with manufacturer; nominal density of 6 to 7 lb/cu. ft., unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
   2. Particleboard: Panels complying with ANSI A208.1, grade to suit performance requirements.
      a. Made with binder containing no urea formaldehyde.
      b. Fire-retardant panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84 or UL 723.
   3. Tackable, Impact-Resistant, High-Density Board for Face Layer: 1/8-inch-thick layer of compressed, molded glass-fiber board with a nominal density of 16 to 18 lb/cu. ft. laminated to face of core.

B. Facing Material: Fabric from same dye lot; color and pattern as indicated on Drawings.
   1. Lining Material: Manufacturer's standard fabric for each use indicated.

C. Mounting Devices: Concealed on back of panel, recommended by manufacturer to support weight of panel, and as follows:
   1. Metal Clips or Bar Hangers: Manufacturer’s standard two-part metal “Z” clips, with one part of each clip mechanically attached to back of panel and the other part to substrate, designed to permit unit removal.

2.4 FABRICATION
A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.

C. Core-Face Layer and Core Overlay: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

D. Facing Material and Lining Material: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
   1. Square Corners: Tailor corners.
   2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.

E. Dimensional Tolerances of Finished Panels: Plus or minus 1/16 inch for the following:
   1. Thickness.
   2. Edge straightness.
   3. Overall length and width.
4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated panels, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting panel performance.

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

3.2 INSTALLATION

A. Install panels in locations indicated. Unless otherwise indicated, install panels with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.

C. Align fabric pattern and grain as indicated on Drawings.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.

B. Variation of Joint Width: Not more than 1/16 inch wide from hairline in 48 inches, noncumulative.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097723
PART 1 - GENERAL

1.1 SUMMARY
A. Section includes surface preparation and the application of paint systems on exterior substrates.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product. Include preparation requirements and application instructions.
B. Sustainable Design Submittals: Submit product data for interior coatings, including printed statement of VOC content and compliance.
C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.
   5. Wall Surface Samples: Submit minimum 100 square foot samples on each actual wall surface and other building components of each paint system as directed by Architect. Provide finish samples including all specified coats with specified sheen, color and texture. Simulate finished lighting conditions for review of samples.
   6. Draw-Down Samples: Provide 3 draw-down samples of each specified sheen, color and finish.
   7. Prepare samples of wood for selection of tone and finish by Architect.
D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. VOC content.

1.3 QUALITY ASSURANCE
A. Applicator Qualifications: Engage experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with record of successful in-service performance.
B. Job Site Sample Areas: Make sample application of high performance epoxy coating on project surfaces to the extent of one system on one wall of one room as directed by Architect.
   1. Obtain acceptance of sample field application before making additional applications.
   2. Accomplish work to equal or exceed standards established by approved samples. Protect and maintain approved field samples through completion of project.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
C. Provide minimum 25 foot candles of lighting on surfaces to be finished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule article in Part 3 below for the paint category indicated.

2.2 PAINT, GENERAL

A. Performance Requirements:
   1. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is intended to imply that products named are required to be used. No substitutions are allowed.
      a. Products specified are by Sherwin-Williams (S-W), unless otherwise indicated.

D. Colors: As indicated on Drawings.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   3. Wood: 15 percent.
   5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer’s written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning."
G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Wood Substrates:
   1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
   3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
   4. Paint entire exposed surface of window frames and sashes.
   5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed to view:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Tanks that do not have factory-applied final finishes.
3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Refer to attached “Froedtert Hospital Facility Guide Specification” for paint schedule.
SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates:

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Sustainable Design Submittals: Submit product data for interior coatings, including printed statement of VOC content and compliance.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.
   5. Wall Surface Samples: Submit minimum 100 square foot samples on each actual wall surface and other building components of each paint system as directed by Architect. Provide finish samples including all specified coats with specified sheen, color and texture. Simulate finished lighting conditions for review of samples.
   6. Draw-Down Samples: Provide 3 draw-down samples of each specified sheen, color and finish.
   7. Prepare samples of wood for selection of tone and finish by Architect.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. VOC content.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Engage experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with record of successful in-service performance.

B. Job Site Sample Areas: Make sample application of high performance epoxy coating on project surfaces to the extent of one system on one wall of one room as directed by Architect.
   1. Obtain acceptance of sample field application before making additional applications.
   2. Accomplish work to equal or exceed standards established by approved samples. Protect and maintain approved field samples through completion of project.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.4 DELIVERY, STORAGE, AND HANDLING
A. Storage: Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS
A. Ambient Conditions:
   1. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
   2. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
B. Provide minimum 25 foot candles of lighting on surfaces to be finished.

PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Sherwin-Williams Company (The).
B. Products: Subject to compliance with requirements, provide one of the products listed in “Interior Paint Schedule” article in Part 3 below for the paint category indicated.

2.2 PAINT, GENERAL
A. Performance Requirements:
   1. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services’ “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.”
B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
C. Material Quality: Provide manufacturer’s best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer’s product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer’s proprietary product names to designate colors or materials is intended to imply that products named are required to be used. No substitutions are allowed.
      a. Products specified are by Sherwin-Williams (S-W), unless otherwise indicated.
D. Colors: As indicated on Drawings.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   3. Wood: 15 percent.
   4. Gypsum Board: 12 percent.
   5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Preparation of Existing Finished Surfaces to Be Refinished: Conform to the following unless the paint applicator can demonstrate that such paint does not contain lead:
   1. Provide local enclosure to limit area of dust scattering.
   2. Provide disposable floor and ground protection to catch dust and flakes.
   3. Conduct scratch tests to determine adhesion of existing finish. Scrape to remove loose paint.
   4. Scrub with detergent and warm, clean water to remove coatings and contaminates. Thoroughly rinse with clean, warm water before washed water dries.
   5. Sand edges of pealed areas to provide smooth transition.
   6. Sand entire area with fine sandpaper for adhesion.
   7. Conduct tests to determine compatibility of existing finish with specified new finish paint systems. Provide barrier coat if required.
   8. After preparation, HEPA vacuum all surfaces within enclosure or within the area.
9. Wipe all horizontal surfaces.
10. Remove temporary protection and coverings in a manner to enclose dust and debris within disposable covering and dispose of legally.

E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

G. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."

H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

I. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

J. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

L. PVC Piping: Remove dust, dirt, clear coat and other material that may impair bond of paint.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:
      a. Equipment, including panelboards.
      b. Uninsulated metal and plastic piping.
      c. Pipe hangers and supports.
      d. Metal conduit.
      e. Plastic conduit.
      f. Tanks that do not have factory-applied final finishes.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

   2. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      h. Other items as directed by Architect.

   3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINT SCHEDULE

A. Refer to attached “Froedtert Hospital Facility Guide Specification” for paint schedule.
3.6 SPECIAL SURFACES

A. Insulated items in rooms with painted walls:
   1. Surfaces Included:
      a. Piping, ducts, tanks, and equipment.
   2. Waterborne System: (Premium Quality Acrylic Latex finish over -Acrylic Primer)
      a. Primer:
         1) 1 coat S-W Moisture Vapor Barrier Primer, B72W1.
      b. Finish:
         1) 2 coats S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series.

B. Black Enamel Finish:
   1. Surfaces Included:
      a. Duct throats for visible distance but not less than approximately 24 inches behind supply or return air grilles, registers, louvers.
      b. Wood blocking exposed at reveals.
   2. Water Based Systems (Low-VOC): (Acrylic Latex Finish)
      a. Finish:
         1) 1 coat S-W ProMar 400 Latex Flat Black, B30W400 Series.

C. Smoke and Fire Partitions and Lead Walls Stenciling
   1. Latex System:
      a. Primer/Finish:

D. PIPE PAINTING
   1. Painting Colors:
      a. Surfaces Included: All exposed surfaces. Colors to match Sherwin Williams
         1) High and Low Pressure Steam: Safety Yellow
         2) High and Low Pressure Condensate Return Line and Tank: Brass
         3) High and Low Pressure Boiler Feed Water: Mill Ivory
         4) High and Low Pressure Exhaust Breaching: Silver
         5) Vacuum: Pure White
         6) Oxygen: Rain Forest
         7) Medical Air: Modelar Tan
         8) Lab Air: Pallet Tan
         9) Nitrous Oxide: Blue Print
         10) 20 lb. Air for Pneumatic controlled Equipment and 80 lb., Air for Pneumatic Controlled Equipment, and Compressed Air: Turbine Blue.
         11) Nitrogen: Graphite
         12) Gas: Safety Orange
         13) Oil: Black
         14) Domestic Water: Circuit Breaker
15) 120 Degree Hot Soft Water: Polymer Blue
16) Soft water and Polished Soft Water: Hydro Blue
17) Non Potable Water: Toggle Teal
19) Condenser Water & Pumps: Dewpoint
20) Radiation Closed Loop & Pump: Solar Yellow
21) Reheat Closed Loop & Pump: Junction Yellow
22) Fire Sprinkler Lines: Safety Red
23) A.C. Freon Lines: Plumb

END OF SECTION 099123
SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Markerboards.
   2. Tackboards.
   3. Tackboard Display Units
   4. Glass markerboards.
   5. Display rails.

1.2 ACTION 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.
   2. Include electrical characteristics for motorized units.
B. Samples: For each type of visual display unit indicated.
   1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, trim and backing indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.
   3. Accessories: Full-size Sample of each type of accessory.
C. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance Data: For visual display units to include in maintenance manuals.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.7 PROJECT CONDITIONS
A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
1.8  WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: 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 exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1  MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2  PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3  VISUAL DISPLAY BOARD ASSEMBLY

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

1. ADP Lemco.
2. Claridge Products and Equipment, Inc.

B. Visual Display Board Assembly: Factory fabricated.

1. Assembly: Markerboard and Tackboard.
2. Corners: Square.
3. Width: As indicated on Drawings.
4. Height: As indicated on Drawings.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.


D. Tackboard Panel: Fabric Covered.

E. Aluminum Frames: Fabricated from not less than 0.062-inch- thick extruded aluminum; slim size and standard shape.

1. Aluminum Finish: Clear anodic finish.

F. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

G. Chalktray: Manufacturer's standard, continuous.
1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

H. Paper Holder Display Rail: Extruded aluminum; designed to hold paper by clamping action.

2.4 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, moisture-resistant, thermoplastic type adhesive.
   1. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
   2. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge, Type A, Series 3 by Claridge Products or a comparable product.
      a. Provide Type A without map rail at top.

2.5 TACKBOARD PANELS

A. Tackboard Panels – Vinyl Covered:
   1. Facing: 1/4-inch-thick, plastic-impregnated cork.
   3. Core: Manufacturer's standard.

B. Tackboard Panels – Fabric Covered: Basis-of-Design: Subject to compliance with requirements provide FABRIC by Claridge Products or comparable product.
      a. As indicated on Drawings.
   2. Core: 1/2 inch thick fiberboard, tackable surfaces.

C. Tackboard Display Units: Factory-fabricated units consisting of hinged-door aluminum cabinet with perimeter face frame, sides, and back; and designed for surface wall mounting. Fabricate inside of cabinet and cabinet doors with fixed visual display units.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Ghent; Glass Enclosed Tackboard, PA23648K or a comparable product.
      a. Facing: 1/4-inch-thick natural cork
      b. Cabinet Doors: Clear Tempered Glass
      c. Cabinet Corners: Square.
      d. Hardware: Manufacturer's standard, full-height continuous hinges.
      e. Fixed Rear Panel: Manufacturer's standard.
      f. Size: As indicated on Drawings.

2.6 GLASS MARKERBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Peter Pepper Products, Inc; Message Center or a comparable product by one of the following:
   1. ADP Lemco.
   2. Claridge Products and Equipment, Inc.

VISUAL DISPLAY UNITS
   1. Edge Treatment: Smooth polished edge with rounded corners.
   2. Surface: Glossy.

C. Mounting: Concealed, Z-shaped brackets.

D. Size: As indicated on Drawings.

2.7 MATERIALS

A. Porcelain-Enamel Face Sheet: PEI-1002, with face sheet manufacturer's standard two- or three-coat process.

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. Hardboard: ANSI A135.4, tempered.

D. Particleboard: ANSI A208.1, Grade M-1.

E. Medium-Density Fiberboard: ANSI A208.2, Grade 130.

F. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.

G. Extruded Aluminum: ASTM B 221, Alloy 6063.

H. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.

I. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099123 "Interior Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

2.8 GENERAL FINISH REQUIREMENTS

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are 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.

D. Aluminum Finish: Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
B. Examine walls and partitions for proper preparation and backing for visual display units.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Comply with manufacturer’s written instructions for surface preparation.
B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION
A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

3.4 CLEANING AND PROTECTION
A. Clean visual display units according to manufacturer’s written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
B. Touch up factory-applied finishes to restore damaged or soiled areas.
C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100
SECTION 102113.16 - PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Plastic-laminate-clad toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
   B. Shop Drawings: For toilet compartments.
      1. Include plans, elevations, sections, details, and attachment details.
      2. Show locations of cutouts for compartment-mounted toilet accessories.
      3. Show locations of centerlines of toilet fixtures.
      4. Show locations of floor drains.
   C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
      1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
      2. Each type of hardware and accessory.
   D. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.3 INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 PROJECT CONDITIONS
   A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide partition system by Metpar Corporation, or a comparable product by one of the following:
   2. General Partitions Mfg. Corp.

B. Toilet-Enclosure Style: Overhead Braced.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, and Pilaster Construction: One-piece, plastic-laminate facing sheets pressure laminated to core material without splices or joints in facings or cores; with laminate applied to edges before faces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture.
   2. Doors and Panels: Finished to not less than 1 inch thick.
   3. Pilasters: Provide construction to comply with the following:
      a. Finished to not less than 1 inch thick and with internal, nominal 0.120-inch-thick, steel-sheet reinforcement.

E. Brackets (Fittings):
   1. Stirrup Type: Ear or U-brackets, chrome-plated zamac.

F. Plastic-Laminate Finish: One color and pattern in each room.
   1. Color and Pattern: As indicated on drawings.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.
   1. Material: Chrome-plated zamac.
   2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees, allowing emergency access by lifting door.
   3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel anchors compatible with related materials.

2.4 MATERIALS
A. Particleboard: ANSI A208.1, Grade M-2.
B. Plastic Laminate: NEMA LD 3, general-purpose HGS grade, 0.048-inch nominal thickness.
C. Aluminum Castings: ASTM B 26/B 26M.
D. Aluminum Extrusions: ASTM B 221.
E. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 FABRICATION
A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
C. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch-wide out-swinging doors with a minimum 32-inch-wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking and supports required for installation.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.
   c. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   d. Align brackets at pilasters with brackets at walls.

2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel or screen.
   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.16
SECTION 102123 – CUBICLE CURTAINS AND TRACKS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Curtain tracks and carriers.
   2. Curtains
   3. Intravenous (IV) supports.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include durability, laundry temperature limits, fade resistance, applied curtain treatment, and fire-test-response characteristics for each type of curtain fabric indicated.
   2. Include data for each type of track.
B. Shop Drawings:
   1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
   2. Include details on blocking above ceiling and in walls.
C. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:
   1. Curtain Fabric: 10-inch-square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
   2. Curtain Track: Not less than 10 inches long.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Curtains: Provide curtain fabrics with the following characteristics:
   1. Launderable to a temperature of not less than 160 deg F.
   2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CURTAIN SUPPORT SYSTEMS
A. Basis of Design Product: Subject to compliance with requirements, provide product as indicated on the drawings or a comparable product by one of the following:
   1. C/S General Cubicle.
   2. InPro Corporation.
   4. Pryor Products.
B. PVC Curtain Track: Not less than 1-1/4 inches wide by 15/16 inch.
C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
   1. End Stop: Nonremovable.
   2. Flush Gridclip: suspended support set; provide as required for conditions.
      a. Flush panel T-bar grid clip; CE9270
      b. standard, CE9272
      c. swivel, CE9274
D. Curtain Carriers: Ball & Chain Carrier: Two nylon rollers and nylon axle with chrome-plated steel hook.
E. Exposed Fasteners: Stainless steel.
F. Concealed Fasteners: Stainless steel.
G. I.V. Support: Stationary pendant with ceiling attachment.

2.3 CURTAINS
A. Owner-Furnished

PART 3 - EXECUTION

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

3.2 INSTALLATION
A. General: Install tracks level and plumb, according to manufacturer's written instructions.
B. Up to 20 feet in length, provide track fabricated from single, continuous length.
   1. Curtain Track Mounting: Surface.
C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
   1. Attach track to suspended ceiling grid with manufacturer's proprietary clip.
D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
E. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.
F. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 102123
SECTION 102239 - FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Manually operated folding privacy screens.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For operable panel partitions.
      1. Include plans, elevations, sections, attachment details and numbered panel installation sequence.
      2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware, blocking, and direction of travel.
   C. Samples for Verification: For each type of exposed material, finish, covering, or facing, prepared on Samples of size indicated below:
      1. Panel Material: Not less than 6 inches square.
      2. Panel Frame Material: Not less than 3 inches long.
      3. Hardware: One of each exposed operating device.

1.3 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Product Certificates: For each type of operable panel partition.
   C. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.
   D. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
      1. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
      2. Seals, hardware and other operating components.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.
1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of operable panel partitions.
   b. Deterioration of metals, metal finishes, panel finishes, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by a testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 FOLDING PRIVACY SCREENS

A. Folding Privacy Screens: Partition system, including panels, seals, finish facing, hardware, wheels, operators, and accessories.

1. Base-of-Design: Subject to compliance with requirements, provide Color Folding Screens by Silentia, Inc.

B. Panel Operation: Manually operated, continuously hinged panels on wheels.

C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Number of Panels: As indicated on drawings.

E. Length: As indicated on drawings.

F. Height: 5 feet 5 inches.

G. Color: As indicated on drawings.

2.3 SUSPENSION SYSTEMS

A. Wall Tracks: Provide Manufacturer’s standard wall mounting track matching panel height.

B. Wheels: Provide manufacturer’s standard wheels and posts, one for every 3 panels.
C. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine wall, floor levelness, structural support, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
   B. Install panels in numbered sequence indicated on Shop Drawings.
   C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
   D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.3 ADJUSTING
   A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
   B. Verify that safety devices are properly functioning.

3.4 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 102239
SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Corner guards.
   2. Wall guards.
   3. Handrails
   4. Impact-resistant wall coverings.

1.2 PERFORMANCE REQUIREMENTS
A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Uniform load of 50 lbf/ft applied in any direction.
   2. Concentrated load of 200 lbf applied in any direction.

B. Uniform and concentrated loads need not be assumed to act concurrently.

1.3 ACTION SUBMITTALS
A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations, jointing and extent. Include sections, elevations, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Wall and Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.
   2. Handrails: 12 inches long. Include examples of joinery, corners and field splices.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.

B. Material Certificates: For each impact-resistant plastic material, from manufacturer.

1.5 QUALITY ASSURANCE
A. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
   a. Store corner-guard covers in a vertical position.
   b. Store covers in a horizontal position.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

1.9 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures.
   b. Deterioration of plastic and other materials beyond normal use.

B. Warranty Period: Five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MATERIALS

A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.
   1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
   2. Self-extinguishing when tested according to ASTM D 635.
   3. Flame-Spread Index: 25 or less.
   4. Smoke-Developed Index: 450 or less.

B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.

C. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.

D. Stainless-Steel Sheet: ASTM A 240/A 240M.

E. Solid Wood: Clear hardwood lumber of species indicated, free of appearance defects, and selected for compatible grain and color.

F. Fasteners: Aluminum, nonmagnetic stainless steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

G. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2 CORNER GUARDS

A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.
   2. Cover: Extruded rigid plastic, minimum 0.080-inch wall thickness; in dimensions and profiles indicated on Drawings.
      a. Profile: Nominal 2-inch-long leg and 1/4-inch corner radius.
      b. Height: As indicated on the drawings.
      c. Color and Texture: As indicated on the drawings.
   3. Retainer: Minimum 0.070-inch-thick, one-piece, extruded aluminum.
   4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
   5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
B. Surface-Mounted, Metal Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.
      a. Thickness: Minimum 0.0625 inch.
      b. Finish: Directional satin, No. 4.
   3. Wing Size: Nominal 3-1/2 by 3-1/2 inches.

2.3 WALL GUARDS
A. Bumper Rail: Standard-duty, PVC-free assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.
   2. Cover: Extruded rigid plastic, minimum 0.080-inch wall thickness; as follows:
      a. Profile: Flat profile, nominal 7-3/4 inches high by 1 inch deep
      b. Color and Texture: As indicated on the drawings
   3. Continuous Retainer: Minimum 0.080-inch thick, one-piece, extruded aluminum.
   4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
   5. Bumper: Continuous, resilient bumper cushion(s).
   6. End Caps and Corners: Prefabricated, injection-molded plastic; matching color, cover, field adjustable for close alignment with snap-on cover.
   7. Accessories: Concealed splices and mounting hardware.
   8. Mounting: Surface mounted directly to wall.

2.4 IMPACT-RESISTANT HANDRAILS
A. Plastic, Impact-Resistant Handrails: Manufacturer's standard assembly consisting of snap-on plastic cover installed over continuous retainer.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.
   2. Cover: Minimum 0.078-inch-thick, extruded rigid plastic; as follows:
      a. Single Handrail: Cylindrical tube profile cover with continuous retainer; with mounting brackets supporting bottom of rail.
      b. Color and Texture: As indicated on drawings.
   3. Retainer: Minimum 0.080-inch-thick, one-piece, extruded aluminum.
   5. End Caps and Corners: Prefabricated, injection-molded plastic; matching color cover; field adjustable for close alignment with snap-on cover.
   6. Accessories: Concealed splices, cushions, and mounting hardware.
   7. Backing Plate: Solid wood, Maple with clear finish.

2.5 IMPACT-RESISTANT WALL COVERINGS
A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.
1. **Basis**
   - **Product**: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.

2. **Size**: As indicated.

3. **Sheet Thickness**: 0.060 inch.

4. **Color and Texture**: As indicated on the drawings

5. **Height**: As indicated.

6. **Trim and Joint Moldings**: Extruded rigid plastic that matches sheet wall covering color.

7. **Mounting**: Adhesive.

8. Provide color matching caulk between top cap trim and wall.

### 2.6 FABRICATION

**A.** Preform curved semirigid, impact-resistant sheet wall covering in factory for radius and sheet thickness as follows:

1. **Sheet Thickness of 0.060 Inch**: 36-inch radius.

**B.** Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

**C.** **Size**: Provide in maximum lengths and widths available that will minimize joints in each area.

**D.** Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

### 2.7 IMPACT-RESISTANT PRINTED WALL COVERINGS

**A.** Impact-Resistant Printed Wall Covering: Fabricated from semi-rigid, plastic sheet wall-covering material.

1. **Basis-of-Design Product**: Subject to compliance with requirements, provide product indicated on Drawings by InPro Corporation.

2. **Size**: As indicated.

3. **Sheet Thickness**: 0.040 inch.

4. **Color and Texture**: Digitally printed image, Match Architect's sample.

5. **Height**: As indicated.

6. **Trim and Joint Moldings**: Extruded rigid plastic that matches wall-covering color.

7. **Mounting**: Adhesive.

### 2.8 METAL FINISHES

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

1. Remove tool and die marks and stretch lines, or blend into finish.

2. Grind and polish surfaces to produce uniform finish, free of cross scratches.

3. Run grain of directional finishes with long dimension of each piece.

4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

**B.** Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Impact-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.

2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.

3. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600
SECTION 102800 - TOILET AND CUSTODIAL ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Toilet Room Accessories.
   2. Custodial Accessories.

1.2 COORDINATION
A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
   2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Include electrical characteristics.
B. Samples: Full size, for each exposed product and for each finish specified.
   1. Approved full-size Samples will be returned and may be used in the Work.
C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS
A. Sample Warranty: For manufacturer’s special warranty.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY
A. Manufacturer’s Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, visible silver spoilage defects.
   2. Warranty Period: 15 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials:
   1. Toilet Tissue Dispenser
   2. Paper Towel Dispenser
   3. Soap Dispenser
   4. Hand sanitizer dispenser
   5. Suture Rack
   6. Seat-Cover Dispenser

2.2 TOILET ROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Grab Bars:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product:
      a. Bobrick Series 6806.
      b. Bobrick Series 6806.99, for grab bars in showers or steam rooms.
      c. Bradley 8370-101 Swing Up Grab Bar
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   5. Configuration and Length: As indicated on Drawings.

C. Sanitary-Napkin Vending Unit:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick B-2706 25
   3. Type: Sanitary napkin and tampon.
   5. Exposed Material and Finish: Stainless steel, No. 4 finish (satin).
   6. Lockset: Tumbler type with separate lock and key for coin box.

D. Sanitary-Napkin Disposal Unit:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Surface mounted; Bobrick 254.
   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).
E. Mirrors:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product:
      a. Framed Mirrors: Bobrick 2908 Series, Tempered safety glass mirrors, sizes as indicated.
   2. Frame: Stainless steel channel, corners welded and ground smooth.
   3. Size: As indicated on Drawings.

F. Folding Shower Seat:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick B-918116 (L or R) Bariatric folding shower seat with legs.
   2. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect.

G. Shower Curtain Rod:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick 6047
   4. Rod Material and Finish: Stainless steel, No. 4 finish (satin).
   5. Flange Material and Finish: Stainless steel, No. 4 finish (satin).

H. Shower Curtain:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick 204-2
   2. Material: Vinyl, minimum 0.006 inch thick, opaque, matte.
   3. Grommets: Corrosion resistant at minimum 6 inches o.c. through top hem.
   4. Shower Curtain Hooks: Bobrick 204-1, stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.

I. Coat Hooks:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product:

J. Hook Strip:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or comparable product:
K. Diaper-Changing Station:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product the following:
      a. Koala Kare KB200: Cream horizontal wall mounted unit.
   2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support minimum of 200-lb static load when opened.
   3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.

2.3 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Utility Hook:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick B-6707
   2. Description: Heavy-duty single prong hook

C. Utility Shelf:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings or comparable product:
      a. Bobrick B-295
      b. Bobrick B-298
   2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
   3. Size:
      a. 5 inches deep, length as indicated on drawings.
      b. 8 inches deep, length as indicated on drawings.
   4. Material and Finish: Nominal 0.05-inch thick stainless steel, No. 4 finish (satin).

D. Mop and Broom Holder:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
      a. Bobrick 223
   2. Length: 24 inches.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.


E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

C. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

D. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:

   1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Fire protection cabinets for the following:
      a. Portable fire extinguishers.
   2. Fire extinguisher brackets

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Size: 6 by 6 inches square.

D. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.3 QUALITY ASSURANCE
A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

1.4 COORDINATION
A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.5 SEQUENCING
A. Apply decals on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 2 (patterned, textured).

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. J. L. Industries, Inc.
      b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
      c. Larsen's Manufacturing Company.
      d. Potter Roemer LLC.

B. Cabinet Construction: Nonrated, 1-hour fire rated or as required for adjacent wall construction.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.
   1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
   1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
   2. Cabinet Trim Material: Brushed aluminum sheet
   3. Door Material: Brushed aluminum sheet
   4. Door Style: Full acrylic, frameless
   5. Door Glazing: Acrylic sheet
      a. Acrylic Sheet Color: Textured Opaque acrylic sheet painted white on unexposed side.
   6. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
      a. Projecting lever handle with cam-action latch.
      b. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

E. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.
   1. Cabinet Trim Material: Brushed aluminum sheet
   2. Door Material: Brushed aluminum sheet
   3. Door Style: Full acrylic, frameless
      a. Acrylic Sheet Color: Textured Opaque acrylic sheet painted white on unexposed side.
   5. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
a. Projecting lever handle with cam-action latch.
b. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

F. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
   a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet door.
      3) Lettering Color: Red.
      4) Orientation: Vertical.

G. Finishes:
1. Aluminum: Brushed Clear anodized

2.3 FABRICATION
A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   1. Weld joints and grind smooth.
   2. Provide factory-drilled mounting holes.
   3. Prepare doors and frames to receive locks.
B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
   2. Miter and weld perimeter door frames.
C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
C. Finish fire protection cabinets after assembly.
D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Prepare recesses for recessed and semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION
   A. General: Install fire protection cabinets in locations and at mounting heights indicated, or, if not indicated, at heights acceptable to authorities having jurisdiction.
   B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
      1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
      2. Provide inside latch and lock for break-glass panels.
      3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING
   A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
   B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
   C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
   D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
   E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413
SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      2. Benches

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of metal locker.
      1. Include construction details, material descriptions, dimensions of individual components
         and profiles, and finishes for each type of metal locker and bench.
   B. Shop Drawings: For metal lockers.
      1. Include plans, elevations, sections, details, and attachments to other work.
      2. Show locker trim and accessories.
      3. Include locker identification system and numbering sequence.
   C. Samples: For each color specified, in manufacturer's standard size.
   D. Product Schedule: For lockers.

1.3 DELIVERY, STORAGE, AND HANDLING
   A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their
      installation.

1.4 FIELD CONDITIONS
   A. Field Measurements: Verify actual dimensions of recessed openings by field measurements
      before fabrication.

1.5 COORDINATION
   A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related
      units of work specified in other Sections to ensure that metal lockers can be supported and
      installed as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Source Limitations: Obtain metal lockers and accessories from single source from single locker
      manufacturer.

2.2 PERFORMANCE REQUIREMENTS
   A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable
      provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA
      Accessibility Guidelines.
2.3 KNOCKED-DOWN CORRIDOR LOCKERS SCHEDULE
A. 12 inch wide by 18 inch deep, 36 inch high, single tier, standard.
B. 12 inch wide by 15 inch deep, 72 inch high, purse locker (5 high).
C. 12 inch wide by 18 inch deep by 72 inch high, double tier, quiet-type.
D. 12 inch wide by 18 inch deep, 24 inch high, triple tier, standard.
E. 12 inch wide by 18 inch deep by 72 inch high, single tier, standard.

2.4 KNOCKED-DOWN CORRIDOR LOCKERS
A. Products: Subject to compliance with requirements, provide products by one of the following:
   1. List Industries Inc.
   2. Lyon Workspace Products, LLC.
   3. Penco Products, Inc.
B. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
   1. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
   2. Sound-Dampening Panels for Quiet-Type: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
   3. Door Style: Vented panel as follows:
      a. Louvered Vents: No fewer than two louver openings at top and bottom, or three louver openings at top or bottom, for triple-tier lockers.
C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
   1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch nominal thickness, with single bend at sides.
   2. Backs and Sides: 0.024-inch nominal thickness, with full-height, double-flanged connections.
   3. Shelves: 0.024-inch nominal thickness, with double bend at front and single bend at sides and back.
D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
   1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
   2. Frame Vents: Fabricate face frames with vents.
E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
   1. Continuous Hinges: Manufacturer's standard, steel, full height.
F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
   1. Single-Point Latching: Non-moving latch hook with steel padlock loop that projects through recessed cup and is finished to match metal locker body.
      a. Latch Hook: Equip each door with one latch hook, fabricated from 0.105-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.

G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

H. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.

I. Coat Rods: 1-inch-diameter steel tube or rod, chrome finished.

J. Continuous Zee Base: Fabricated from 0.060-inch nominal-thickness steel sheet.
   1. Height: 4 inches.

K. Continuous Sloping Tops: Fabricated from 0.036-inch nominal-thickness steel sheet.
      2. Sloping-top corner fillers, mitered.

L. Filler Panels: Fabricated from 0.036-inch nominal-thickness steel sheet.

M. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.

N. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

O. Materials:
   1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

P. Finish: Baked enamel or powder coat.
   1. Color: As selected by Architect from manufacturer's full range.

2.5 LOCKS
A. Combination Padlocks: Provided by Owner.

2.6 BENCHES
A. Provide bench units with overall assembly height of 17-1/2 inches.
B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.
   1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick except provide 20- to 24-inch-wide tops where accessible benches are indicated.
      2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.
C. Fixed-Bench Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
   1. Tubular Steel: 1-1/2-inch-diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.
2.7 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
   1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
   2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
C. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for preassembly at plant prior to shipping.
D. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
E. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
   1. Sloping-top corner fillers, mitered.
G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.
H. Boxed End Panels: Fabricated with 1-inch-wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.
I. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of non-recessed metal lockers; finished to match lockers.

2.8 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
B. Anchors: Material, type, and size required for secure anchorage to each substrate.
   1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
   2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.

2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment:

1. Attach door locks on doors using security-type fasteners.

2. Identification Plates: Identify metal lockers with identification indicated on Drawings.

   a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

   b. Attach plates to upper shelf of each open-front metal locker, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.

2. Attach sloping-top units to metal lockers, with closures at exposed ends.

3. Attach boxed end panels using concealed fasteners to conceal exposed ends of non-recessed metal lockers.

4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of non-recessed metal lockers.

E. Fixed Benches: Provide no fewer than two brackets for each bench, uniformly spaced not more than 72 inches apart. Securely fasten to undersides of bench tops, and anchor to wall.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113
SECTION 105123 - PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes plastic-laminate-clad wood lockers.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of plastic-laminate-clad wood locker.
      1. Include construction details, material descriptions, dimensions of individual components
         and profiles, and finishes for each type of locker.
   B. Shop Drawings: For plastic-laminate-clad wood lockers.
      1. Include plans, elevations, sections, details, and attachments to other work.
      2. Show locations and sizes of furring, blocking, and hanging strips, including concealed
         blocking and reinforcement specified in other Sections.
      3. Show locations and sizes of cutouts and holes for items installed in lockers.
      4. Show locker fillers, trim, base, sloping tops, and accessories.
      5. Show locker numbering sequence.
   C. Samples for Verification: For the following products:
      1. Plastic-laminate-clad panels, not less than 8 by 10 inches, for each type, color, pattern,
         and surface finish, with separate samples of unfaced panel product used for core.
      2. Thermoset decorative-overlay-surfac ed panels, not less than 8 by 10 inches, for each type,
         color, pattern, and surface finish.
      3. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end
         pieces, not less than 18 inches wide by 18 inches high by 6 inches deep.
      4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.3 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms
      to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Do not deliver lockers until painting and similar operations that could damage lockers have been
      completed in installation areas. If lockers must be stored in other-than-installation areas, store
      only in areas where environmental conditions are the same as those in final installation location,
      and comply with requirements specified in "Field Conditions" Article.
   B. Deliver master and control keys to Owner by registered mail or overnight package service.
1.6 FIELD CONDITIONS
   A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
   B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
      1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION
   A. Coordinate sizes and locations of concealed wood support bases.
      1. Requirements are specified in Section 061053 "Miscellaneous Rough Carpentry."
   B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.

1.8 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures.
         b. Faulty operation of locks or hardware.
         c. Deterioration of wood and other materials beyond normal use.
      2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS
   A. Basis-of-Design Product: Subject to compliance with requirements, provide 2000 Series by Ideal Products, Inc., or comparable product by one of the following:
      1. Classic Woodworking, LLC.
      3. Famous Lockers.
      4. Hollman, Inc.
      5. Legacy Lockers.
      6. List Industries Inc.
      7. Treeforms.

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B. Construction Style: Flush overlay.

C. Locker Style: Refer to Drawings.

D. Locker Body: Fabricated from fire-retardant-particleboard-core panels covered on both sides with thermoset decorative overlay.
   3. Top Panel: 3/4 inch thick.
   5. Exposed Panel Edges: High-pressure decorative laminate, Grade VGS, to match panels.

E. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade VGS, over both sides of fire-retardant-particleboard core.
   1. Thickness: 3/4 inch thick.
   2. Panel Edges: 3mm PVC edge molding as selected to match plastic laminate.

F. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.

G. Shelves: Fabricated from fire-retardant-particleboard-core panels covered on both sides with thermoset decorative overlay.
   1. Thickness: 3/4 inch.
   2. Exposed Edges: 3mm PVC edge molding as selected to match plastic laminate.


I. Continuous Finish Base: Plastic-laminate-clad, 3/4-inch-thick panel that matches door faces; fabricated in lengths as long as practical to enclose base and base ends of lockers.

J. Plastic-Laminate Colors, Patterns, and Finishes:
   1. As selected by Architect from plastic-laminate manufacturer's full range of solid colors, wood grains and patterns.

2.3 MATERIALS

A. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
   1. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as follows:
   1. Horizontal Surfaces: Grade HGS.
   2. Vertical Surfaces: Grade VGS.

C. Fire-Retardant-Treated Materials: Where fire-retardant-treated materials are indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.
   1. Do not use treated material that does not comply with requirements of referenced material standards or material that is warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.

3. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84:
   a. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2, except for the following minimum properties: density, 45 lb/cu. ft; modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 lbf and 225 lbf, respectively.

D. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

E. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.4 HARDWARE

A. General: Provide manufacturer's standard locker hardware complying with the requirements in this Section.

B. Cam Padlock Hasp: Surface mounted steel, finished to match other locker hardware.

C. Hinges: Fixed pin with hospital tip, five knuckle, dull chrome, 2-1/2 inch fastened with 4 screws each let into faces, no edge fastening allowed.

D. Wire Pulls: Back mounted; 4 inches long, 5/16 inch in diameter.

E. Accessible Handle: Metal, fixed, graspable lever handle and rose trim; surface mounted.

F. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; chrome finished. Attach hooks with at least two fasteners.
   1. Provide two double-prong wall hook for each compartment of double-tier lockers.

G. Digital Locks:
   1. Shared Use: recess mount, Provide with one ADA compliant user key and a manager bypass key. DK-STS-619-01-3A by Digilock
   2. Assigned use: recess mount, Provide with one ADA compliant user key and a manager bypass key. DK-STS-619-01-3A by Digilock

H. Exposed Hardware Finishes: Satin chrome unless otherwise indicated

2.5 ACCESSORIES

A. Number Plates: 1-1/2-inch diameter, etched, embossed, or stamped, plates with black numbers and letters at least 1/2 inch high. Identify lockers in sequence indicated on Drawings.

2.6 FABRICATION

A. Fabricate each locker with shelves, an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments, and sloped top.
   1. Fabricate lockers to dimensions, profiles, and details indicated.
2. Ease edges of corners of solid-wood members to 1/16-inch radius.

B. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately factory machine components for attachments. Make joints tight and true.
   1. Fabricate lockers using manufacturer’s standard construction, with joints made with dowels, dados, or rabbets. Dado side panels to receive shelving except where indicated to be adjustable.

C. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

D. Venting: Fabricate lockers with space between doors and locker assembly of not less than 1/4 inch.

E. Number Plates: Inlay number plates flush in each locker door, near top, centered.

F. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

G. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Condition lockers to average prevailing humidity conditions in installation areas before installation.
   B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION
   A. Assemble knocked-down lockers with manufacturer’s standard fasteners, with no exposed fasteners on face frames.
   B. Install lockers level, plumb, and true; use concealed shims.
   C. Connect groups of lockers together with manufacturer’s standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.

PLASTIC-LAMINATE-CLAD LOCKERS

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D. Install lockers without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Installation Tolerance: No more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line. Shim as required with concealed shims.

E. Locker Anchorage: Fasten lockers through wood locker base, at ends, and not more than 36 inches o.c. with No. 8 flush-head wood screws sized for 1-inch penetration into wood base.

F. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.

G. Install number plates after lockers are in place.
   1. Attach number plate on each locker door, near top, centered, with at least two screws with finish matching number plate.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding.

B. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105123
SECTION 108000 – PASS THROUGH CHAMBER

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes: Miscellaneous specialties and accessories.

1.2 SUBMITTALS
   A. Shop Drawings: Submit for each item of work in accordance with Section 0133.

1.3 DELIVERY, STORAGE AND HANDLING
   A. Do not deliver miscellaneous specialties to site until rooms in which they are to be installed are ready to receive them.
   B. Pack miscellaneous specialties individually in manner to protect accessory and its finish. Replace damaged units.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Cleanroom Pass Through shall be capable of maintaining the following cleanroom performance requirements when installed as follows.
      1. Capable of maintaining Class 100 to 10,000 (ISO 5 to ISO 8) conditions in accordance with FS 209E and ISO 146744.
      2. Capable of meeting validation requirements of FDA/cGMP and the following requirements.
         a. Nonviability Particle Count: Maximum of 10,000 per cf, 0.5 micron or larger measured 6 inches above work surface (Class 10,000/ISO 7). Other permissible counts accord with nominal cleanliness rating (1000 per cf. for Class 1000, 100 per cf. for Class 100).
         b. Viable Count: Less than 1.5 colony forming units per 10 cubic feet. Other permissible counts in accord with nominal cleanliness rating.
      3. Capable of maintaining a passive pressure differential of:
         a. Area outside room: balance condition
         b. Air lock: 0.05-inch w.g.
         c. Cleanroom: 0.1 inch w.g.

2.2 PASS THROUGH CHAMBER
   A. Cleanroom Pass Through Chamber: Provide General Pass Thru Chamber by Terra Universal, Inc.:  
      1. Wall mount type.
      2. Type 304 stainless steel welded construction, ground smooth.
      3. Stainless steel or chrome plated hinges.
      4. Stainless steel doors with static –dissipative PVC windows with gaskets.
      5. Self-closing with mechanism which prevents both doors from opening at same time.
      6. Size: as indicated on drawings.
B. Fire Rate Cleanroom Pass Through Chamber: Provide Fire Rated Pass Through Chamber by Terra Universal, Inc.
   1. Fire-rated access panels carry the UL-B label for 90-minute fire exposure (suitable for 2-hour wall rating).
   2. Double-wall 304 stainless steel construction with mechanical interlock.
   3. Stainless steel or chrome plated continuous hinges.
   4. Self-closing with mechanism which prevents both doors from opening at same time.
   5. Access door on non-rated side includes LiftLatch and static-dissipative PVC viewing window.

2.3 EXAMINATION
   A. Examine areas and conditions for compliance with requirements for installation and other conditions affecting performance of the Work.
   B. Verify that rough openings and surfaces are ready to receive work.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.4 PREPARATION
   A. Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates and rough-in measurements as required.
   B. Clean surfaces thoroughly prior to installation.
   C. Verify with Architect exact location of accessories.

2.5 INSTALLATION
   A. Install fixtures, accessories and items in accordance with reviewed shop drawings and manufacturer's printed instructions.
   B. Install true, plumb and level, securely and rigidly anchored to substrate.
   C. Adjust and lubricate operating parts for proper operation.

2.6 PROTECTION
   A. Protect installed products until completion of project.
   B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 108000
SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Manually operated roller shades with single rollers and with double rollers.
   2. Motor-operated, single-roller shades and double-roller shades.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
C. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
   2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
   3. Installation Accessories: Full-size unit, not less than 10 inches long.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance Data: For roller shades to include in maintenance manuals.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.6 FIELD CONDITIONS
A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
2.1 MANUFACTURERS
   A. Basis-of-Design Product: Subject to compliance with requirements, provide Mecho Shade or WT Shade product as indicated on.
   B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS
   A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
         a. Loop Length: Full length of roller shade.
         b. Limit Stops: Provide upper and lower ball stops.
         c. Operating Function: Stop and hold shade at any position in ascending or descending travel.
   B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
      1. Roller Drive-End Location: Right side of inside face of shade.
      2. Direction of Shadeband Roll: Regular, from back of roller.
   C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
   D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
   E. Shadebands:
      2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
         a. Type: Enclosed in sealed pocket of shadeband material.
   F. Installation Accessories:
      1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
         a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
         b. Provide pocket as detailed on the drawings.
      2. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
      3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Double-Roller Mounting Configuration: As detailed on the drawings.
2. Inside Roller:
   a. Drive-End Location: Right side of inside face of shade.
   b. Direction of Shadeband Roll: Regular, from back of roller.

3. Outside Roller:
   a. Drive-End Location: Left side of inside face of shade.
   b. Direction of Shadeband Roll: Regular, from back of roller.


C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Inside Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.

F. Outside Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.

G. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
   b. Provide pocket as detailed on drawings.
2. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

2.4 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
      a. Maximum Total Shade Width: As required to operate roller shades indicated.
      b. Maximum Shade Drop: As required to operate roller shades indicated.
      c. Maximum Weight Capacity: As required to operate roller shades indicated.
   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
      a. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.
         1) Switch Positions: Three.
         2) Switch Style: Rocker.
      b. Color: As selected by Architect from manufacturer's full range.
   4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: As indicated on Drawings.
   2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected by Architect from manufacturer's full range.
E. Installation Accessories:

1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer’s standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
   b. Provide pocket as detailed on drawings.

2. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

5. Accessories Color: As selected by Architect from Manufacturer’s full range.

2.5 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

A. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Electric Motor: Manufacturer’s standard tubular, enclosed in roller.
   a. Maximum Total Shade Width: As required to operate roller shades indicated.
   b. Maximum Shade Drop: As required to operate roller shades indicated.
   c. Maximum Weight Capacity: As required to operate roller shades indicated.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
   a. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.
      1) Switch Positions: Three.
      2) Switch Style: Rocker.
   b. Color: As selected by Architect from manufacturer’s full range.

4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.

1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.

2. Inside Roller:
a. Drive-End Location: As indicated on Drawings.

b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Outside Roller:
   a. Drive-End Location: As indicated on Drawings.
   b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.


C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Inside Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Outside Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Installation Accessories:
   1. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
      a. Height: Manufacturer’s standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
      b. Provide pocket as detailed on drawings.
   2. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   3. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
   4. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
   5. Accessories Color: As selected by Architect from Manufacturer’s full range.

2.6 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
   1. Source: As indicated on drawings.

   1. Source: As indicated on drawings.
2.7 ROLLER-SHADE FABRICATION
   A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
   B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
      1. Fabricate units to the maximum size of equal lengths.
   C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
      1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacing along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
      2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

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

3.2 ROLLER-SHADE INSTALLATION
   A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
      1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.
   B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING
   A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION
   A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
   B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
   C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.
3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413
SECTION 123616 – STAINLESS STEEL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless-steel countertops.
2. Stainless-steel sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For metal fabrications.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. For countertops, show locations and sizes of cutouts and holes for items installed in metal countertops.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver products only after casework and supports on which they will be installed has been completed in installation areas.
B. Keep finished surfaces of products covered with polyethylene film or other protective covering during handling and installation.

1.4 FIELD CONDITIONS

A. Field Measurements: Where products are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL FABRICATIONS

A. Countertops: Fabricate from 0.062-inch-thick, stainless-steel sheet. Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch over the base cabinets.

2. Weld shop-made joints.
3. Sound deaden the undersurface with heavy-build mastic coating.
4. Extend the top down to provide a 1-inch-thick edge with a 1/2-inch return flange.
5. Form the backsplash coved to and integral with top surface, with a 1/2-inch-thick top edge and 1/2-inch return flange.
6. Provide raised (marine) edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
B. Stainless-Steel Sinks: Fabricate from stainless-steel sheet, not less than 0.050-inch nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.
   1. Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.
   2. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch diameter.
   3. Factory punch holes for fittings.
   4. Provide sinks with stainless-steel strainers and tailpieces.
   5. Factory weld sinks to stainless-steel countertops to provide one, integral unit.
   6. Apply 1/8-inch-thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.2 HARDWARE
A. Shelf Standards and Rests: K & V extra heavy duty slotted standards #87 with #212 end rests (or 211-212), satin chrome finish.
B. Shelf Brackets: K & V #187, satin chrome finish.

2.3 MATERIALS
A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.
B. Sealant for Countertops: Manufacturer's standard sealant that complies with applicable requirements in Section 079200 "Joint Sealants" and the following:

2.4 STAINLESS-STEEL FINISH
A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

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 products.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
C. Secure countertops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
E. Seal junctures of countertops, splashes, and walls with sealant for countertops.

3.3 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces. Remove and replace damaged products or touch up and refinish damaged areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123616
SECTION 134900 - RADIATION PROTECTION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Lead sheet, strip, and plate.
   2. Lead-lined gypsum board.
   3. Lead glass.
   4. Lead-lined, hollow-metal doors and door frames.
   5. Lead-lined flush wood doors.
   7. Modular shielding partitions.
   8. Informational signs.

1.2 DEFINITIONS
A. Lead Equivalence: The thickness of lead that provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions.
   1. Lead equivalence specified for materials used in diagnostic x-ray rooms is as measured at 100 kV unless otherwise indicated.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Show layout of radiation-protected areas. Indicate lead thickness or lead equivalence of components. Show components and installation conditions not fully dimensioned or detailed in product data.
   1. Show ducts, pipes, conduit, and other objects that penetrate radiation protection; include details of penetrations.
C. Samples for Initial Selection: For units with factory-applied color finishes.
D. Product Schedule: For observation windows, doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For flush wood door manufacturer and testing agency.
B. Field quality-control reports.
C. Sample Warranty: For warranty.

1.5 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For neutron-shielding doors to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.
B. Testing Agency Qualifications: Licensed by authorities having jurisdiction to perform radiation shielding surveys.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Lead-Lined Gypsum Panels: Neatly stack panels flat to prevent deformation.

B. Lead-Lined, Hollow-Metal Doors and Frames: Comply with requirements in Section 081113 "Hollow Metal Doors and Frames" for delivery, storage, and handling.

C. Lead-Lined Flush Wood Doors: Comply with requirements in Section 081416 "Flush Wood Doors" for delivery, storage, and handling.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install radiation protection until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Warranty for Lead-Lined Flush Wood Doors: Comply with requirements in Section 081416 "Flush Wood Doors."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide materials and workmanship, including joints and fasteners that maintain continuity of radiation protection at all points and in all directions equivalent to materials specified in thicknesses and locations indicated.

1. Materials, thicknesses, and configurations indicated are based on radiation protection design prepared by Owner's radiation health physicist. This design is available to Contractor on request.

B. Lead-Lined Assemblies: Unless otherwise indicated, provide lead thickness in doors, door frames, window frames, penetration shielding, joint strips, and other items located in lead-lined assemblies not less than that indicated for assemblies in which they are installed.

C. Lead Glazing: Unless otherwise indicated, provide lead equivalence not less than that indicated for assembly in which glazing is installed.

2.2 MANUFACTURERS

A. Source Limitations: Obtain each type of radiation protection product from single source from single manufacturer.

2.3 MATERIALS


B. Lead-Lined Gypsum Board: 5/8-inch- thick gypsum board complying with Section 092900 "Gypsum Board," of width and length required for support spacing and to prevent cracking during handling, and with a single sheet of lead laminated to the back of the board.

1. Lead Sheet Lining: Full width and length of board.
2. Furnish 3-inch-wide lead strips for wrapping metal stud flanges.
3. Furnish 2-inch-wide lead strips for backing joints.
5. Furnish finishing materials, accessories, and trim for lead-lined gypsum board complying with Section 092900 "Gypsum Board."

C. Lead Glass: Lead-barium, polished glass containing not less than 60 percent heavy metal oxides, including not less than 48 percent lead oxide by weight.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A&L Shielding Inc.
   b. Amerope Enterprises, Inc.
   c. Corning Incorporated
   d. Ray-Bar Engineering Corp.

2. Safety Glass: Tempered lead glass or laminated glass.
3. Laminated Glass:
   a. Outer Ply: Clear float glass.
   b. Interlayer: Clear polyvinyl butyral.
   c. Inner Ply: Lead glass; thickness as needed to provide lead equivalence indicated.

D. Lead Glazing Plastic: Transparent acrylic sheet impregnated with an organo-lead compound and containing 30 percent lead by weight.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fluke Biomedical.

2. Thickness: As needed to provide lead equivalence indicated.

E. Glazing Compounds, Gaskets, and Accessories: Comply with requirements in Section 088000 "Glazing."

F. Accessories and Fasteners: Manufacturer's standard fasteners and accessories as required for installation, maintaining same lead equivalence as rest of system.

2.4 LEAD-LINED, HOLLOW-METAL DOORS
A. General: Steel doors complying with NAAMM-HMMA 861, except with a single continuous sheet of lead of thickness not less than that required for partition in which door is installed extending from top to bottom and edge to edge, installed either between back-to-back stiffeners or between stiffeners and stop face of door.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A&L Shielding Inc.
   b. Ray-Bar Engineering Corp.
   c. Republic Doors and Frames.
   d. Security Metal Products; a brand of ASSA ABLOY.
2. Line inverted channels at top and bottom of doors with lead sheet of same thickness used in door and close with filler channels to provide flush top and bottom edges.
3. Shield cutouts for locksets with lead sheet of same thickness used in door. Lap lining of cutouts with door lining 1 inch.
4. Furnish lead-lined astragals for pairs of doors.
5. Factory fit doors to suit frame-opening sizes indicated with 1/16-inch clearance at heads and jambs and minimum clearance at bottom.
6. Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

2.5 LEAD-LINED, HOLLOW-METAL DOOR FRAMES

A. General: Steel door frames complying with NAAMM-HMMA 861, except 0.0667 inch thick, lined with lead sheet of thickness not less than that required for doors and walls where frames are used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A&L Shielding Inc.
   b. Fluke Biomedical.
   c. Ray-Bar Engineering Corp.
   d. Republic Doors and Frames.
   e. Security Metal Products; a brand of ASSA ABLOY.

2. Furnish with additional reinforcements and internal supports to adequately carry the weight of lead-lined doors. Install reinforcements and supports before installing lead lining.

3. Form lead sheet to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Fabricate lead lining wide enough to maintain an effective lap with lead of adjacent shielding.

4. Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

2.6 LEAD-LINED FLUSH WOOD DOORS

A. Lead-Lined Flush Wood Doors: Solid-core wood doors with lead lining, thickness not less than that required for partition in which door is installed.

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. A&L Shielding Inc.
   b. Algoma Hardwoods, Inc.
   c. Eggers Industries.
   d. Fluke Biomedical.
   e. Oshkosh Door Company.
   f. Ray-Bar Engineering Corp.
   g. VT Industries Inc.

2. Door Construction: Veneer face, five ply, bonded structural composite lumber core.

3. Lead Lining: One or more continuous sheets of lead extending from top to bottom and edge to edge, constructed either in the core or between the core and faces, at manufacturer's option.

4. Comply with Section 081416 "Flush Wood Doors" for grade, faces, veneer matching, performance grade, fabrication, finishing, and other requirements unless otherwise indicated.
B.  WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C.  Shield cutouts for locksets with lead sheet of same thickness used in door. Lap lining of cutouts with door lining.

D.  Furnish lead-lined astragals for pairs of doors.

E.  Factory fit doors to suit frame openings indicated with 1/16-inch clearance at heads and jambs and minimum clearance at bottom. Factory machine doors for hardware not surface applied.

F.  Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.7 LEAD-LINED, OBSERVATION-WINDOW FRAMES

A. General: Fabricate from 0.043-inch-thick, formed-steel sheet or 0.064-inch-thick aluminum extrusions with mitered corners, welded or bolted with concealed fasteners.
   1. Line with lead sheet formed to match frame contour, continuous in each jamb and across head and sill, lapping the stops, and fabricated wide enough to maintain an effective lap with lead of adjoining assemblies.
   2. Construct so lead lining overlaps glazing material perimeter by at least 3/8 inch and furnish removable stops.

2.8 LEAD-LINED MODULAR SHIELDING PARTITIONS

A. General: Partial-height modular partitions assembled from factory-finished standard components consisting of lead-lined, enameled-steel framing members; lead-lined opaque panels; lead glazing plastic vision panels; and hardware necessary for assembly and for securing to other construction. Fabricate opaque panels from honeycomb-core metal panels with polyurethane paint finish.
   1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. A&L Shielding Inc.
      b. Amerope Enterprises, Inc.
      c. Fluke Biomedical.
      d. S&S Technology.
   2. Lead Equivalence for Opaque Panels: 1.5 mm.
   3. Lead Equivalence for Framing Members: 1.5 mm.

2.9 INFORMATIONAL SIGNS

A. Informational Signs: High-pressure-laminate engraving stock with contrasting face and core, machine engraved from master templates for accurately formed letters, numbers, and symbols.
   1. Color: As selected by Architect from manufacturer's full range of colors.
   2. Provide copy indicated or as directed.
   3. Indicate lead equivalence in millimeters and heights of radiation protection in inches.

B. Rooms Where the Level of Protection Is Uniform Throughout: Provide one sign for each room indicating lead equivalence of partitions, ceilings, floors, doors, and other portions of radiation protection enclosure. Indicate height of radiation protection above floor or indicate that partitions are radiation protected to full height.
C. Rooms Where the Level of Protection Is Not Uniform Throughout: Provide one sign for each room with different lead equivalences in different locations. Indicate, in tabular form, lead equivalence of each wall, partition, ceiling, floor, door, and window. Indicate height of radiation protection above floor or indicate that partitions are radiation protected to full height. Indicate where lead equivalence changes or is not continuous.

D. Rooms Where Some Partitions Are without Radiation Protection: Provide one sign for each partition that contains radiation protection and indicate its lead equivalence. Indicate height of radiation protection above floor or indicate that partitions are radiation protected to full height.

E. Rooms Where Only the Door Has Radiation Protection: Provide one sign for each door indicating its lead equivalence.

2.10 DOOR AND DOOR FRAME FABRICATION

A. Hardware Preparation: Factory prepare doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

1. Stagger bolts for door pulls on plates which penetrate lead lining relative to opposite plate and recess on side of door opposite pull.
2. Provide lead plugs over recessed nut ends of such bolts. Line hardware cutouts with same lead thickness as core of door.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive radiation protection, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection.

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

3.2 INSTALLATION OF LEAD-LINED GYPSUM BOARD

A. Install with long edge parallel to supports and lead lining facing supports. Provide blocking at end joints. Install using construction adhesive and supplementary fasteners.

B. Fastening to Metal Supports: Use steel drill screws spaced as recommended in writing by gypsum board manufacturer.

1. Install lead strips, 2 inches wide and same thickness as lead lining, to face of supports and blocking where joints occur. Secure lead strips with construction adhesive. Provide shims at face of supports and blocking where joints do not occur.
2. Apply lead disks recessed flush with surface of board over heads of screws securing gypsum board and trim.

C. Openings: Extend lead-lined gypsum board into frames of openings, lapping lead lining with lead frames or frame linings at least 1 inch. Arrange board around openings so neither horizontal nor vertical joints occur at corners of openings.

D. Install control and expansion joints where indicated, with appropriate trim accessories. Install lead strip on face of framing, extending across joint, and lap with lead lining of gypsum board.

E. Finish lead-lined gypsum board to comply with Section 092900 "Gypsum Board."
3.3 INSTALLATION OF LEAD-LINED DOORS AND DOOR FRAMES
A. Install lead-lined steel doors and door frames according to Section 081113 "Hollow Metal Doors and Frames."
B. Install lead-lined wood doors according to Section 081416 "Flush Wood Doors."
C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with door manufacturer's written instructions.
D. Lap lead lining of frames over lining in walls at least 1 inch.
E. Line astragals with lead sheet.
F. Hardware: Line covers, escutcheons, and plates to provide effective shielding at cutouts and penetrations of frames and doors. See Section 087100 "Door Hardware" for other installation requirements.

3.4 INSTALLATION OF LEAD-LINED OBSERVATION WINDOWS
A. Install observation windows according to manufacturer's written installation instructions.
B. Install windows level, plumb, square, true to line, and anchored securely in place to structural support.
C. Install leaded side of frame on radiation side of wall. Lap lead lining of frames over lining in walls at least 1 inch.
D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with manufacturer's written instructions.

3.5 INSTALLATION OF LEAD-LINED MODULAR SHIELDING PARTITIONS
A. Install partitions after finishes are complete in spaces where partitions are located. Install according to manufacturer's written instructions and Shop Drawings.
B. Cut and remove wall base where modular shielding partitions meet other walls so partition fits tightly to wall.
C. Secure partition framing to floor with 1/4-inch expansion anchors 16 inches o.c., and fasten to walls and ceilings as indicated. Brace partitions with tie rods fastened to walls or ceilings as indicated.

3.6 INSTALLATION OF PENETRATING ITEMS
A. At penetrations of lead linings, provide lead shields to maintain continuity of protection.
B. Provide lead linings, sleeves, shields, and other protection in thickness not less than that required in assembly being penetrated.
C. Secure shields at penetrations using adhesive or wire ties but not penetrating fasteners unless indicated on Drawings.
D. Outlet Boxes and Conduit: Cover or line with lead sheet lapped over adjacent lead lining at least 1 inch. Wrap conduit with lead sheet for a distance of not less than 10 inches from box.
E. Duct Openings: Unless otherwise indicated, line or wrap ducts with lead sheet for distance from partition/ceiling equal to three times the largest opening dimension. Lap lead sheet with adjacent lead lining at least 1 inch.
F. Piping: Unless otherwise indicated, wrap piping with lead sheet for a distance of not less than 10 inches from point of penetration.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections after radiology equipment has been installed and placed in operating condition.

B. Correct deficiencies in or remove and replace radiation protection that inspection reports indicate does not comply with specified requirements.

C. Prepare test and inspection reports.

3.8 PROTECTION

A. Lock radiation-protected rooms once doors and locks are installed, and limit access to only those persons performing work in the rooms.

END OF SECTION 134900
SECTION 140620 – ELEVATOR FINISHES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes finishes for elevators.

1.2 ACTION SUBMITTALS
A. Product Data: Include product data for car enclosure finishes
B. Shop Drawings:
   1. Include plans, elevations, sections, and large-scale details indicating layout of finishes, reveals and coordination with fixtures and controls
C. Samples for Initial Selection: For finishes involving color selection.
D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.3 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, and handle materials, components, and equipment in manufacturer’s protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board’s ADA-ABA Accessibility Guidelines and with ICC A117.1.

2.2 ELEVATORS
A. Service Elevator
B. Public Elevator
C. Patient Transfer
D. Parking Garage Elevator

2.3 SERVICE ELEVATOR
A. Car Enclosure
   1. General: Provide steel-framed car enclosures with non-removable wall panels, with car roof, access doors, power door operators, and ventilation.
   2. Materials and Finishes:
      a. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
      b. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.
      c. Car Fixtures: Satin stainless steel, No. 4 finish.
      d. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
      e. Reveals: Satin stainless steel, No. 4 finish.
f. Door Faces (Interior): Satin stainless steel, No. 4 finish.
g. Door Sills: Nickel silver, with grooved surface.
h. Ceiling: Satin stainless steel, No. 4 finish, Flush panels, with low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
i. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
j. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.
k. Floor Finish: Plate, 3003 bright aluminum 5-bar tread, 0.125 inch.
l. Fabricate car with recesses and cutouts for signal equipment.
m. Fabricate car door frame integrally with front wall of car.
n. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled or powder-coated cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
o. Sight Guards: Provide sight guards on car doors.
p. Light Fixture Efficiency: Not less than 35 lumens/W.
q. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

B. Hoistway Entrances

1. Hoistway Entrance Assemblies: Manufacturer’s standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
   a. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

2. Materials and Fabrication:
   a. Stainless-Steel Frames: Formed from stainless-steel sheet.
   b. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
   c. Sills: Nickel silver, polished with grooved surface.
   d. Hall Fixtures: Satin stainless steel, No. 4 finish.
   e. Additional Requirements:
      1) Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
      2) Provide hooks for protective pads and one complete set(s) of full-height protective pads.
   f. Sight Guards: Provide sight guards on doors matching door edges.
   g. Non-Shrink, Non-Metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107/C 1107M.

2.4 PUBLIC ELEVATOR

A. Car Enclosure

1. General: Provide enameled or powder coated steel car enclosures to receive removable wall panels, with car roof, access doors, power door operators, and ventilation.

2. Materials and Finishes: Refer to drawings for wall panel configuration.
a. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

b. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from plastic-laminate manufacturer's full range.

c. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.

d. Car Fixtures: Satin stainless steel, No. 4 finish.

e. Side and Rear Wall Panels: Plastic laminate and Satin stainless steel, No. 4 finish.

f. Reveals: Satin stainless steel, No. 4 finish.

g. Door Faces (Interior): Satin stainless steel, No. 4 finish.

h. Door Sills: Nickel silver with grooved surface.

i. Ceiling: Satin stainless steel, No. 4 finish Flush panels, with low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.

j. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at sides and rear of car.

k. Floor recessed and prepared to receive ceramic tile (specified in Division 09 Section "Tiling").

l. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.

m. Fabricate car with recesses and cutouts for signal equipment.

n. Fabricate car door frame integrally with front wall of car.

o. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled or powder-coated cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

p. Sight Guards: Provide sight guards on car doors.

q. Light Fixture Efficiency: Not less than 35 lumens/W.

r. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

B. Hoistway Entrances

1. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

   a. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

2. Materials and Fabrication:

   a. Stainless-Steel Frames: Formed from stainless-steel sheet.

   b. Frames: Satin stainless steel, No. 4 finish.

   c. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

   d. Doors Satin stainless steel, No. 4 finish.

   e. Sills Nickel silver, polished with grooved surface.

   f. Hall Fixtures: Satin stainless steel, No. 4 finish.

   g. Additional Requirements:

      1) Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
h. Sight Guards: Provide sight guards on doors matching door edges.

i. Non-Shrink, Non-Metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107/C 1107M.

2.5 PATIENT TRANSFER ELEVATOR

A. Car Enclosure

1. General: Provide enameled or powder coated steel car enclosures to receive removable wall panels, with car roof, access doors, power door operators, and ventilation.

2. Materials and Finishes: Refer to drawings for wall panel configuration.

a. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

b. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from plastic-laminate manufacturer's full range.

c. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.

d. Car Fixtures: Satin stainless steel, No. 4 finish.

e. Side and Rear Wall Panels: Plastic laminate and Satin stainless steel, No. 4 finish.

f. Reveals: Satin stainless steel, No. 4 finish.

g. Door Faces (Interior): Satin stainless steel, No. 4 finish.

h. Door Sills: Nickel silver with grooved surface.

i. Ceiling: Satin stainless steel, No. 4 finish flush panels, with low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.

j. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at sides and rear of car.

k. Floor prepared to receive resilient flooring (specified in Division 09 Section "Resilient Flooring").

l. Subfloor: Exterior, C-C Plugged grade plywood, not less than 7/8-inch nominal thickness.

m. Fabricate car with recesses and cutouts for signal equipment.

n. Fabricate car door frame integrally with front wall of car.

o. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled or powder-coated cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

p. Sight Guards: Provide sight guards on car doors.

q. Light Fixture Efficiency: Not less than 35 lumens/W.

r. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

B. Hoistway Entrances

1. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.

   a. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

2. Materials and Fabrication:

   a. Stainless-Steel Frames: Formed from stainless-steel sheet.
b. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

c. Sills: Nickel silver, polished with grooved surface.

d. Hall Satin stainless steel, No. 4 finish.

e. Additional Requirements:

   1) Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

f. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches high, on both inside surfaces of hoistway door frames.

g. Sight Guards: Provide sight guards on doors matching door edges.

h. Non-Shrink, Non-Metallic Grout: Factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107/C 1107M.

2.6 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

E. Stainless-Steel Bars: ASTM A 276, Type 304.

F. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

G. Aluminum Extrusions: ASTM B 221, Alloy 6063.


I. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications Type HGP for post-formed applications and Type BKV for panel backing.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect elevator finishes

   1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

   2. Provide strippable protective film on entrance and car doors and frames.

   3. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.

   4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinshed in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

END OF SECTION 142100

ELEVATOR FINISHES

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