PROJECT MANUAL
Vol. 2 of 5
Divisions 2 - 14
10.21.16

NORM ASBJORNSON HALL

PPA # 13-0200
A/E # 2014-02-07
A&E # 14080
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SECTION 02 32 00 - GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes geotechnical data.

1.2 GEOTECHNICAL DATA
A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for the Proposed Norm Asbjornson Innovation Center, Montana State University, Bozeman, Montana, prepared by DOWL, dated March 8, 2016, is available for viewing as appended to this Document.

END OF SECTION 02 32 00

Attachment to follow: Geotechnical Report (77 pages)
SECTION 02 41 00 – SITE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. This section includes demolition, salvage and removal of selected site structures, utilities and surfacing.

1.2 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.
B. Section 31 20 00 - Earth Moving.

1.1 RELATED DOCUMENTS

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

Standard Specifications:

2. Except as specifically noted otherwise in the contract documents, all work shall be performed in accordance with the Standard Specifications.
3. The information in these project specifications shall take precedence in the event of any discrepancies. Any discrepancies discovered by the Contractor shall be brought to the attention of the Engineer before performing the associated work.

1.3 COORDINATION

A. Conduct pre-demolition conference to cover the following:

4. Identify items to be protected and preserved before proceeding with work.
5. Conduct a walking inspection to identify materials and equipment to be salvaged for re-installation and Owner use.
6. During the walking inspection, photograph or otherwise determine and record existing physical conditions of boundary areas. Surfaces, equipment, or other items damaged during demolition work are to be restored to original condition as recorded during the walking inspection.
7. Agree upon location where items salvaged for Owner are to be delivered and stored.

B. Prior to closing or obstructing streets, walks, or other adjacent occupied facilities, obtain written permission from the authorities having jurisdiction. Provide alternate vehicular and pedestrian routes in accordance with the requirements of the Owner and governing authorities. Provide, erect, and maintain temporary barriers and security devices.
C. Traffic and Passageways:

1. Conduct demolition operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
2. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
3. Provide temporary alternate vehicular and pedestrian traffic routes as required to complete the work and in accordance with the requirements of the Owner and governing authorities. Provide, erect, and maintain temporary barriers and security devices.
4. Maintain free and safe passage to and from Owner occupied areas.

D. Coordinate shut-off, capping, and continuation of utility services with Owner prior to any planned mechanical, electrical, and plumbing shutdowns. Schedule site demolition and removal work to ensure uninterrupted service of all utilities, or to obtain prior approval from the Owner for type, start date and duration of planned service outages.

E. Coordinate with the Owner to schedule irrigation shutdowns, demolition and replacement, and to provide temporary irrigation as required.

1.4 OBSTRUCTIONS

A. Some obstructions may not appear on the Drawings. Bidders are advised to carefully inspect the existing site before preparing their proposals. The protection or removal and replacement of minor obstructions such as fences, pipe, and similar items shall be anticipated and accomplished even though not shown or specifically mentioned.

B. Major obstructions encountered that are not shown on the Drawings, or could not have been foreseen by visual inspection of the site prior to bidding, should immediately be brought to the attention of the Architect. The Architect will make a determination for proceeding with the work. If the Architect finds that the obstruction adversely affects the Contractor's costs or schedule of completion, a proper adjustment to the Contract will be made in accordance with the General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Mark and identify location of utilities to be disconnected.

B. The Contractor is advised that there is a One-Call utility locate number in use for utility location requests within the state of Montana for buried utilities. The one call number is 1-800424-5555. MCA 69-4-501 through 69-4-506 requires the use of the One Call system prior to any excavation work in Montana.

C. The Contractor shall be responsible for having the appropriate utility or Owner turn off all services before demolition is started. Notify affected utility company in advance of date and time when service needs to be disconnected.
3.2 PROTECTION

A. Protect existing utilities, structures and other facilities to remain, including supporting soils, from damage at all times during performance of the work.

B. Protect improvements on adjoining properties as well as those on Owner's property.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary for safety and to support the structure and protect it from movement, settlement or damage.

D. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain in place.

E. Protect trees, shrubs and other vegetation unless specifically identified for demolition. Cut and remove tree branches only where, in the opinion of the Owner and Architect, such cutting is necessary to perform the specified work.

F. Restore improvements damaged by the Work to their original condition as acceptable to Owners or other parties or authorities having jurisdiction.

G. Protect salvageable items from damage.

H. Monuments and Markers: Preserve and protect survey monuments, benchmarks and markers from damage or displacement throughout construction. If damage occurs or removal becomes necessary, immediately notify Architect and restore monument or marker to original condition.

3.3 SALVAGEABLE IMPROVEMENTS

A. Carefully remove, store and protect materials and equipment indicated to be salvaged, and deliver to locations on the Owner's premises as directed by the Owner.

B. Carefully remove, store, and protect items noted on Drawings for salvage and re-installation. Store these items at locations as directed by the Owner.

C. Materials Retained by Contractor:
   1. Items of salvageable value not specified to be salvaged or re-installed, once removed, become the property of the Contractor and shall be removed as work progresses.
   2. On-site storage of salvaged items for sale on site will not be permitted.

3.4 STRUCTURE DEMOLITION

A. Perform demolition in accordance with governing authorities. Cease demolition operations immediately if adjacent structures appear to be in danger.

B. Remove existing curbs, gutters and concrete surfacing to existing joints or to neatly cut lines where no joints exist.

C. Pavement Removal: Asphalt and concrete pavement to be removed is shown on the Drawings or is above locations where new piping is to be installed. Remove existing pavement and material below the pavement to a depth sufficient to allow replacement of pavement, sub-base aggregate and base
course aggregate materials to the specified depths below the finished grade elevations indicated on the Drawings. Pavement to be removed shall be separated from pavement to remain by neat, vertically cut edges using a pavement breaker, cutting wheel or other Engineer-approved means.

D. Utilities:

1. Where electrical, natural gas, telephone, or any other utility lines are exposed by demolition excavation, the Contractor shall immediately notify the owner(s) of these utilities that their facilities have been exposed, and shall allow sufficient time for the utility to either re-locate their facilities or to determine that they have been abandoned. Rearrange demolition schedule as necessary to continue overall project progress without delay.

2. The Contractor shall be responsible for having the appropriate utility or Owner turn off all services before demolition is started. Notify affected utility company in advance of date and time when service needs to be disconnected.

3. Remove all buried overhead and underground utilities within the work area (grading limits) that have been abandoned previously or will be abandoned by this project.

4. Disconnect and cap utility services; comply with requirements of governing authorities. Do not commence demolition operations until associated disconnections have been completed.

5. If not in the construction area for the new facilities, all abandoned piping, fittings, and similar items may be left in place or removed at the Contractor's option.

6. All sanitary sewer lines, water lines, storm drain lines, culverts, utility conduits, and gas lines over 2 inches in diameter to be abandoned in place shall be plugged at the cut ends with concrete to form a tight closure with a length of at least 5 pipe diameters.

7. Submit record documents identifying actual locations of capped or abandoned existing utilities encountered during performance of the specified work.

A. Fencing and/or hand railing indicated on the drawings to remain may be removed by the Contractor at his option as an aid for construction access. Where such fencing is removed, all fence materials must be replaced in their original condition and location after construction is complete. Any fencing materials damaged by the Contractor's removal or other construction activities must be replaced with new materials matching the existing materials at no extra cost to the Owner.

B. Repair or replace, at Owner's option, demolition performed in excess of that required. Replacement will be at the sole expense of the Contractor.

3.5 HAZARDOUS MATERIALS

C. Inform Architect and Owner immediately upon discovery of asbestos products, radioactive materials, radon gas, toxic wastes, or other similar hazardous materials. Do not remove hazardous materials without Owner authorization.

D. Explosives are not permitted.

3.6 DEBRIS AND WASTE REMOVAL

A. All material and items not specified to be salvaged shall be removed and legally disposed of offsite by the Contractor. The Contractor shall make all necessary arrangements for this disposal, and shall bear any costs or retain any profit incidental to this disposal.

B. Recycle materials to the greatest extent possible.
C. No burning of debris is allowed on site.

3.7 CLEANING

A. Broom clean demolition areas of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Remove temporary work and protection when no longer needed.

END OF SECTION 02 41 00
SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.
   2. Section 03 35 43 "Polished Concrete" for special slab finish.
   3. Section 32 13 13 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Include any contractors performing work in Section 03 35 43 "Polished Concrete".
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor’s superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
   3. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Construction/Control/Isolation Joint Layout: Indicate proposed overall pour sequence and locations for all concrete work as well as any changes to the indicated construction, control, and isolation joints required to construct the structure.
   1. Location of all joints is subject to approval of the Architect/Engineer.

F. Samples: For waterstops, vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Waterstops.
   6. Curing compounds.
   7. Floor and slab treatments.
   9. Vapor retarders.
   10. Semirigid joint filler.
   12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:
   1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

E. Mockups: See Section 03 35 43 “Polished Concrete” for required cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:


C. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

2.4 REINFORCEMENT ACCESSORIES

A. Expansion Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. Cementitious Materials:
   2. Fly Ash: ASTM C 618, Class F.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
   1. Maximum Coarse-Aggregate Size: As indicated in the Drawings.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
   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. Greenstreak.
      b. Paul Murphy Plastics Company.
      c. Vinylex Corp.
   2. Profile: Ribbed without center bulb.

B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Greenstreak; Hydrotite.
      c. Vinylex Corp.; Swellseal.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   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. Stego Industries, LLC.: Stego Wrap Vapor Barrier (15 mil)
      b. Fortifiber Corporation; Moistop Ultra 15.
      c. Raven Industries Inc.; Vapor Block 15

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.9 RELATED MATERIALS

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: At contractor’s option, may use fly ash in mix designs. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated in the Drawings at 28 days.
   4. Air Content: As indicated in the Drawings.

B. Foundation Walls and Columns/Piers/Pilasters: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated in the Drawings at 28 days.
   4. Air Content: As indicated in the Drawings.

C. Slabs-on-Grade and Slabs-on-metal decking: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated in the Drawings at 28 days.
   4. Air Content: As indicated in the Drawings.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.
3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

F. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints where indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for slabs-on-deck as indicated.
4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

G. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated within 7 hours of final floating. Construct contraction joint as indicated and as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

H. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.

3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.6 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to all surfaces.
2. Finish exposed slab on grade surfaces indicated to be “polished concrete” to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
a. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

3. Finish non-exposed slab on grade surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

4. At exposed slabs on metal decks indicated to be “polished concrete”, finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

5. At non-exposed slabs on metal decks, finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: 4000 psi at 28 days.
   4. Install steel reinforcing to connect concrete base to concrete floor. Unless otherwise indicated, install at centers around the full perimeter of concrete base as indicated.
   5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete slabs on grade and slabs on metal deck that are indicated to have a “polished finish” by the following method according to ACI 308.1:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

F. Cure other concrete not included in the category above according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install joint filler full depth in saw-cut joints as indicated.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.
3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
   1. Steel reinforcement placement.
   2. Steel reinforcement welding.
   3. Headed bolts and studs.
   4. Verification of use of required design mixture.
   5. Concrete placement, including conveying and depositing.
   6. Curing procedures and maintenance of curing temperature.
   7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
      a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M.
      a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      b. For elements requiring verification of strength before remove of shoring or supports, cast and field cure an additional two sets of two standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
   7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
   8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
   9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

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

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00
SECTION 03 35 43 – POLISHED CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Grinding of the slab surface to receive clear reactive, penetrating liquid hardener/densifier.
   2. Application of clear reactive liquid hardener.
   3. Progressive polishing of the slab surface to achieve Finish Requirements.
   5. Protection of the slab surface to be polished from slab pour to project completion.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Placement of slabs requiring integral color, grinding and polishing.
   2. Section 09 65 13 - Resilient Base and Accessories: Transitions.

1.2 REFERENCES

A. American Concrete Institute (ACI):
   1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
   2. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

B. ASTM International (ASTM):
   1. ASTM C171 - Sheet Materials for Curing Concrete.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Samples: Submit one 12” x 12” sample of a polished concrete surface based upon the description of the process outlined in this Section. To facilitate the Mock-up process, the sample will be reviewed and discussed prior to developing the Mock-up outlined in Section 1.4C

C. Product Data: Submit data on hardener, sealer, and slip resistant treatment, compatibilities, and limitations.

D. Manufacturer’s Instructions: Submit application instructions, special procedures, and conditions requiring special attention.

E. Project Phasing Schedule indicating work descriptions, locations/areas of each work phase, and duration of each phase.

F. Certificate: Written certification, signed by manufacturer’s representative, stating applicator as trained and qualified to perform work of this Section using manufacturer’s products. Include qualification criteria.

G. Closeout Submittals
1. **Extra Material:** Provide 5 gallons of cleaning agent with hardener/densifier chemical content to prolong life of flooring finish.

2. **Operation and Maintenance Data:** Submit instructions on maintaining floor. Include methods and frequency recommended for maintaining optimum condition under anticipated use. Include precautions against cleaning products and methods which may be detrimental to finishes and performance.

### 1.4 QUALITY ASSURANCE

**A. Qualifications**

1. **Manufacturer:** Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

2. **Applicator/Installer:** Company specializing in performing work of this section with minimum of 5 successful projects.
   a. Certified by manufacturer’s representative as qualified to perform work of this Section, and accepted by Architect.
   b. Maintain competent supervisor who is at Project during times specified work is in progress.

**B. Pre-Installation Meeting**

1. **Attendance:** Contractor, Owner, Architect, concrete slab installer and finisher, polished floor installer, manufacturer’s rep, and any others requested to attend.
2. **Timing:** At least 3 weeks prior to beginning work of Section 03 30 00 in area to be polished.
3. **Establish project timeline and communicate necessity of quality assurance measures.**

**C. Mock-Up**

1. **Section 01 40 00 – Quality Control Services:** Requirements for mockup.
2. Construct mock-ups of approximately 200 sf at slab on grade and elevated slab under conditions similar to those which will exist during actual placing, with specified finishes and coatings applied, and specified joints. In each mock-up, include and hand-finish condition. Finish various components to show maximum variation that will exist in work. Locate mock-ups where the slab will be covered by a finished material. Coordinate locations with Architect.
3. Use same personnel, including supervisors, which will perform work.
4. Use specular gloss meter as required to verify accepted gloss level.

### 1.5 DELIVERY, STORAGE, AND HANDLING

**A. Section 01 60 00 - Product Requirements:** Product storage and handling requirements.

**B. Deliver materials in manufacturer’s packaging including application instructions.**

### 1.6 PROJECT CONDITIONS

**A. Section 01 60 00 – Product Requirements:** Environmental conditions affecting products on site.

**B. Temporary Lighting:** Minimum 200 W light source, placed 8 feet above floor surface, for each 425 sq ft of floor being finished.

**C. Temporary Heat:** Ambient temperature of 50 degrees F minimum. Maintain work area temperature, humidity, and ventilation within limits recommended by manufacturer of any products used for application.
D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

E. Concrete Slab Curing:
   1. Moisture cure, using moisture-retaining cover, non-staining curing paper or film for minimum 7 days and as specified Section 03 30 00.
   2. Do not apply liquid curing compounds to concrete floors, except as instructed by manufacturer and accepted by Architect as part of work of this Section.
   3. Cure slab minimum 28 days, or as instructed by manufacturer, before beginning work of this Section.

F. Protection of concrete floor surface:
   1. Protect concrete floor slab to be polished throughout the entire construction process – from slab pour to project completion.
   2. ‘Diaper’ all hydraulic powered equipment to prevent floor surface abrasion and to prevent oils, hydraulic fluids, grease, etc., from contacting the floor surface.
   3. Inform all trades that the concrete floor shall be protected at all times. Protect floor surface from acids, acidic detergent, cutting oils, primers, solvents, dyes, etc. Protect floor surface from impact, abrasion, chips, gouges, etc.
   4. Do not permit vehicles or pipe cutting machinery on the concrete floor surface.
   5. Do not place steel on concrete floors.

1.7 COORDINATION
   A. Coordinate the Work with concrete floor placement and concrete floor curing.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Floor Flatness and Floor Levelness Tolerances: Conform to Section 03 30 00 and specified ACI 302.1R, and ACI 117 provisions.

   B. ADA Coefficient of Friction:
      1. Minimum dry static coefficient of friction (SCOF) of 0.6 as measured per latest editions of ASTM C1028 or ASTM F-609.
      2. Slip Resistance Potential rating of Acceptable (not less than 0.40 for level surfaces or inclined surfaces) when tested by measuring the wet dynamic coefficient of friction using an approved tribometer according to ANSI B101.3 Test Method for Measuring Wet DCOF of Common Hard Surface Floor Materials.

   C. Degree of Reflectiveness: Medium to High Appearance: Not less than 60 units, as tested in accordance with ASTM E430.

   D. Degree of Hardness: Exceeding 5.5 tested in accordance with ASTM D3363.

2.2 ACCEPTABLE MANUFACTURERS
   A. Consolideck L/S by Prosoco, 3741 Greenway Circle, Lawrence, KS 66046.

   B. LM Scofield Formula One. Tel: 800.800.9900.
1. Performance Criteria:
   a. System materials to be same types as specified for Consolideck.

C. FGS PermaShine manufactured by L&M Construction Chemicals, 14851 Calhoun Road, Omaha, NE, 68152. Tel: 800-362-3331.

   1. Performance Criteria:
      a. System materials to be same types as specified for Consolideck.

D. Retroplate, manufactured by Advanced Floor Products, Inc., PO Box 50533, Provo Utah 84605. Tel: 801-812-3420.

   1. Performance Criteria:
      a. System materials to be same types as specified for Consolideck.

E. Substitutions: Under provisions of Section 01 25 00.

2.3 MATERIALS

A. Hardener/Densifier: Basis-of-Design - Consolideck LS.

   1. Description: Premium hardener and sealer for concrete surfaces. A penetrating lithium silicate treatment reacting with the calcium hydroxide from concrete hydration to produce insoluble calcium silicate hydrates.
      a. Properties:
         1) Form: Clear, water like liquid.
         2) Specific Gravity: 1.10.
         3) pH: 11.
         5) Active Content: 14.5%.
         6) Total Solids: 14.5%.
         7) Freeze Point: 32 degrees F.
         8) VOC Content: VOC compliant.

B. Protective Finish Treatment: Basis-of-Design - Consolideck SLX100 Water and Oil Repellant.

   1. Description: Combines water and oil repellency to prevent staining by waterborne and oily substances.
      a. Properties:
         1) Form: Clear liquid, slight solvent odor.
         2) Specific Gravity: .909.
         3) Wt/Gal: 7.56 lbs.
         4) Active Content: 93%.
         5) Total Solids: 62%.
         6) VOC Content: VOC compliant.

C. Maintenance Cleaning Product: Basis-of-Design - Consolideck Klean Super Concentrate

   1. A concentrated maintenance cleaner for concrete floors.
      1) Form: Clear liquid, soapy odor.
      2) Specific Gravity: 1.014.
      3) pH: 11.0.
      4) Wt/Gal: 8.45 lbs.
      5) Flash Point: ASTM D3278, more than 200 degrees F.
      6) VOC Content: VOC compliant.
2.4 ACCESSORIES

A. Neutralizing Agent: Tri-sodium phosphate or baking soda.

B. Water: Clear and potable.

C. Protection Layer: Conforming to ASTM C171, Type 1.1.1, non-staining, moisture retentive, as specified by Section 03 30 00, or as instructed by manufacturer and accepted by Architect.

D. Joint Filler:
   1. Manufacturers:
      a. CSS Polymers Quick Joint.
      b. Metzger/McGuire Spal-Pro RS 88 polyurea joint filler.
   2. Color: To be selected by Architect from manufacturer’s complete range of color options.

2.5 EQUIPMENT

A. Shot blasting and Grinding Equipment: Equipped with vacuum to capture and prevent concrete dust from escaping into interior spaces, and as instructed by manufacturer.

2.6 FINISHES

A. Final Concrete Floor Finish (CONC-1): Conform to finish sheen and treatment as accepted by mock-up. Definitions as outlined in Concrete Polishing Association of America (CPAA) Polished Concrete Definition D100.0.

   1. Finished Gloss: Level 2 Satin (Honed) Finish, matte appearance with or without slight diffused reflection. Suggested Grit Range: 100 to 400.
   2. Aggregate Exposure: Class C, Medium Aggregate Finish: Remove not less than 3/16 inch of concrete surface by grinding and polishing resulting in medium aggregate exposure with little or no large aggregate exposure at random locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify the following conditions as satisfactory to receive work of this Section before beginning:

   1. Concrete Surface:
      a. Clean, smooth and flat conforming to specified floor tolerances listed above.
      b. Free of chemicals, acids, curing compounds and other substance that may inhibit application of products specified in this Section.

3.2 PREPARATION

A. Where concrete slabs do not conform to tolerances specified in this Section above and Section 03 30 00, make flat and level. Perform work as necessary to provide substrate within acceptable tolerances.

B. Protect surfaces not receiving work of this Section.

   1. Seal off adjacent building areas and cover adjacent work to limit air-born dust migration from settling on surfaces and polluting other parts of the building.
C. Clean concrete surfaces of dirt and other particulates and remove oil, stains, grease, adhesives, water repellants, and other substances that may be detrimental of this Section.

D. Perform repair of isolated surface defects, irregularities and cracks prior to grinding floor to match adjacent floor finish.

E. Installation of Joint Filler at construction and control joints:
   1. Clean joint of dirt, debris, coatings, etc. Joints must be free of all laitance and visible moisture. Joints shall have continuous, square edges without spalls or voids.
   2. Mask edges of joint as required and install backer rod. Install joint filler per manufacturer’s recommendations until material crowns the floor surface without voids.
   3. Color of joint filler product to be selected by Architect from full range of manufacturer’s selections.

3.3 GRINDING

A. Perform initial grinding to remove protective coverings from concrete floor slab using subsequent finer grits until floor is scratch pattern free.

B. Commence grinding procedures to achieve desired finish as described in Para. 2.6 above.

C. Cross grind at 90 degree angles to achieve uniform scratch patterns at each grinding grit level.

D. Vacuum the floor thoroughly after each grind.

E. DENSIFIER APPLICATION

F. Apply hardener/densifier. Comply with manufacturer’s current recommendations. Apply as required to seal and densify concrete surface without changing color of concrete surface except for sheen.

G. Squeegee or AutoScrub excess material off of floor as recommended by manufacturer.

H. Allow 1-2 hours to dry before proceeding if required by densifier manufacturer.

I. POLISHING

J. Perform finish polishing of concrete floor slab using polishing equipment to achieve uniform final finish, matching mock-up and described in Para. 2.6 above.

K. PROTECTIVE FINISH APPLICATION

L. Apply light coating of protective finish treatment using micro fiber mop. Allow to dry. Burnish using #1500 grit diamond pad and high speed burnisher per manufacturer’s recommendations.

M. EDGES

N. Where desired, polished edge work of all areas shall be done with a hand held or walk behind polishing tool. Match edge polishing process to desired gloss level.

O. FIELD QUALITY CONTROL

P. Manufacturer’s Representative:
1. Attend pre-installation meeting.
2. Perform initial inspection and subsequent inspections during and at completion of work to verify conformance with manufacturer’s instructions.
3. Make recommendations for remedial action where non-conforming work is discovered.

Q. Test Reports: Provide field quality control sheen gloss reading and static coefficient of friction test results confirming compliance with specified performance criteria.

3.4 CLEANING

A. Leave area clean, free from spillage, overspray, tracking, and other residue resulting from work of this Section.

B. Repair or replace any adjacent surfaces damaged by work of this Section, as directed by Architect.

C. Clean polished concrete using maintenance cleaning product recommended by manufacturer prior to Substantial Completion of Project. Repair scratches, and other surface damage to show no evidence of repair.

3.5 PROTECTION

A. Install slurry coat over all polished floor areas after initial grinding process to allow for additional protective layer. Slurry coat to be a minimum of 1/8" thick.

B. Cover the polished floor after grinding and polishing processes are complete with one of the following methods. Floor protection to remain in place until all interior finish work is complete except wall base installations.

   1. EZ Cover: http://www.mctechgroup.com/ezcover.html
   2. Ram Board: http://www.ramboard.com/

C. Do not lay non-permeable films, membranes, or covers, including polyethylene, over finished floor.

END OF SECTION 03 35 43
SECTION 04 26 13 - MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Clay face brick.
B. Products Installed but Not Furnished under This Section:
   1. Steel lintels in masonry veneer.
   2. Steel shelf angles for supporting masonry veneer.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
C. Samples for Verification: For each type and color of brick and colored mortar.

1.3 INFORMATIONAL SUBMITTALS
A. Material Certificates: For each type and size of product.

1.4 QUALITY ASSURANCE
A. Sample Panels: Sample panels for masonry veneer and mortar were constructed for the Parking Garage projects and are available on the site. The final accepted panel will serve as the basis-of-design for the building masonry veneer and mortar.

1.5 FIELD CONDITIONS
A. 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 TMS 602/ACI 530.1/ASCE 6.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

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

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

2.2 BRICK

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

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Locations include but are not limited to ledger angles, window head conditions and as indicated on drawings.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Manufacturer: Endicott Clay Products Co., Endicott, NE (402) 729-3315
2. Grade SW.
3. Type FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
9. Layup Pattern: Modified standard bond or stacked soldier bond as indicated on drawings. Three vertical courses equals 8 inches.

2.3 MORTAR MATERIALS

A. Regional Materials: Aggregate for mortar and grout shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
C. Hydrated Lime: ASTM C 207, Type S.

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

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Davis Colors.
   b. Euclid Chemical Company (The); an RPM company.
   c. Lanxess Corporation.
   d. Solomon Colors, Inc.

F. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement-Lime Mix:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Holcim (US) Inc.
      2) Lafarge North America Inc.
      3) Lehigh Hanson; HeidelbergCement Group.

G. Aggregate for Mortar: ASTM C 144.

1. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation; Construction Systems.
   b. Euclid Chemical Company (The); an RPM company.
   c. GCP Applied Technologies Inc. (formerly Grace Construction Products).

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete bricks containing integral water repellent from same manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ACM Chemistries.
   b. BASF Corporation - Admixture Systems.
c. Euclid Chemical Company (The); an RPM company.
d. GCP Applied Technologies Inc. (formerly Grace Construction Products).

J. Water: Potable.

2.4 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

1. Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.

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


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 made from 0.25-inch-diameter, hot-dip galvanized-steel wire.
3. Tie connector section consists of a triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch-thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie made from 0.25-inch-diameter, hot-dip galvanized-steel wire.
3. Tie connector section consists of a triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire.

E. Adjustable Masonry-Veneer Anchors for Connecting to Light Gage Steel Stud Wall framing:

1. Fabricate sheet metal anchor sections and other sheet metal parts from a minimum of 0.105-inch-thick steel sheet, galvanized after fabrication.
2. Fabricate wire ties from a minimum of 0.25-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
3. Fabricate wire connector sections from a minimum of 0.25-inch-diameter, hot-dip galvanized, carbon-steel wire.
4. Seismic Masonry-Veneer Anchors: Connector section and a gasketed sheet metal anchor section, 1-1/4 inches wide by 6 inches long, with screw holes top and bottom; top and bottom
ends bent to form pronged legs of length to match thickness of insulation or sheathing; and raised rib-stiffened strap, 5/8 inch wide by 6 inches long, stamped into center to provide a slot between strap and base for inserting connector section. Connector section consists of a triangular wire tie and rigid PVC extrusion with snap-in grooves for inserting continuous wire.

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

1) Hohmann & Barnard, Inc.
2) Wire-Bond.

5. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except with hex washer head and neoprene or EPDM washer, No. 10 diameter and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.

2.5 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Section 076200 “Sheet Metal Flashing and Trim” and as follows:

1. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
2. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

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

1) Advanced Building Products Inc.
2) Hohmann & Barnard, Inc.
3) York Manufacturing, Inc.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 “Sheet Metal Flashing and Trim.”

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer’s standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.6 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. Weep/Vent Products: Use the following unless otherwise indicated:
1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

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

      1) Advanced Building Products Inc.
      2) Heckmann Building Products, Inc.
      3) Hohmann & Barnard, Inc.
      4) Wire-Bond.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

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

      a. Advanced Building Products Inc.
      b. Heckmann Building Products, Inc.
      c. Hohmann & Barnard, Inc.
      d. Mortar Net Solutions.
      e. Wire-Bond.

   2. Configuration: Provide one of the following:

      a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
      b. Strips, not less than 1-1/2 inches thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
      c. Sheets or strips, full depth of cavity and installed to full height of cavity.

2.7 MASONRY CLEANERS

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

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

      b. PROSOCO, Inc.

2.8 MORTAR 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. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Use Type N unless another type is indicated.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of portland cement by weight.
   2. Mix to match Architect’s on-site mock-up.
   3. Application: Use pigmented mortar for exposed mortar joints.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
   1. Mix to match Architect’s on-site mock-up.
   2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

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

C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.3 LAYING MASONRY WALLS

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

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

3.4 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and horizontally. Install additional anchors within 12 inches of openings and at intervals, not exceeding 24 inches, around perimeter.
B. Provide continuous airspace as shown on drawings between back of masonry veneer and face of insulation.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space as shown between masonry and structural steel or concrete unless otherwise indicated for other anchored masonry veneers. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints with continuous wire and attached to structure.
3. Space anchors as indicated, but not more than 18 inches o.c. vertically and 18 inches o.c. horizontally.

3.7 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.

C. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.

D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in “Miscellaneous Masonry Accessories” Article.

E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.
3.8 FIELD QUALITY CONTROL

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

B. Inspections: Special inspections according to 2012 IBC and Level A in TMS 402/ACI 530/ASCE 5.

C. Provide periodic inspections of the anchored masonry veneer installation to verify compliance with the approved submittals.

3.9 REPAIRING, REPOINTING, AND CLEANING

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

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
3. 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.

3.10 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 26 13
SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. For SidePlate Connections the more stringent criteria between the SidePlate General Notes and this Specification section shall apply to the SidePlate moment frame connections.

1.2 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Field-installed shear connectors.

B. Related Requirements:
   1. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
   2. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
   2. Welded built-up members with plates thicker than 2 inches.
   3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are prohibited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.
1.4 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 anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. **Product Data:** For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   5. Identify members and connections of the Seismic-Load-Resisting System.
   6. Indicate locations and dimensions of protected zones.
   7. Identify demand critical welds.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and, for SLRS members and SidePlate Connections, according to AWS D1.8/D1.8M, for each welded joint whether prequalified or qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator, professional engineer, and testing agency.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.
   1. Include Charpy V-Notch test results for heavy shapes according to AISC 360.
   2. Include Charpy V-Notch test results for heavy sections according to AISC 341 and 341s1.
D. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.

E. Source Quality Control:
   1. Fabricator's and Erector's Quality Control Measures for SidePlate Connections.
   2. Fabricator's and Erector's Distortion Control Procedures for SidePlate Connections.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

C. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and relubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Special Moment Frame Connections: Proprietary “SidePlate” system, see SidePlate structural notes.
2.2 STRUCTURAL-STEEL MATERIALS

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

B. **W-Shapes**: ASTM A 992.

C. **Channels, Angles, S-Shapes**: ASTM A 36, ASTM A529, ASTM A572. Where angles are used in the SidePlate moment frame connections, minimum yield strength shall be 50 ksi (50 ksi yield or greater may be justified by a mill certificate).

D. **Plate and Bar**: ASTM A 36, unless indicated in general connection details as “Grade 50”, then provided ASTM A572. All plate or bar connection material for the SidePlate moment frame connections shall be ASTM A572 and have a minimum yield strength of 50 ksi (50 ksi yield or greater may be justified by a mill certificate).

E. **Cold-Formed Hollow Structural Sections**: ASTM A 500, Grade B, structural tubing.

F. **Steel Pipe**: ASTM A 53, Type E or Type S, Grade B.
   1. **Weight Class**: As indicated in the Drawings.
   2. **Finish**: Black except where indicated to be galvanized.

G. **Steel Castings**: ASTM A 216, Grade WCB with supplementary requirement S11.

H. **Welding Electrodes**: Use E70XX electrodes unless indicated otherwise. Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M requirements.
   1. Welding electrodes for demand critical welds shall meet the Charpy V-Notch toughness requirements of AISC 341 and 341s1 section 7.3b and diffusible hydrogen level requirements of AWS 1.8/D1.8 M section 6.3.2.

I. **BOLTS, CONNECTORS, AND ANCHORS**

J. **High-Strength Bolts, Nuts, and Washers**: Unless indicated as “A325-SC” bolts, provide snug tightened ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

K. **High-Strength Bolts, Nuts, and Washers**: Where indicated as “A490-N” bolts, provide snug tightened ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

L. **Tension-Control, High-Strength Bolt-Nut-Washer Assemblies**: At typical connections where bolts are indicated as “A325-SC”, provide ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. **Finish**: Plain.

M. **Tension-Control, High-Strength Bolt-Nut-Washer Assemblies**: for the SidePlate moment frame connections, provided ASTM F 2280, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. **Finish**: Plain.

N. **Shear Connectors**: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
O. Headed or Unheaded Anchor Rods: ASTM F 1554, Grade 36 unless indicated as ASTM F 1554, Grade 55 (type S1, weldable), in the Drawings.
   4. Washers: ASTM F 436, Type 1, hardened carbon steel.
   5. Finish: Plain.

P. Threaded Rods: ASTM A 36/A 36M, unless indicated in the Drawings as “Grade 50” or “Gr. 50” then provide ASTM A 572/A 572M, Grade 50.
   2. Washers: ASTM F 436, Type 1, hardened carbon steel.
   3. Finish: Plain.

Q. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

R. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

S. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

T. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
   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. Amscot Structural Products Corp.
      b. Fluorocarbon Company Limited.
      c. R.J. Watson Bridge & Structural Engineered Systems.
      d. Seismic Energy Products, L.P.
      e. Fabreeka Bearings, Structural Expansion/Slide Bearings
   2. Mating Surfaces: PTFE and PTFE.
   3. Coefficient of Friction: Not more than 0.05.
   4. Design Load: Not less than 2,000 psi.
   5. Total Movement Capability: 6-inches.

2.3 PRIMER

A. Primer: Fabricator’s standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time, minimum compressive strength of 7000 psi at 7 days.
2.5 FABRICATION

   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.
   5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, sub-punch, or punch standard bolt holes perpendicular to metal surfaces. Punched holes are not permitted at SidePlate connections.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning. Punched holes are not permitted at SidePlate connections.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened unless noted as pretensioned or "SC", slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
   2. At building elements indicated for welds to comply with architecturally exposed structural steel (AESS) quality and appearance standards, use weld sizes, fabrication sequence, and equipment for AESS components that limit distortions to allowable tolerances.
   3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS quality welds are exposed to weather.
   4. Provide continuous welds of uniform size and profile where AESS quality welding is indicated.
   5. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch for AESS quality welding. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
6. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for AESS quality welding.
7. At locations where welding on the far side of an exposed connection of AESS quality welding occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
8. Make fillet welds for AESS quality welding of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform shop tests and inspections.
1. If Owner chooses to engage a qualified testing agency, provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections. Owner reserves the right to perform inspections at the project site after delivery of fabricated materials.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and as indicated in the Statement of Special Inspection included in the drawings.
1. In addition to visual inspection, shop welds will be tested and inspected according to AWS D1.1/D1.1M, AWS D1.8/D1.8M, and the following inspection procedures, at testing agency's option:
a. Partial Joint Penetration Welds: One spot test per weld using magnetic particle inspection, according to ASTM E 709, or ultrasonic inspection, according to ASTM E 164. Test at least 4 inches of weld length. If flaws are detected, test two additional spots in the weld. If additional flaws are detected, test entire length of all welds in the joint.

b. Complete Joint Penetration Welds: Test full length of weld using ultrasonic inspection, according to ASTM E 164.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers where indicated to top of baseplate.
   3. At the Special Moment Frame column baseplates, if setting/leveling nuts are used, shim with steel and back-off leveling nuts prior to snug tightening anchor rods and grouting below baseplate.
   4. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
5. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened unless noted as pretensioned or “SC”, slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   4. At building elements indicated for welds to comply with architecturally exposed structural steel (AESS) quality and appearance standards, use weld sizes, fabrication sequence, and equipment for AESS components that limit distortions to allowable tolerances.
   5. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS quality welds are exposed to weather.
   6. Provide continuous welds of uniform size and profile where AESS quality welding is indicated.
   7. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus zero inch for AESS quality welding. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
   8. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for AESS quality welding.
9. At locations where welding on the far side of an exposed connection of AESS quality welding occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
10. Make fillet welds for AESS quality welding of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and as indicated in the Statement of Special Inspection included in the drawings.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Permanently mark all Protected Zones.

END OF SECTION 05 12 00
SECTION 05 21 00 - STEEL JOIST FRAMING

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:
      2. LH- long-span steel joists.

1.3 DEFINITIONS
   A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
   B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of joist, accessory, and product.
   B. Sustainable Design Submittals:
      1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   C. Shop Drawings:
      1. Include layout, designation, number, type, location, and spacing of joists.
      2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For manufacturer.
   B. Welding certificates.
   C. Manufacturer certificates.
   D. Mill Certificates: For each type of bolt.
E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
   1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
   1. Use ASD; data are given at service-load level.
   2. Design special joists to withstand design loads with snow-load deflections no greater than the following:

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

2.2 K-SERIES STEEL JOISTS


B. Provide holes in chord members for connecting and securing other construction to joists.

C. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

E. Do not camber joists.
F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 LONG-SPAN STEEL JOISTS

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

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications."

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

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

2.5 JOIST ACCESSORIES

A. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

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

C. Welding Electrodes: Comply with AWS standards. Use E70XX electrodes unless indicated otherwise.

D. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

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

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

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

3.1 EXAMINATION

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

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

3.2 INSTALLATION

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

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
   4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

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


E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
      b. Magnetic Particle Inspection: ASTM E 709.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.
3.4 PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION 05 21 00
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. Roof deck.
3. Composite floor deck.
5. Noncomposite form deck.

B. Related Requirements:
1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight structural concrete fill over steel deck.
2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Section 09 91 23 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
1. Power-actuated mechanical fasteners.
2. Acoustical roof and floor deck.
D. Evaluation Reports: For steel deck, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."


1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof and floor deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. 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.

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

2.2 ROOF DECK

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. Nucor Corp.; Vulcraft Group.
   2. Verco Manufacturing Co.
   3. ASC Steel Deck

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Gray top surface with white underside.
   2. Deck Profile: Type WR, wide rib.
   3. Profile Depth: As indicated.
4. **Design Uncoated-Steel Thickness:** As indicated.
5. **Span Condition:** As indicated.
6. **Side Laps:** Overlapped.

### 2.3 ACOUSTICAL CELLULAR ROOF DECK

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. Nucor Corp.; Vulcraft Group.
2. Verco Manufacturing Co.
3. ASC Steel Deck

B. **Acoustical Cellular Roof Deck:** Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. **Prime-Painted Steel Sheet:** ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
   a. **Color:** Gray top surface with white underside.
2. **Cellular Deck Profile:** Type WR, wide rib, with bottom plate.
3. **Profile Depth:** As indicated.
4. **Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate:** As indicated.
5. **Span Condition:** As indicated.
6. **Side Laps:** Overlapped.
7. **Acoustical Perforations:** Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
8. **Sound-Absorbing Insulation:** Manufacturer's standard premolded roll or strip of glass or mineral fiber.
   a. **Factory install sound-absorbing insulation into cells of cellular deck.**
9. **Acoustical Performance:** NRC 0.70, tested according to ASTM C 423.

### 2.4 COMPOSITE FLOOR DECK

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. Nucor Corp.; Vulcraft Group.
2. Verco Manufacturing Co.
3. ASC Steel Deck

B. **Composite Floor Deck:** Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. **Prime-Painted Steel Sheet:** ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard white baked-on, rust-inhibitive primer.
2. **Profile Depth:** As indicated.
3. **Design Uncoated-Steel Thickness:** As indicated.
4. **Span Condition:** As indicated.
5. **Side Laps:** Interlocking seam.

### 2.5 ACOUSTICAL CELLULAR COMPOSITE FLOOR DECK

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. Nucor Corp.; Vulcraft Group.
2. Verco Manufacturing Co.
3. ASC Steel Deck

B. Acoustical Cellular Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard white baked-on, rust-inhibitive primer.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
4. Span Condition: As indicated.
6. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
7. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber
   a. Factory install sound-absorbing insulation into cells of cellular deck.
8. Acoustical Performance: NRC 0.70, tested according to ASTM C 423.

2.6 NONCOMPOSITE FORM DECK

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. Nucor Corp.; Vulcraft Group.
2. Verco Manufacturing Co.
3. ASC Steel Deck

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.
5. Side Laps: Overlapped.

2.7 ACCESSORIES

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

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

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

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

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

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Galvanizing Repair Paint: ASTM A 780/A 780M.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

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

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

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

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

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

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

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members and connect sidelaps between adjacent steel sheets as indicated in the Drawings.

B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

C. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
   1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

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

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels and connect sidelaps between adjacent steel sheets as indicated in the Drawings.

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

C. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

D. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds and other decking attachments will be subject to inspection.

C. Prepare test and inspection reports.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.
B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on bottom surface of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

END OF SECTION 05 31 00
SECTION 05 40 00 - COLD-FORMED METAL FRAMING

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. Load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
   2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
   3. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of code-compliance certification for studs and tracks.
C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
   1. Steel sheet.
   2. Expansion anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

D. Evaluation Reports: For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association.

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

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. ClarkWestern Building Systems, Inc.
   2. Dietrich Metal Framing; a Worthington Industries company.
   3. SCAFCO Corporation.
   4. Steel Network, Inc. (The).
   5. Steeler, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
   1. Wall Studs: AISI S211.
B. 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 acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

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

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
   1. Grade: ST33H.
   2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection, Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: 33 50, Class 1 as required by structural performance.
   2. Coating: G60.

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: As indicated.
   2. Flange Width: As indicated.
   3. Section Properties: As indicated.

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: As indicated.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as indicated.

2.5 EXTERIOR NON-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: As indicated.
   2. Flange Width: As indicated.
   3. Section Properties: As indicated.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: As indicated.
C. Vertical Deflection Clips: Manufacturer’s standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   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. ClarkWestern Building Systems, Inc.
      b. Dietrich Metal Framing; a Worthington Industries company.
      c. SCAFCO Corporation.
      d. Steel Network, Inc. (The).
      e. Steeler, Inc.

D. Single Deflection Track: Manufacturer’s single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: as indicated.
   2. Flange Width: as indicated.

E. Double Deflection Tracks: Manufacturer’s double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: as indicated.
      b. Flange Width: as indicated
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Base-Metal Thickness: as indicated
      b. Flange Width: as indicated

F. Drift Clips: Manufacturer’s standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation 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.
   9. Joist hangers and end closures.
2.7 ANCHORS, CLIPS, AND FASTENERS

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

B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards, use E60XX electrodes unless noted otherwise.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M.

B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

D. 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 as required.

2.9 FABRICATION

A. Fabricate cold-formed steel 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 steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M 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, with screws penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

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

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable 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 steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing 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. 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 required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and 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 steel 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 steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners, install according to Shop Drawings, and comply 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 equal 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 joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

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 spacings as follows:
   1. Anchor Spacing: As indicated.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 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 indicated on Drawings.

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

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. 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. Fasten jamb members together to uniformly distribute loads.
   2. Install 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.
H. 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.

I. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.

J. 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 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As indicated on Drawings.

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

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
   4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection.
   1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
   1. Install solid blocking at 96-inch centers.

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

3.6 ERECTION TOLERANCES

A. Install cold-formed steel 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.

3.7 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. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

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

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M 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 steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00
SECTION 05 50 00 - METAL FABRICATIONS

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. Steel framing and supports for ceiling-hung toilet compartments.
2. Steel framing and supports for overhead doors and counter shutters.
3. Steel framing and supports for countertops.
4. Steel tube reinforcement for low partitions.
5. Steel framing and supports for mechanical and electrical equipment.
6. Steel framing and supports for portable cranes or lifting devices.
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
8. Steel shapes for supporting elevator door sills.
9. Shelf angles.
10. Metal ladders.
11. Metal ships’ ladders.
12. Elevator pit sump covers.
13. Miscellaneous steel trim including steel angle corner guards and steel edgings.
14. Metal bollards.
15. Abrasive metal nosings for stair treads.
16. Loose bearing and leveling plates for applications where they are not specified in other Sections.
17. Loose steel lintels.
18. Loose steel plates and angles.
19. Aluminum grating screen wall panels (bridge).
20. Roof paver platform edging and guardrail.
21. Transformer enclosure.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be

C. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Section 04 26 13 "Masonry Veneer" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Section 05 12 00 "Structural Steel Framing."
4. Section 32 93 00 "Trees, Shrubs, and Groundcovers" for tree grates.
1.3 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.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Nonslip aggregates and nonslip-aggregate surface finishes.
   2. Prefabricated building columns.
   3. Metal nosings and treads.
   4. Paint products.
   5. Grout.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   1. Steel framing and supports for overhead doors and grilles.
   2. Steel framing and supports for countertops.
   3. Steel tube reinforcement for low partitions.
   4. Steel framing and supports for mechanical and electrical equipment.
   5. Steel framing and supports for portable cranes or lifting devices.
   6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   7. Steel shapes for supporting elevator door sills.
   8. Shelf angles.
   9. Metal ladders.
   10. Metal ships’ ladders.
   11. Elevator pit sump covers.
   12. Miscellaneous steel trim including steel angle corner guards and steel edgings.
   13. Metal bollards.
   15. Loose bearing and leveling plates for applications where they are not specified in other Sections.
   16. Loose steel lintels.
   17. Loose steel plates and angles.
   18. Aluminum grating screen wall panels (bridge)
   19. Transformer enclosure.

D. Samples for Verification: For each type and finish of extruded nosing.
E. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

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

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

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

B. 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."
   3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

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 01 40 00 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2.2 METALS

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

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

D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

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

F. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

G. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.


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, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. 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.
F. 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/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

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

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

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

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/D 1187M.

E. 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.

F. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

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 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 or welds
   where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners
   unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are 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.

J. 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.

C. Hot-dip galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing.
   Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends
   and 24 inches o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately
      2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and
   concrete.

C. Hot-dip galvanize shelf angles located in exterior walls. Masonry ledgers to be galvanized.
D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders: Bidder designed.

1. 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.
2. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
3. Hot-dip galvanize and prime exterior ladders, including brackets.

2.9 METAL SHIPS' LADDERS

A. Brackets and fittings for installation.

1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
2. Fabricate ships' ladders, including railings from steel.
3. Fabricate treads and platforms from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 3/4 inch in least dimension.

B. Hot-dip galvanize and prime exterior steel ships' ladders, including treads, railings, brackets, and fasteners.

2.10 ELEVATOR PIT SUMP COVERS

A. Fabricate from 3/16-inch rolled-steel floor plate with four 1-inch-diameter holes for water drainage and for lifting.

B. Provide steel angle supports as indicated.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe steel shapes, as indicated.

1. Cap bollards with 1/4-inch-thick steel plate.
2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.

B. Hot-dip galvanize bollards.

C. Paint in the field.

2.13 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast aluminum with an integral-abrasive, non-slip finish. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Safety Tread Co., Inc.
   b. Balco, Inc.
   c. Barry Pattern & Foundry Co., Inc.
   d. Safe-T-Metal Company, Inc.

2. Nosings: Basis-of-Design – American Safety Tread Style 801SP

B. Provide anchors for embedding units in wood treads, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed surfaces of cast-metal units. Color to be black.

E. Apply clear lacquer to concealed surfaces of extruded units.

2.14 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Hot-dip galvanize plates.
C. Prime plates with zinc-rich primer.

2.15 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Hot-dip galvanize and prime loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.16 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.17 ALUMINUM GRATING SCREEN WALL PANELS

A. McNichols Quality Swage Locked Bar Grating, Aluminum Type 6063-T6, GAL 150 Smooth, 1 ¼” x 3/16” bearing bars, 1 3/16” o.c., regular cross bars at 4” o.c., 24” and 36” wide panels with all sides banded, length varies, or approved equal. See drawings for fabrication and attachment details.

2.18 ROOF PAVER EDGING AND GUARDRAIL

1. As shown on the drawings.

2.19 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

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

2.20 STEEL AND IRON FINISHES

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

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

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

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

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

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

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

2.21 ALUMINUM FINISHES

A. 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. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, 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. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

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 overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, "Specifications for Structural Steel Buildings," and with requirements applicable to listing and labeling for fire-resistance rating indicated.

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 in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

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

3.5 INSTALLING NOSINGS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.6 INSTALLING BEARING AND LEVELING PLATES

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.7 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. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.
SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Applies to Stairs #1, #2 and #3 as labeled in the drawings.
2. Preassembled steel stairs with metal pans to receive wood treads – Stair #1.
   a. Fabricated steel guardrail assembly attached to metal stairs with stainless steel cable infill.
   b. Abrasive metal nosing recessed into wood treads.
   c. Round wood railings attached to guardrail assembly – See Section 06 20 23 Interior Finish Carpentry.
3. Preassembled steel stairs with metal pans and concrete-filled treads – Stairs #2 and #3.
   a. Fabricated steel guardrail assembly with steel tube handrails attached to metal stairs.
   b. Steel tube handrails attached to walls adjacent to metal stairs.
   c. Abrasive metal nosing cast into concrete treads.

1.2 ACTION SUBMITTALS

A. Product Data: For metal pan stairs.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
D. Delegated-Design Submittal: For stairs and railings, 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.
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.

D. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

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

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

D. Steel Tubing: ASTM A 500 (cold formed).

E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.


H. Stainless Steel Cable Infill System: Consisting of ¼” SS cables with quick-connect fittings, threaded terminal fittings, flat washers, and end caps. All to be SS Type 316.

1. Manufacturer:
   a. Feeney, Inc.
   b. Ultra-Tec Cable Railing Products.
   c. AGS Stainless.
      Wagner Collaborative Metal Works
2.3 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with replaceable 2-stage system, abrasive filler strip in an epoxy-resin binder.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Safety Tread Co., Inc. Basis-of-Design: Type TP-311R.
      b. ACL Industries, Inc.
      c. Amstep Products.
      d. Armstrong Products, Inc.
      e. Balco, Inc.
      f. Granite State Casting Co.
      g. Nystrom, Inc.
      h. Wooster Products Inc.

   2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
   3. Provide solid-abrasive-type units without ribs.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

2.4 FASTENERS

A. 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.

2.5 MISCELLANEOUS MATERIALS

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

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

C. Concrete Materials and Properties: Comply with requirements in Section 0 30 00 "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.

D. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.6 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. 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 3 welds: partially dressed weld with spatter removed.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.7 STEEL-FRAMED STAIRS

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

B. Stair Framing: As detailed.

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.

2.8 GUARDRAILS

A. Fabricate supports and top rail from steel tube and flat bar as detailed in drawings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.

B. Stair #2 and #3 - Fabricate intermediate rails from steel tube.
C. Stair #1 - Drill holes in vertical supports to receive wire cable system components.
D. Stair #1 - Install wire cable system and adjust for proper tensioning.
2.9 STAIR RAILINGS

A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads. As detailed in drawings.

B. 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" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.

C. Form changes in direction of railings by bending or by inserting prefabricated elbow fittings.

D. 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.

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

F. Provide wall returns at ends of wall-mounted handrails.

G. Connect posts to stair framing by direct welding.

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.

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.

2.10 FINISHES

A. Finish metal stairs after assembly.

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

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. 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 INSTALLING METAL PAN STAIRS

A. 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.

B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints.

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

E. Place and finish concrete fill for treads and platforms to comply with Section 03 30 00 "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in 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 to steel supporting members.
2. Anchor handrail ends with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts to blocking in the frame walls.

B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements.

C. After final painting of steel is complete, install wire cable system and adjust for proper tensioning as required by manufacturer.

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.

END OF SECTION 05 51 13
SECTION 05 73 00 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stair #1 and Sitting Stair Railings as indicated in drawings: Steel fabricated decorative railings with stainless-steel handrail and stainless-steel wire-rope guard infill.
   2. Decorative metal guardrails (cable rail system and decorative metal panel system) around Atrium floor openings on second and third floors.

B. Related Sections:
   1. Section 05 50 00 Metal Fabrications.
   2. Section 05 52 13 Metal Pan Stairs

1.2 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of railings assembled from standard components.
   2. Grout, anchoring cement, and paint products.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Include plans, elevations, sections, and attachment details.

D. Samples: For each type of exposed finish required.

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

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

C. Preconstruction test reports.

D. Evaluation Reports: For post-installed anchors, from ICC-ES.
1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components.
   a. Cable rail system.
   b. Perforated metal panel system

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "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.

2.3 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.4 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 304.

B. Pipe: ASTM A 312/A 312M, Grade TP 304.
C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

D. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

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

F. Wire Rope and Fittings:
   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. Cable Connection (The).
      b. Carl Stahl DecorCable, Inc.
      c. Morse Industries.
      d. VIVA Railings, LLC.
   2. Wire Rope: ¼” wire rope made from wire complying with ASTM A 492, Type 316.
   3. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.5 STEEL AND IRON

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

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

C. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

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

E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

F. Perforated Metal: See 09 05 02 Finish Materials.

2.6 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:
   1. Stainless-Steel Components: Type 304 stainless-steel fasteners.
   2. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
   3. Dissimilar Metals: Type 304 stainless-steel fasteners.

B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
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.

2.7 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

B. Epoxy Intermediate Coat: Complying with MPI#77 and compatible with primer and topcoat.

C. Polyurethane Topcoat: Complying with MPI#72 and compatible with undercoat.

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

E. 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.

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

C. 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. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

D. Form changes in direction by bending or by inserting prefabricated elbow fittings.

E. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components. Weld corners of panels.

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

G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

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

I. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from steel as indicated on drawings.

1. Type A (metal railing) Basis-of-Design: Custom perforated steel plate, round end slot pattern, see drawings for slot size and typical dimension.

2. Type B (café bar)

J. Solid Metal Infill Panels: Fabricate infill panels from steel plate.
2.9 STAINLESS-STEEL FINISHES

A. Directional Satin Finish: No. 4.

2.10 STEEL AND IRON FINISHES

A. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.


1. Color: As scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

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. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
2. 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.

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

E. Attach handrails to guardrail assembly with wall brackets as detailed.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

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

END OF SECTION 05 73 00
SECTION 057500 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Perforated metal plate at Atrium guardrails.
   2. Perforated metal over acoustic insulation on walls of Inspiration Hall.
   3. Preformed and finished metal plate at doors portals.
   4. Perforated metal wall material at Café Counter.
   5. Painted steel plate at Inspiration Hall Entry, Donor Wall, and center wall in Vestibule.
   6. Pre weather steel wall plate in Innovation Alley.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Show fabrication and installation details for decorative formed metal.
   1. Include plans, elevations, component details, and attachment details.
   2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

D. Samples: For each type of exposed finish required, prepared on 6-inch-square Samples of metal of same thickness and material indicated for the Work.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

B. Evaluation Reports: For post-installed anchors, from ICC-ES.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. Decorative Formed Metals: See Section 09 05 02 Finish Materials.
B. General: Fabricate products from sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

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

D. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.

E. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M, commercial steel, exposed or electrolytic zinc-coated, ASTM A 879/A 879M, with steel sheet substrate complying with ASTM A 1008/A 1008M, commercial steel, exposed.

F. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.2 MISCELLANEOUS MATERIALS

A. Sealants, Exterior: Elastomeric sealant complying with Section 079200 “Joint Sealants” and as recommended in writing by decorative formed metal manufacturer.

B. Sealants, Interior: Nonsag, paintable sealant complying with Section 079200 "Joint Sealants" and as recommended in writing by decorative formed metal manufacturer.

C. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as necessary for strength, corrosion resistance, and compatibility in fabricated items.

   1. Use filler metals that will match the color of metal being joined.

D. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated.

   1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

E. Anchors: Provide fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

F. Anchor Materials:

   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.


G. Sound-Deadening Materials:


   2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

H. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal and is noncombustible after curing.
I. Isolation Coating: Manufacturer's standard bituminous paint.

2.3 PAINTS AND COATINGS

A. Shop Primers: Comply with Section 099123 "Interior Painting."

B. Universal Shop Primer for Ferrous Metal: 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 1187M.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop 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.

B. 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.

C. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface 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.

D. Where welding is indicated, 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.

2.5 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

C. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils. Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where needed to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

E. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 057500
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking, cants, and nailers.
   3. Wood furring.
   4. Wood sleepers.
   5. Raised floor platforms.
   7. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.
B. Sustainable Design Submittals:
   1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
   3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
   4. Product Data: For installation adhesives, indicating VOC content.
   5. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Regional Materials: Dimension lumber shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
B. Certified Wood: Lumber and plywood shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

C. 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 or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

D. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

B. 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.

C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Naiers.
3. Rooftop equipment bases and support curbs.
5. Furring.
7. Raised floor platforms.
B. Concealed Boards: 15 percent maximum moisture content of the following species and grades:
   1. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

C.  

2.4 PLYWOOD BACKING PANELS
A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.5 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-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
B. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.6 MISCELLANEOUS MATERIALS
A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
C. 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.
D. Do not splice structural members between supports unless otherwise indicated.
E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

2. ICC-ES evaluation report for fastener.

3.2 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.

END OF SECTION 06 10 53
SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior trim.
2. Solid surfacing chair rails.
3. Interior board paneling.
4. Interior raised platforms below Stair #1.
5. Interior stair treads and risers below Stair #1.
6. Benches in Commons areas.
7. Seating stair.
8. MDF base strip (@ treehouse).

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
6. Product Data: For installation adhesives, indicating VOC content.
7. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

C. Samples: For each type of paneling, stair tread/riser, and wood bench material.

D. Mock-ups: Fabric wrapped panels with edge trim.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
2.1 MATERIALS, GENERAL

A. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

1. Interior trim.
2. Interior board paneling.
3. Interior stair treads and risers.
4. Seating stair.
5. Benches in Commons areas.

B. Certified Wood: The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004.

1. Interior trim.
2. Interior board paneling.
3. Interior stair treads and risers.
4. Seating stair.
5. Benches in Commons area.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

D. Composite Wood Products: Products 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."

E. Lumber: DOC PS 20.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece.

F. Softwood Plywood: DOC PS 1.

G. Hardboard: ANSI A135.4.

H. MDF: ANSI A208.2, Grade 130.

I. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

1. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber and plywood indicated to receive a stained or natural finish, mark back of each piece.

C. Application: All interior lumber and plywood.

2.3 INTERIOR TRIM – See drawings and Section 09 05 02 - Finish Materials.

2.4 PANELING

A. Board Paneling WD-1: Interior wood-board paneling complying with MMPA WM 9. Call out all wood assemblies, including attachment systems (French cleats), trim (angles).

1. Description: See Section 09 05 02 - Finish Materials, vertical application, mounted on substrate and cleated to wall. As detailed.
2. Grade: Clear No. 1.


C. Fabric Wrapped Panels.

2.5 RAISED PLATFORM – BELOW STAIR #1

1. Description: See Section 09 05 02 - Finish Materials, vertical application, and cleated to wall. As detailed.
2. Grade: Reclaimed.
1. Finish: Dark stain to be determined by Architect from samples on reclaimed material.

2.6 STAIRS AND RAILINGS

A. Treads and Risers – Stair 1: See Section 09 05 02 – Finish Materials.

B. Wood handrails.

2.7 BENCHES

A. At Commons Area: See Section 09 05 02 – Finish Materials.

B. At Railings around Atrium: See Section 09 05 02 – Finish Materials.
2.8 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Adhesives 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. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. 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."
   1. Adhesives shall have a VOC content of 30 g/L or less.

D. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.
   1. Adhesives shall have a VOC content of 70 g/L or less.
   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."

E. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.
   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."

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.2 INSTALLATION, GENERAL

A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
   3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
3.3 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

3.4 PANELING INSTALLATION

B. Board Paneling: Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.

1. Install in full lengths without end joints.
2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
3. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
4. Fasten paneling by face nailing, setting nails, and filling over nail heads.
5. Fasten paneling with trim screws, set below face and filled.
6. Fasten paneling by blind nailing through tongues.

3 STAIR, PLATFORM, AND BENCH INSTALLATION

1. As detailed.

END OF SECTION 06 20 23
SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Adjustable Utility Shelving
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 12 36 61.16 – Solid Surfacing Countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials, and cabinet hardware and accessories.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

D. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.
2. Thermoset decorative panels, for each color, pattern, and surface finish.
1.3 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Grade: Premium.

C. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

D. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

E. Type of Construction: As detailed. All cabinet boxes are to be constructed of plywood. Particleboard and Fiberboard will not be allowed.

F. Cabinet, Door, and Drawer Front Interface Style: As detailed.

G. Reveal Dimension: As detailed.

H. 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. Formica Corporation.
b. Lamin-Art, Inc.
c. Pionite; a Panolam Industries International, Inc. brand.
d. Wilsonart.

I. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGS.
   2. Vertical Surfaces: Grade HGS.
   3. Pattern Direction: As indicated.

J. Materials for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
   2. Drawer Sides and Backs: Solid-hardwood lumber.
   3. Drawer Bottoms: Hardwood plywood.

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

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements: See Section 09 05 02 – Finish Materials.

2.2 PLASTIC-LAMINATE-CLAD ADJUSTABLE WALL SHELVING AND SUPPORT SYSTEM

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

B. Grade: Premium.

C. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

D. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

E. Type of Construction: As detailed. All shelving to be constructed of plywood, thickness as indicated. Particleboard and Fiberboard will not be allowed.

F. Edge Design: As detailed, provide radiused corners. 3mm plastic edging routed and glued to exposed edges. Color as selected by Architect from manufacturer's full range of colors.

G. 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:
H. Laminate Cladding for Top of Shelving: Grade HGS.
   1. Materials for Underside of Shelving: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements: See Section 09 05 02 Finish Materials.


2.3 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. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Products 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."
   1. Softwood Plywood: DOC PS 1, medium-density overlay.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   1. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2.5 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

G. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.

H. Drawer Slides: BHMA A156.9.
   1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
   2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
   3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
   4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
   5. For computer keyboard shelves, provide Grade 1HD-100.
   6. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

L. 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.

2.6 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.
D. 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."

E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION

A. Complete fabrication, including assembly 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.

B. 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.

C. Install glass to comply with applicable requirements in Section 08 80 00 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. 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.

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

D. 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.

E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.
PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS
SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes plastic sheet paneling.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Product Data: For sealants, indicating VOC content.
   4. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
C. Samples: For plastic paneling and trim accessories.

1.3 QUALITY ASSURANCE
A. Testing Agency: Acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING
A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Crane Composites, Inc.
      b. Marlite.
   2. 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."
   3. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory. Extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

2. Adhesives shall have a VOC content of 50 g/L or less.
3. 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."

B. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant 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."

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

C. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

3.2 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

4. Nominal Thickness: Not less than 0.09 inch.
5. Surface Finish: See Section 09 05 02 - Finish Materials.
E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provision of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of Geotextile/Bentonite Clay waterproofing membrane is shown on the drawing and/or as specified herein.

1.3 RELATED SECTIONS

A. Division 03 - Concrete
B. Division 31 - Earthwork

1.4 QUALITY ASSURANCE

A. Manufacturer: Provide Geotextile/Bentonite Clay waterproofing membrane produced by a manufacturer with a minimum of 5 years experience in the waterproofing industry.
B. Installer: A firm with a minimum of 2 years experience in installing bentonite clay or other related waterproofing products.

1.5 SUBMITTALS

A. Manufacturer: Submit six copies of product data sheets, specifications, installation instructions and general recommendations for each type of product specified.
B. Installer: Submit detail drawings for installation of product specified.
C. Water Sample Test Result: A water sample (2 liters) is required on projects that have ground water and should be submitted to the waterproofing manufacturer to test for contamination and compatibility with waterproofing membrane. Submit to architect a letter of compatibility recommending which formulation to use.
D. Warranty: Submit specimen of manufacturers’ standard warranty.
1.6 WARRANTY

A. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials for a period of 5 years.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original manufacturer’s packaging and store materials in strict accordance with manufacturer’s instructions.

B. Remove and replace products that have been prematurely exposed to moisture.

1.8 PROJECT CONDITIONS

A. Install materials in accordance with all safety and weather conditions required by the manufacturer.

B. Install materials only after work on the applicable substrate is complete.

C. Complete cast-in-place reinforced columns prior to membrane installation.

PART 2 - PRODUCTS

2.1 WATERPROOFING SYSTEM

A. Basis-of-Design: The Geotextile/Bentonite clay waterproofing membrane shall be CCW MiraCLAY supplied by Carlisle Coatings & Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 75098, Phone (800) 527-7092 Fax: (972) 442-0076. Substitutions: See Section 01 25 00 Substitution Procedures.

Physical Properties for Geotextile/Bentonite Clay Waterproofing Membrane: CCW MiraCLAY:

<table>
<thead>
<tr>
<th>Property Bentonite-</th>
<th>Test Method</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>—</td>
<td>1.0 lb/ft² (.488 kg/m²)</td>
</tr>
<tr>
<td>Nominal Dry Thickness</td>
<td>—</td>
<td>0.25 in</td>
</tr>
<tr>
<td>Weight</td>
<td>—</td>
<td>75 lb</td>
</tr>
<tr>
<td>Permeability</td>
<td>ASTM D 5084</td>
<td>5 x 10⁻⁸ cm/sec</td>
</tr>
<tr>
<td>Grab Tensile Strength</td>
<td>ASTM D 4632</td>
<td>95 lb (422 N)</td>
</tr>
<tr>
<td>Grab Elongation</td>
<td>ASTM D 4632</td>
<td>150%</td>
</tr>
<tr>
<td>Puncture Resistance</td>
<td>ASTM D 4833</td>
<td>120 psi</td>
</tr>
<tr>
<td>Hydrated Internal Shear</td>
<td>ASTM D 5321</td>
<td>500 psf</td>
</tr>
<tr>
<td>Swell Index</td>
<td>ASTM D 5890</td>
<td>2g min.</td>
</tr>
<tr>
<td>Fluid Loss</td>
<td>ASTM D 5891</td>
<td>18 ml max.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>—</td>
<td>5.12 ft x 13.62 ft (69.75 ft²)</td>
</tr>
<tr>
<td>Hydrostatic Head Pressure</td>
<td>ASTM D751</td>
<td>228 ft</td>
</tr>
<tr>
<td>Adhesion to Concrete</td>
<td>ASTM D903</td>
<td>17.7 lb/in</td>
</tr>
</tbody>
</table>
B. Waterproofing system accessories supplied by waterproofing membrane manufacturer:
   1. Sealant: CCW MiraCLAY Sealant is used for detailing at terminations and penetrations. Also used to fill minor voids in concrete and as a fillet in angle changes.
   2. Granules: CCW MiraCLAY Granules used for horizontal to vertical transitions and for detailing at seams and slab penetrations.
   3. Waterstop: CCW MiraSTOP used as a waterstop at cold concrete pours and between pre-cast concrete panels.

C. Membrane to Substrate Fasteners: Fasteners, of the type and length suitable for the substrate, shall be used in conjunction with washers, of at least 1” diameter to attach the geotextile/bentonite clay waterproofing membrane to the substrate.

D. Membrane to Membrane Fasteners: Mechanically fasten membrane sheets together with a box stapler or similar device for horizontal applications.

E. The Geotextile/Bentonite membrane shall consist of geotextile panels of sodium bentonite clay sandwiched between two layers of needle-punched woven and non-woven polypropylene fabrics.

F. Drainage Composite: Shall be CCW MiraDRAIN® as recommended by the manufacturer for each condition.

G. Perimeter Drainage System: Where required shall be CCW MiraDRAIN

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrate and condition under which waterproofing will be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Grade Substrates: Shall be level and uniform that is compacted to a minimum of 85% modified proctor.

B. Concrete Application:
   1. Apply CCW MiraCLAY Sealant to all construction joints at a minimum of 1/4” thickness and a 3” minimum width.
   2. Remove projections from the wall surface in excess of 3/4”.

C. Honeycombing, voids and aggregate pockets exceeding 1” in diameter or have a depth greater than 3/4” should be filled with a non-shrink cementitious grout. Fill tie-rod holes with a non-shrink cementitious grout.

3.3 INSTALLATION

A. Prevent geotextile/bentonite clay waterproofing membrane from hydrating before being covered with overburden. When threat of rain is imminent or backfill is not immediate, geo-
textile/bentonite clay waterproofing membrane should be covered with polyethylene sheet.

B. Underslab Application: (Concrete slab shall have a minimum thickness of 4” if reinforced or 5” if not reinforced).

1. Install CCW MiraCLAY with the white non-woven side up, facing the installer.
2. Overlap edges a minimum of 4”.
3. Protect CCW MiraCLAY from damage caused by chairs with sharp edges or points by placing a patch of CCW MiraCLAY under the chair.
4. Staple joints often enough to prevent excessive movement.
5. Pour CCW MiraCLAY Granules or trowel CCW MiraCLAY Sealant around all penetrations and press in “cut-to-fit” collars of CCW MiraCLAY.
6. Extend the installation of CCW MiraCLAY 12” up or beyond the perimeter slab forms.
7. Inspect and repair any damaged material before concrete pour.

C. Concrete Wall Application:

1. Install CCW MiraCLAY with the white non-woven side out, facing the installer.
2. Starting at the bottom of the wall, unroll CCW MiraCLAY and nail across top of panel one nail per 12” on center. Allow sheet to hang down nailing only as required to stabilize.
3. Install adjacent membrane by overlapping edges a minimum of 4”.
4. Fasten membrane once every 18” on seams or as required to prevent blousing with 3/4” to 1” concrete nails with washers.
5. Extend waterproofing membrane to 6” below grade and fasten membrane to the substrate to maintain constant compression using a 1/8” X 1” minimum termination bar. Trowel a 1/2” thick and 2” wide bead of CCW MiraCLAY Sealant at top edge of membrane and cover termination bar.
6. Create a cant at any vertical to horizontal transition by applying a 1.5” to 2” cant of CCW MiraCLAY Granules or CCW MiraCLAY Sealant.
7. Strip in all outside corners and transitions with a min. 12” (30) piece of CCW MiraCLAY membrane to double cover these areas.
8. Make a min. 1” cant at all inside corners with CCW MiraCLAY Sealant.
9. Backfill must be compactible soils free of construction debris and must be uniformly compacted to a minimum 85% Modified Proctor density on each lift.

3.4 PROTECTION AND DRAINAGE

A. Protect the geotextile/bentonite clay waterproofing membrane with CCW MiraDRAIN Drainage Composite.

B. Install the CCW MiraDRAIN Drainage Composite according to the detailed drawings for the specific installation requirements of the project.

3.5 BACKFILL

A. Backfill with smooth and uniform material with no sharp projections or stones larger than 3/4”. Compact backfill to an 85% Modified Proctor density. Ensure backfill material is not contaminated with salt or other materials that could prevent the CCW MiraCLAY from hydrating.
SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board – foundation wall and under perimeter slab.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Laboratory Test Reports: For Insulation, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called “XPS boards."

B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

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

   a. DiversiFoam Products.
A. Insulation 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

C. Mineral-Wool Blanket, Unfaced: 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, provide products by one of the following:
   a. Industrial Insulation Group, LLC (IIG-LLC).
   b. Roxul Inc.
   c. Thermafiber, Inc.; an Owens Corning company.

2.4 MINERAL-WOOL BOARD

A. Insulation 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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
C. Mineral-Wool Board, Type III: ASTM C 612, Type III; unfaced, with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Nominal density of 8 lb/cu. ft..

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Industrial Insulation Group, LLC (IIG-LLC).
   b. Roxul Inc.
   c. Thermafiber, Inc.; an Owens Corning company.

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

1. Adhesives shall have a VOC content of 70 g/L or less.
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."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

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. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
3.2 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.4 INSTALLATION OF ROOF INSULATION – See Section 07 53 23 – Ethylene-Propylene-Diene-Monomer (EPDM) Roofing.

3.5 INSTALLATION OF EXTERIOR CAVITY-WALL CONTINUOUS INSULATION

A. Mineral Wood Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 04 26 13 “Masonry Veneer.”

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. 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. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Mineral Wool Blanket Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
3.7 INSTALLATION OF CURTAIN-WALL INSULATION

A. Foil-faced Mineral Wool Board Insulation: Install board insulation in curtain-wall construction 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 on Drawings between insulation and glass. Inside face of insulation assembly to be foil faced, all others unfaced.

2. Install insulation to fit snugly without bowing.

3. Foil tape at all joints to prevent air leakage.

3.8 INSTALLATION OF SOLAR WALL INSULATION

A. Foil Faced Mineral Wool Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with loosely edge butted in both directions; do not tightly edge butt or tape joints in either direction. Press units firmly against inside substrates.

**Provide manufacturer’s testing reports of zero off-gassing for adhesive products as air through solar wall feed the DOAS unit.

END OF SECTION 07 21 00
SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the vapor retarders in the exterior wall assemblies, including framed cavity walls and opaque portions of the exterior curtainwalls.

B. Related Requirements:

1. Section 03 30 00 - Cast-in-Place Concrete for under-slab vapor retarders and waterproof membranes.
2. Section 07 53 23 – EPDM Roofing for vapor retarders in the roof assembly.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

PART 2 - PRODUCTS

2.1 POLYAMIDE VAPOR RETARDERS

A. Polyamide Vapor Retarders: MemBrain by Certainteed, ASTM C 665, 2 mil thick sheet, with maximum permeance rating of 0.1 perm, or approved equal. See Section 01 25 00 – Substitution Procedures.

PART 3 - EXECUTION

3.1 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 07 26 00
SECTION 07 27 15 - NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Self-adhering, vapor-permeable, nonbituminous sheet air barriers applied to exterior frame walls.

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

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Sustainable Design Submittals:
      1. Product Data: For coatings, indicating VOC content.
      2. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
   C. Shop Drawings: For air-barrier assemblies.
      1. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1.4 INFORMATIONAL SUBMITTALS
   A. Product Certificates: For each type of nonbituminous self-adhering sheet air barrier.
   B. Product test reports.
   C. Field quality-control reports.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
   B. 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

NONBITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

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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.

PART 2 - PRODUCTS

2.1 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, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

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.

2.2 NONBITUMINOUS SHEET WATER RESISTIVE and AIR BARRIER (WRB / AB)

A. Vapor-Permeable Nonbituminous Sheet: Minimum 20-mil-thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. VaproShield LLC. Basis of Design: WrapShield SA. Substitutions must be submitted for prior approval
   b. Carlisle Coatings & Waterproofing Inc.
   c. GCP Applied Technologies Inc. (formerly Grace Construction Products).

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. Puncture Resistance: Minimum 40 lbf; ASTM E 154/E 154M.
   c. Vapor Permeance: Minimum 27 perms (minimum); ASTM E 96/E 96M, Desiccant Method, Procedure A.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541 as modified by ABAA.
   e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   f. UV Resistance: Can be exposed to sunlight for 150 days according to manufacturer's written instructions.
2.3 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing 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."

PART 3 - EXECUTION

3.1 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 fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

E. 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.

F. Bridge isolation joints, 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.

3.2 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
   1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.

B. 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.
C. 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.

D. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

E. 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.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip 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.

G. 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.

H. Do not cover air barrier until it has been tested and inspected by testing agency.

I. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: As determined by testing agency from among the following tests:

   1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
   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.

C. 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.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

E. Prepare test and inspection reports.
3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

END OF SECTION 07 27 15
SECTION 07 42 13.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exposed-fastener, lap-seam perforated metal wall panels.
   2. Concealed-fastener, vertical inverted pan with no reveal between pans 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.
   B. Sustainable Design Submittals:
      1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   C. Shop Drawings: 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.
   D. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

   A. Product test reports.
   B. Warranties: Samples of special warranties.

1.5 CLOSEOUT SUBMITTALS

   A. Maintenance data.

1.6 QUALITY ASSURANCE

   A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. 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 1/240 of the span.

C. 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.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, over stressing 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.

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. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 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. MTL-1: Perforated, corrugated steel collector panel system on thermally broken clips:
   2. Size: 1 ¾" deep x 7 7/8" wide.
   6. Mounting Location: Wall.
   7. Solar Absorptivity: 0.96.
   8. Profile: SW150.

C. MTL-2: Weathering Steel Flat Metal Wall Panels - See Section 07 42 19

D. MTL-3: Weathering Steel Flat Metal Soffit Panels – See Section 07 42 19

E. MTL-4: Prefinished metal coping, flashing, and trim:
   1. Size: As indicated on drawings.
   2. Gauge: 22 ga.
      MTL-4S: match Black SW9400 (MTL-1).

F. MTL-5: Basis-of Design – Prefinished aluminum to match curtainwall system. See drawings for various applications.
   2. Size and Thickness: As indicated on drawings.
   3. Finish: Duranar Premium Fluoropolymer coating.
   4. Color: Eclipse Gray UC121948

G. MTL-6: Interlocking metal panel (penthouse, roof monitor, screen wall, and bridge), steel:
   1. Basis-of-Design: Morin, F-12S
   2. Size: As indicated on drawings.

H. MTL-7: Painted Steel Plate Wall Panels – See Section 07 42 19
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 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 formed from same material as metal panels 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.

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.

   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
   2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.

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. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. 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.
E. 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.

2.5 FINISHES

A. Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

A. 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.

B. Interlocking-Seam Metal Panels: Install metal panels per manufacturer’s recommendations.

C. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

D. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
E. 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.

3.3 CLEANING

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.

END OF SECTION 07 42 13.13
SECTION 07 42 19 – FLAT METAL PLATE WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Flat metal plate wall and soffit panels for exterior and interior use.

1.2 RELATED SECTIONS

A. Section 05 75 00 – Decorative Formed Metal: M-1 – M-4 Interior Metal Wall Panels.

B. Section 07 21 00 – Thermal Insulation: For insulation.

C. Section 07 27 15 – Non-bituminous Self-adhering Sheet Air Barriers: For air barrier and self-adhering underlayments.

D. Section 07 42 13.13 – Formed Metal Wall Panels: For MP-1, MP-4, MP-5, and MP-6.

E. Section 07 62 00 – Sheet Metal Flashing and Trim: For gutters, downspouts, reglets, and counterflashings.

F. Section 09 29 00 – Gypsum Board: For sheathing.

1.3 DEFINITION

A. Metal Plate Wall Panel Assembly: Metal plate wall panels, attachment system components, miscellaneous metal framing, attachment clips and accessories necessary for a complete weathertight wall system.

1.4 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 type of metal plate wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal plate wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories, and special details.

C. Qualification Data: For installer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

E. Maintenance Data: For metal plate wall panels to include in maintenance manuals.
1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
   B. Mockups: Build mockups to verify selection made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
      1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
      2. Approved mockups may become part of the complete work if undisturbed at time of substantial completion.
   C. Preinstallation Conference: Conduct conference at project site.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver components, metal plate wall panels, and other manufactured items so as not to be damaged or deformed. Package panels for protection during transportation and handling.
   B. Unload, store, and erect metal plate wall panels in a manner to prevent bending, warping, twisting, and surface damage.
   C. Stack metal plate wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store panels to ensure dryness, with positive slope for drainage of water. Do not store panels in contact with other materials that might cause straining, denting, or other surface damage.
   D. Retain strippable protective covering on metal plate wall panel for period of installation.

1.7 PROJECT CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal plate wall panels to be performed according to manufacturer’s written instructions and warranty requirements.
   B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal plate wall panel fabrication and indication measurements on Shop Drawings.

1.8 COORDINATION
   A. Coordinate metal plate wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.9 WARRANTY
   A. Special Warranty on Fluoropolymer Panel Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finish or replace metal plate wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ATM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of substantial completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the
   following loads, based on testing according to ASTM E 330:
   1. Design and size components to withstand dead and live loads caused by positive and negative
      wind pressure acting normal to plane of wall as calculated in accordance with code.

C. Movement: Accommodate movement within system without damage to components or deterioration of
   seals, movement within system, movement between system and perimeter components when subject to
   seasonal temperature cycling, dynamic loading and release of loads; and deflection of structural support
   framing.

D. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within
   panel system.

E. Continuity: Proved continuity of thermal barrier at building enclosure elements and continuity of air
   barrier and vapor retarder seal at building enclosure elements in conjunction with materials specified in
   Division 7

2.2 PANEL MATERIALS

Weathering Steel Plate: ASTM A588. Alloy and temper as recommended by manufacturer for
application. Steel plate sources include but are not limited to the following:

http://www.azahner.com/solanum-steel.cfm
http://www.centralsteelservice.com/cor-ten.htm
http://www.corten.com/contact-us.html

A. Perforated Aluminum Sheet: (Exterior Column wraps, canopies, Innovation Alley).

B. Panel Sealant: ASTM C 920; elastomeric silicone sealant; of type, grade, class, and use classifications
   required to seal joints in metal plate wall panels and remain weathertight; and as recommended in
   writing by panel manufacturer.
2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard Z-shaped sections, size as indicated on drawings.

C. Clips: Basis of Design: Cascadia Fiberglass Rainscreen Clips and girts.

D. Panel Clips: Interlocking side lap feature which conceals the fasteners and is installed using clips to allow for thermal movement. Clips shall be designed to hold the panel ½ inch minimum from exterior sheathing to create a drainage plane and ventilation cavity. Load span tables must include evaluation of clip and side joint interaction.

E. Cold-Rolled Furring Channels: Minimum ½ inch wide flange.
   1. Nominal Thickness: As required to meet performance requirements.
   2. Depth: as indicated on drawings.
   3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch (1.02 mm).
   4. Tie Wire: ASTM A 641/A 641 M, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048 inch diameter wire.

F. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.4 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws; bolts and nuts; self-locking rivets and bolts; end-welded studs; and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVS, or neoprene sealing washers.

B. Steel angle at curb with finish to match MTL-2.

2.5 METAL PLATE WALL PANELS

A. Metal Plate Wall Panels: Provide metal plate wall panels fabricated from single sheets of metal formed for installation method indicated. Include attachment system components, panel stiffeners, and accessories required for complete rainscreen system.

B. MTL-2: Custom Weathering Steel Metal Plate Wall Panels - Fabricated from standard size sheets of Weathering Steel. Substitutions: See Section 01 25 00 Substitution Procedures.
   2. Material Thickness:
      a. Exterior Panels: 3/16 inch, unless otherwise noted.
   3. Panel Depth: As detailed.
   4. Factory or Shop Finishes:

5. Attachment System Components: Formed from stainless steel.
   a. Provide internal drainage system that allows individual panels to be installed and removed
      without disturbing adjacent panels.
   b. Include standard stainless steel subgirts, perimeter extrusions, tracks, drainage channels,
      panel stiffeners, panel clips, and anchor channels.
   c. Alignment Pins: Stainless steel.
   d. Exterior: All exposed fasteners and flashing:
      1) Fasteners: Button Head Hex Socket Drive; ASTM A588.
      2) Flashing: Stainless Steel – factory or shop paint FP-3.

C. MTL-3: Custom Weathering Steel Metal Plate Soffit Panels - Fabricated from standard size sheets of
   Weathering Steel. Same as MTL-2, only with pre-patina finish applied.

D. MTL-7: Perforated Aluminum Sheet (exterior column wraps and canopies). Same as MTL-2, only with
   PT-5 (Iron Ore) applied.

E. M-1 – M-7: Decorative Interior Metal Wall Panels – See Drawings and Section 05 75 00 Decorative
   Formed Metal.

2.6 ACCESSORIES

A. Metal Plate Wall Panel Accessories: Provide components required for a complete metal plate wall
   panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashing, sealants,
   gaskets, fillers, closure strips, and similar items. Match material and finish of panels unless otherwise
   indicated.

B. Flashing and Trim: Same material, finish, and color as adjacent metal plate wall panels, minimum 0.030
   inch (0.76 mm) thick unless otherwise indicated.

C. Structural Fabrication Tape: 3M VHB tape, gray, or equal.

2.7 FABRICATION

A. General: Fabricate and finish metal plate wall panels and accessories at the factory to greatest extent
   possible, 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. Fabricate metal plate wall panels in a manner that eliminates condensation on interior side of panel and
   with joints between panels designed to form weathertight seals.

C. Metal Plate Wall Panels: Fabricate panels with panel stiffeners as required to comply with deflection
   limits. Weld and grind panel corners smooth. Fabricate panels to the following dimensional tolerances:

   1. Length and Width: Plus or minus 0.032 inch up to 48 inches; 0.064 inch more than 48 inches.
   2. Diagonal: Plus or minus 0.1875 inch.
   3. Panel Bow: Not more than 0.2 percent of panel width or length up to 0.1875 inch maximum.
   4. Thickness: Plus or minus 0.008 inch.
   5. Squareness: 0.1875 inch difference between diagonal measurements.
6. Camber: 0.032 inch.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in AMSCNA’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.
2. Seam for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
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 elastomeric sealant 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 by metal plate wall panel manufacturer.

a. Size: As recommended by SMACNA’s “Architectural Sheet Metal Manual” or metal plate wall panel manufacturer for application, but not less than thickness of metal being secured.

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 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 abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Variations in appearance of other components are acceptable if they are within the range of approved samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal plate wall 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 plate 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 plate wall panel manufacturer.
3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
B. Examine roughing-in for components and systems penetrating metal plate wall panels to verify actual locations of penetrations relation to seam locations of panels before installation.

C. For the record, 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. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous metal plate wall panel support members and anchorage according to ASTM C 754 and panel manufacturer’s written instructions.

3.3 METAL PLATE WALL PANEL INSTALLATION

A. General: Install metal plate wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement.

1. Commence metal plate wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal plate wall panels.
3. Flash and seal metal plate wall panels with weather closures at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
4. Install flashing and trim as metal plate wall panel work proceeds.
5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Aluminum Plate Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal plate wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall plate panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

1. Seal metal plate wall panel end laps with double beads of sealant, full width of panel. Seal side joint where recommended by panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 Joint Sealants.

E. Attachment System, General: Install attachment system required to support metal plate 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.
F. Clip Installation: Attach panel clips to supports at locations, spacing, and with fasteners recommended by the manufacturer. Attach flanges of metal plate wall panels to panel clips with fasteners, as recommended by manufacturer.

1. Seal horizontal and vertical joints between adjacent metal plate wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 07 92 00 “Joint Sealants”.
2. Seal horizontal and vertical joints between adjacent metal plate wall panels with manufacturer’s standard gaskets.

3.4 ACCESSORY INSTALLATION

A. General: 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 plate wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. 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 will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, 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 and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of ¼ inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.6 COORDINATION OF OTHER TESTS

A. Coordination with Weather Barrier tests.

1. The Air Barrier will be tested per Section 07 27 15 prior to testing the wall panel assembly.
2. Provide and install all: girts, fasteners, clips or other material that will attach to or pierce the weather barrier prior to the weather barrier being tested.
3. Document method of attachment to ensure that wall panel assembly is constructed in a manner that maintains the weather resistance of the building.
3.7 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal plate wall panels are installed unless otherwise indicated in manufacturer’s written installations instructions. On completion of metal plate wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal plate wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal plate wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 19
SECTION 07 53 23 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
1. Adhered ethylene-propylene-diene-monomer (EPDM) roofing system installed using a fully-adhered method of attachment with no mechanical fasteners penetrating the steel decking.
2. Vapor Barrier.
3. Roof insulation.
4. Cover Board.
5. Roof Paver System.
6. Roof Flexible Walk Pads.

1.2 DEFINITIONS
A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA’s "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

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

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
1. Product Test Reports: For roof materials, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
2. Product Data: For adhesives and sealants, indicating VOC content.
3. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
D. Samples for Verification: For the following products:
1. Sheet roofing, of color required.
2. Roof paver in each color and texture required.
3. Walkway pads or rolls, of color required.
1.5 INFORMATIONAL SUBMITTALS
   A. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
   B. Sample Warranties: For manufacturer’s special warranties.

1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE
   A. 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.

1.8 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. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS
   A. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
   B. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
   C. Roofing System Design: Tested by a qualified testing agency to resist uplift pressures as required by IBC Section 1609.
   D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
   E. 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 EPDM ROOFING

A. EPDM: ASTM D 4637, Type I, nonreinforced, uniform, flexible EPDM sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products.
   c. GAF Materials Corporation.
   d. GenFlex Roofing Systems.
   e. Johns Manville; a Berkshire Hathaway company.
   f. Versico Incorporated.

2. Thickness: 60 mils, nominal.

2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants shall comply with the following limits for VOC content:
   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Contact Adhesives: 80 g/L.
   f. PVC Welding Compounds: 510 g/L.
   g. Other Adhesives: 250 g/L.
   h. Single-Ply Roof Membrane Sealants: 450 g/L.
   i. Nonmembrane Roof Sealants: 300 g/L.
   j. Sealant Primers for Nonporous Substrates: 250 g/L.
   k. Sealant Primers for Porous Substrates: 775 g/L.

3. 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."

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

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

D. Seaming Material: Single-component, butyl splicing adhesive and splice cleaner or manufacturer's standard, synthetic-rubber polymer primer and 3-inch-wide minimum, butyl splice tape with release film.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

F. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, 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.

2.5 SUBstrate BOARD

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corporation.
   b. Georgia-Pacific Building Products.
   c. National Gypsum Company.
   d. United States Gypsum Company.

2.6 VApor RETARDER

A. Basis-of-Design: Firestone V-Force Vapor Barrier, Class I, self-adhering, with perm rating of .02

2.7 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products.
   c. GAF Materials Corporation.
   d. Johns Manville; a Berkshire Hathaway company.
   e. Rmax, Inc.

B. 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. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer.

B. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick, factory primed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corporation.
   b. Georgia-Pacific Building Products.
   c. National Gypsum Company.
   d. United States Gypsum Company.
2.9 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 312, Type III or Type IV.

2.10 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

B. Roof Deck Pavers: Heavyweight, hydraulically pressed concrete units, square edged with top edges beveled 3/16 inch, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:

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 Company.
   e. Wausau Tile Inc.
   f. Westile Roofing Products.

2. Size: 18 by 18 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. Colors and Textures: As selected by Architect from manufacturer's full range.

C. Paver Pedestals: Paver-support assembly, standard with paver manufacturer, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch.

1. Fill: As recommended in writing by pedestal manufacturer.

D. Steel Edging and Guardrail around Raised Paver Platforms: See Section 05 50 00 Metal Fabrications.

PART 3 - EXECUTION

3.1 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. 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. Remove and discard temporary seals before beginning work on adjoining roofing.

3.2 SUBSTRATE BOARD INSTALLATION

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 roofing system manufacturers’ written instructions.

3.3 VAPOR BARRIER INSTALLATION
A. Install vapor barrier directly over substrate board per manufacturer’s recommendations.

3.4 INSULATION INSTALLATION
A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
B. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, 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.
C. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
   1. Set each layer of insulation in manufacturer’s recommended insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 COVER BOARD INSTALLATION
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. Loosely butt cover boards together.
   1. Using manufacturer’s recommended bonding adhesive, adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.
   2. Tape joints of cover boards as recommended by membrane roofing system manufacturer’s written instructions.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION
A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer’s written instructions. Unroll membrane roofing and allow to relax before installing.
B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
C. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
D. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing according to manufacturer’s written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.
1. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing terminations.

G. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to 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.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 PLAZA-DECK PAVER INSTALLATION

A. Install pavers according to manufacturer's written instructions.

B. Install paver pedestals and accessories to required elevations. Adjust for final level and slope of paved surfaces.

C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.

1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

D. Install pavers to vary no more than 1/16 inch in elevation between adjacent pavers and no more than 1/16 inch from surface plane elevation of individual paver.
E. Limit variation in paving installation to within 1/4 inch in 10 feet of surface plane in any direction; noncumulative.

3.8 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does 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 07 53 23
SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manufactured reglets with counterflashing.
   2. Formed roof-drainage sheet metal fabrications.
   4. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Distinguish between shop- and field-assembled work.
   3. Include identification of finish for each item.
   4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

D. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.
1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
   
   1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   
   1. See drawings for mockup requirements.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   
   1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:
   
   1. Design Pressure: As indicated on Drawings.

E. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 4 (polished directional satin) finish.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Exposed Coil-Coated Finish:
   a. 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.

2. Color: As indicated on drawings.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

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. Carlisle Coatings & Waterproofing Inc.
   b. Carlisle Residential; a division of Carlisle Construction Materials.
   c. Henry Company.
   d. Owens Corning.
   e. Polyguard Products, Inc.


3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

3. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide, or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.


2.5 MANUFACTURED REGLETS

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions 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. Fry Reglet Corporation.
   b. Heckmann Building Products, Inc.
   c. Hickman Company, W. P.
   d. Hohmann & Barnard, Inc.

2. Material: Stainless steel, 0.019 inch thick.

3. Finish: Mill.
2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. 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.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Fabricate from the Following Materials:
   a. Stainless Steel: 0.025 inch thick.
   b. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

C. Counterflashing and Flashing Receivers: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

E. Roof-Drain Flashing: Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, [jamb,] and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
   1. Stainless Steel: 0.016 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:
   1. Stainless Steel: 0.019 inch thick.
   2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

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, 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, levels, and slopes. 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. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that 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 required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer’s recommended methods for cleaning and neutralization.
5. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.
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 cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. 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 minimum of 4 inches.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing is specified in Section 04 26 13 Masonry Veneer.

C. Reglets: Installation of reglets is specified in Section 03 30 00 Cast-in-Place Concrete, or Section 04 26 13 Masonry Veneer.

D. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

3.6 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.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07 62 00
SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof curbs – see Division 23 – HVAC.
   2. Equipment supports – see Division 23 – HVAC.
   3. Roof hatches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.
B. Shop Drawings: For roof accessories.
C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer’s standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AES Industries, Inc.
b. Babcock-Davis.
c. Bilco Company (The).
d. JL Industries, Inc.; a division of the Activar Construction Products Group.
e. Milcor; Commercial Products Group of Hart & Cooley, Inc.

B. Type and Size: Single-leaf lid, 36" x 88".


   1. Thickness: Manufacturer's standard thickness for hatch size indicated.
   2. Color: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Extruded polystyrene or Polyisocyanurate board.
      a. R-Value: 12.0 according to ASTM C 1363.
   3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of
      same material and finish as outer metal lid.
   4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   6. Fabricate curbs to minimum height of 12 inches above roofing insulation surface unless otherwise
      indicated.
   7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height
      that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip
      hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, galvanized-steel spring latch with turn handles, galvanized-
   steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches.

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.
   3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
   4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in
      diameter.
   5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
   6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system.
      Provide manufacturer's standard hinges and self-latching mechanism.
   7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end
      fittings.
   8. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and
      railing members.
9. Fabricate joints exposed to weather to be watertight.
10. 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 METAL MATERIALS
A. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 coated.
1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
2. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
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.

B. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
1. Mill Finish: As manufactured.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
3. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
4. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
5. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

6. 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.

C. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500/A 500M, round tube.

G. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.


2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Security Grilles: 3/4-inch diameter, ASTM A 1011/A 1011M steel bars spaced 6 inches o.c. in one direction and 12 inches o.c. in the other, shop-primed for field finish. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Underlayment:

1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

2. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
G. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.


PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. 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, 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 roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.

C. Plywood Liner: Provide a plywood liner around inside face of roof hatch with ½” A/C grade, exterior glue plywood. Provide two coats of clear sealer. VOC not more than 200 g/L.

D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 “Exterior Painting.”

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.
SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes sprayed fire-resistive materials.
B. Related Requirements:
   1. Section 09 96 46 "Intumescent Painting" for intumescent paints that are fire retarding but not fire resistive.

1.2 DEFINITIONS
A. SFRM: Sprayed fire-resistive materials.

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

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS
A. Product certificates.
B. Evaluation reports.
C. Field quality-control reports.

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.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer’s written instructions.

B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

C. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.

D. Low-Emitting Materials: 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.”

E. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material - SFRM: 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 or conveyed in a dry state and mixed with atomized water at place of application.

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

   a. GCP Applied Technologies Inc. (formerly Grace Construction Products).
   b. Isolatek International.
   c. Pyrok, Inc.
   d. Schundler Company (The).

2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.

3. Bond Strength: Minimum 430-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.

4. 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.


   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.
7. Compressive Strength: Minimum 100 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 or rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273.

2.3 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 for the required fire-resistance design.

C. Bonding Agent: Product approved by fireproofing manufacturer.

D. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

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.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. 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.

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. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

D. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

3.4 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 the IBC, as indicated on Schedule of Special Inspections.

B. 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.

C. Prepare test and inspection reports.

3.5 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. Repair fireproofing damaged by other work before concealing it with other construction.

C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 00
SECTION 07 81 23 - INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes mastic and intumescent fire-resistive coatings.

B. Related Requirements:
   1. Section 07 81 00 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Evaluation reports.

C. Field quality-control reports.

1.5 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.
2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

C. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.

D. Low-Emitting Materials: 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."

E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.

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

   a. Albi Manufacturing; a division of StanChem, Inc.
   b. Carboline Company; a subsidiary of RPM International.
   c. Hilti, Inc.
   d. International Protective Coatings.
   e. Isolatek International.

2. Application: Designated for "interior general purpose" and "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.

3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.


   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 50 or less.

5. Finish: As selected by Architect from manufacturer's standard finishes.

   a. Color and Gloss: As selected by Architect from manufacturer's full range.
2.3 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 for the required fire-resistance design.

C. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

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.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. 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.

C. 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.

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, 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. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

D. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

E. 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.

3.4 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 the IBC, Subsection 1705.14, "Mastic and Intumescent Fire-Resistant Coatings." as indicated on Schedule of Special Inspections.

B. 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.

C. Prepare test and inspection reports.

3.5 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. Repair fireproofing damaged by other work before concealing it with other construction.

C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23
SECTION 07 84 00 - FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes firestopping for through penetrations and top/bottom of fire rated wall, barrier and partitions.

B. Related Sections:
   1. Section 07 26 00 - Vapor Retarders: Vapor retarder materials to adjacent insulation.

1.2 REFERENCES

A. American Society for Testing and Materials:


C. Intertek Testing Services (Warnock Hersey Listed):  
   1. WH - Certification Listings.

D. National Fire Protection Association:

E. Underwriters Laboratories Inc.:
   2. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

B. Mortar and grout: Fill for firestopping permitted in masonry and concrete surfaces.

C. UL: Underwriters Laboratories Inc.

D. WH: Intertek’s Warnock Hersey
1.4 SUBMITTALS
   A. Section 01 33 00 - Submittal Procedures.
   B. Product Data: Submit data on product characteristics, performance and limitation criteria.
   C. Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed
doors to seal openings to maintain fire resistance rating of adjacent assembly.
   D. Manufacturer’s Installation Instructions: Submit preparation and installation instructions.
   E. Manufacturer’s Certificate: Certify products meet or exceed specified requirements and applicable
code requirements.
   F. Engineering Judgments: For conditions not covered by UL or WH listed designs, submit judgments by
licensed professional firestop engineer suitable for presentation to authority having jurisdiction for
acceptance as meeting code fire protection requirements.

1.5 QUALITY ASSURANCE
   A. Single Source Responsibility: Obtain firestop systems for each kind of penetration and construction
condition indicated from a single primary firestop systems manufacturer.
   B. Materials of different manufacture other than allowed by the tested and listed systems shall not be
intermixed in the same firestop system or opening.
   C. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch
water gage (24.9 Pa) minimum positive pressure differential to achieve fire F-Ratings as indicated on
Drawings, but not less than 1-hour.
      1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
      2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on
Drawings, but not less than 1-hour.
         a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
   D. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist
free passage of flame and products of combustion.
      1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting
maximum of three stories.
      2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items
connecting maximum of two stories.
   E. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to
achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
   F. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage
(24.9 Pa) minimum positive pressure differential to achieve fire resistant rating as indicated on
Drawings for floor assembly.
   G. Surface Burning Characteristics: Maximum 15/60 flame spread/smoke developed index when tested
in accordance with ASTM E84, NFPA 255, or UL 723.
H. Qualifications
1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
2. Installer: Company specializing in performing Work of this section with minimum five years documented experience, and accredited by manufacturer.
   a. UL or FM 4991 Certified installers.

I. Mockup
1. Section 01 40 00 - Quality Requirements: Requirements for mockup.
2. Apply 3 linear ft of each type of linear firestopping material to representative substrate surface.
3. Apply one of each unit type of firestopping material, such as penetrations through fire rated assembly, to representative application.
4. Locate where directed by Architect.
5. Incorporate accepted mockup as part of Work.

J. Pre-Installation Meetings
1. Section 01 31 00 – Project Management and Coordination: Pre-installation meeting.
2. Convene minimum one week prior to commencing work of this section.
3. Attendance: Contractor, Installer, Owner, Architect, Manufacturer’s Representative, Firestopping Installer and those requested to attend.
4. Agenda: Verify and adjust firestopping systems and construction of penetrations, construction joints, and perimeter fire containment systems of fire-resistant rated construction to meet and verify provision of this Section.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Section 01 60 00 - Product Requirements.

B. Do not apply materials when temperature of substrate material and ambient air is below 40 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

D. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Hilti Construction Chemicals, Inc.

B. Grace Flamesafe.

C. Specified Technologies, Inc. (STI).

D. 3M Fire Protection Products.
2.2 PERFORMANCE REQUIREMENTS

A. Conform to applicable UL and WH listings fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

2.3 MATERIALS

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Use only firestop products that have been UL 1479, ASTM E814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

D. Product Description:
   2. Foam Firestopping Compounds: Two component foam compound.
   3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
   4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
   5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
   6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
   7. Firestop Bricks: Formed mineral fiber bricks.

E. Pre-installed firestop devices for use with noncombustible and/or combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors, the following products are acceptable:
   1. Hilti CP 680P or CP 680M Cast-In Place Firestop Devices:
      a. Add Aerotor adapter when used in conjunction with an Aerotor (Sovent system)
      b. Add metal deck adapter kit if utilizing CP 680P or M on corrugated metal deck.
      c. Add height extension if utilizing CP 680P or M in concrete slabs thicker then 8’.
      d. Add Hilti Water Module (2" up to 6") to achieve UL W-Rating
      e. Add Hilti TOP SEAL (1/2" up to 2") to achieve UL W-Rating
   2. Hilti CP 681 Tub Box Kit for use with bath tub installations.
   3. Hilti Toilet Flange for use with floor outlet water closets.
   4. Hilti coupling sleeve for use with floor, shower or general purposes drains
F. Telecommunications cabling shall be sealed with non-curing, re-penetrable intumescent putty or foam material, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick
   2. Hilti CP 658 Firestop Plug

G. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 604 Self-leveling Firestop Sealant
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 601S Elastomeric Firestop Sealant

H. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:
   1. Hilti CP 601S Elastomeric Firestop Sealant
   2. Hilti CP 606 Flexible Firestop Sealant
   3. Hilti FS-ONE Intumescent Firestop Sealant

I. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti CP 672 Speed Spray
   2. Hilti CP 672 FC “FAST CURE” Speed Spray
   3. Hilti CP 601S Elastomeric Firestop Sealant
   4. Hilti CP 606 Flexible Firestop Sealant
   5. Hilti CP 604 Self-leveling Firestop Sealant

J. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.
   1. Hilti CP 777 Speed Plugs
   2. Hilti CP 767 Speed Strips

K. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant

L. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 620 Fire Foam
   3. Hilti CP 601S Elastomeric Firestop Sealant
   4. Hilti CP 606 Flexible Firestop Sealant

M. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 618 Firestop Putty Stick
   2. Hilti CP 658 Firestop Plug

N. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti CP 617 Firestop Putty Pad
   2. Hilti Firestop Box Insert
   3. Hilti FS 657 FIRE BLOCK

O. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:
1. Hilti CP 643 N Firestop Collar
2. Hilti CP 644 Firestop Collar
3. Hilti CP 648E Endless Wrap Strips
4. Hilti CP 648S Single Wrap Strips

P. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti CP 637 Firestop Mortar
   2. Hilti FS 657 FIRE BLOCK
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 675T Firestop Board

Q. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
   1. Hilti FS 657 FIRE BLOCK
   2. Hilti CP 675T Firestop Board

R. Sealants or caulking materials used for openings between structurally separate sections of wall and floors, the following products are acceptable:
   1. Hilti CP 672 Speed Spray
   2. Hilti CP 601S Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-Leveling Firestop Sealant

S. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:
   1. Hilti FS 657 FIRE BLOCK
   2. Hilti CP 658T Firestop Plug

T. Color: As selected from manufacturer’s entire range of colors.

2.4 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Backing Material: Permanent:
   1. Mineral fiberboard.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Coordination and project conditions.

B. Verify openings are ready to receive firestopping.
3.2 PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, water or other matter affecting bond of firestopping material.
B. Remove incompatible materials affecting bond.
C. Install backing or damming materials to arrest liquid material leakage.

3.3 APPLICATION
A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating to uniform density and texture.
D. Compress fibered material per manufacturer’s instructions.

3.4 FIELD QUALITY CONTROL
A. Section 01 40 00 - Quality Requirements and Section 01 73 00 - Execution: Field inspecting, testing, adjusting, and balancing.
B. Inspect installed firestopping for compliance with specifications and submitted schedule.
C. Manufacturer: Provide letter stating representative has visited the site and confirms installation of products identified in this Section is complete.

3.5 CLEANING
A. Section 01 77 00 - Closeout Procedures: Final cleaning.
B. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION OF INSTALLED CONSTRUCTION
A. Section 01 73 00 - Execution: Protecting installed construction.
B. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 84 00
SECTION 07 92 00 – JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
   1. Sealants and joint backing.
   2. Pre-compressed foam sealers.
   3. Hollow gaskets.
   4. Accessories.

B. Related Sections:
   1. Section 07 26 00 – Vapor Retarders: Sealants required in conjunction with vapor retarders.
   2. Section 07 27 15 – Non Bituminous Self-Adhering Sheet Air Barriers: Sealants required in conjunction with air barriers.
   3. Section 07 84 00 - Firestopping: Firestopping sealants.
   4. Section 08 80 00 - Glazing: Glazing sealants and accessories.
   5. Section 09 21 16 - Gypsum Board Assemblies: Acoustic sealant.
   6. Section 09 30 00 - Tiling: Sealant used as tile grout.

1.2 REFERENCES

A. ASTM International:
   2. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

B. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
C. Samples: Submit two samples, 2 x 1/4 inch in size illustrating sealant colors for each product selection.

D. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

E. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight or watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

F. Section 01 77 00 - Closeout Procedures.

G. Manual for Materials and Finishes: Submit locations, types and frequency for inspection and maintenance of sealants. Provide instructions for repairing and replacing failed sealant joints.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
   2. Applicator: Company specializing in performing Work of this section with minimum three years documented experience, and approved by manufacturer.

B. Mockup
   1. Section 01 40 00 - Quality Requirements: Requirements for mockup.
   2. Construct mockup of sealant joints in conjunction with mockups specified in other sections.
   3. Construct mockup with specified sealant types and with other components noted.
      a. Determine preparation and priming requirements based on manufacturers recommendations; take action necessary for correction of failure of sealant tests on mock-up.
      b. Verify sealants, primers, and other components do not stain adjacent materials.
   4. Locate where directed by Architect/Engineer unless location is indicated on the Drawings.
   5. Incorporate accepted mockup as part of Work unless noted otherwise.
   6. Remove mockup when directed by Architect/Engineer.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.6 COORDINATION

A. Section 01 31 00 – Project Management and Coordination.
PART 2 PRODUCTS

2.1 JOINT SEALERS

A. Manufacturers:

1. Dow Corning Corp.
2. GE Silicones
3. Pecora Corp.
4. Sika Corp.
5. Tremco Sealants & Waterproofing
6. BASF, Master Builders Solutions.
8. US Gypsum.
9. Substitutions: See Section 01 25 00 - Product Requirements

B. Products Description:

1. Type A (Acoustical) – Refer to Section 07 92 19.
2. Type B (Butyl) Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, non-drying, non-skinning, non-curing.
   b. Tremco, Butyl Sealant.
   c. Applications: Use for concealed sealant bead in sheet metal work and concealed sealant bead in siding overlaps.
3. Type G (Gasket) Exterior Compressible Gasket Expansion Joint Sealer Pre-compressed Joint sealant: Silicone coated polyurethane foam.
   a. Construction Specialties, Type: VF.
   b. Color: As selected from manufacturer’s full line.
   c. Size and Shape: As indicated on Drawings.
   d. Applications: Use for exterior wall expansion joints.
4. Type GI (General Interior) General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
   a. Pecora, AC-20 + Silicone.
   b. Tremco, Tremflex 834.
   c. Color: Colors as selected from manufacturer’s full line.
   d. Applications: Use for interior wall and ceiling control joints, joints between door and window frames and wall surfaces, and other interior joints for which no other type of sealant is indicated.
   a. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
5. Type GP (General Polyurethane) General purpose Polyurethane sealant: One component, nonpriming, elastomeric, gun-grade; ASTM C920, Type S, Grade NS, Class 35; Uses T, NT, M, A, G and O.
   a. Masterseal NP1.
   c. Color as selected from manufacturer’s full line.
6. Type HP (Hybrid Polyurethane) High Performance hybrid polyurethane sealant: One component, nonpriming, elastomeric, gun grade; ASTM C920, Type S, Grade NS, Class 50; Use NT,M, A, O.
a. BASF MasterSeal NP100
b. Exterior Applications: expansion joints, precast units, metal, coated metal (Kynar), curtain walls, vinyl, cement board & wood siding, window & door frames. Color as selected from manufacturer’s full line.

7. Type GS (General Silicone) High Performance General Purpose Exterior (Non-traffic) Sealant: Silicone; ASTM C920, Grade NS, Type S, Class 100/50, Uses M, G, and A; single component.
   a. Dow Corning 790.
   b. Pecora 864 NST.
   c. Tremco Spectrem 1.
   d. Color: Colors as selected from manufacturer’s full line.
   e. Applications: Use for:
      1) Control, expansion, and soft joints in masonry.
      2) Joints between concrete and other materials.
      3) Joints between metal frames and other materials.
      4) Other exterior non-traffic joints for which no other sealant is indicated.

8. Type T (Traffic) General Purpose Traffic Bearing Sealant: Polyurethane; ASTM C920, Grade P, Class 25, Use T; single component.
   b. Tremco, Vulkem 45 SSL.
   c. Color: Colors as selected from manufacturer’s full line.
   d. Applications: Use for exterior and interior pedestrian and vehicular traffic bearing joints.
      1) Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

9. Type W (Wet) Bathtub/Tile Sealant: White silicone; ASTM C920, Type S, Grade NS, Class 50/25, Uses M and A; single component, mildew resistant.
   a. Dow Corning 786 Silicone sealant.
   b. Pecora 898.
   c. Tremco Tremsil 200.
   d. Color: Colors as selected from manufacturer’s full line.
   e. Applications: Use for joints between plumbing fixtures and floor and wall surfaces, and joints between kitchen and toilet room counter tops and wall surfaces.
      1) Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
   1. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant;

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Sand: Provide sand finish at Concrete and Masonry Joints: Apply sand of color, appearance, and texture matching mortar sand. Completely cover joint sealant.
F. MATERIALS, GENERAL

G. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

H. Colors: Unless otherwise specified, match color of adjacent material occurring in same plane. Where joints occur adjacent to two or more material colors in same plane, match color of lighter adjacent material, unless otherwise directed. Custom colors for exposed sealants may be required if standard colors are not acceptable to the Architect.

I. Sealant for Face Brick: Sealant must have been tested by the manufacturer for staining of face brick, resulting in no discoloration or change in appearance of the joint substrate due to fluid migration.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination.

B. Verify substrate surfaces and joint openings are ready to receive work.

C. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean joints.

C. Prime joints if required for a specific sealant or substrate as recommended by the sealant manufacturer.

D. Perform preparation in accordance with ASTM C1193.

E. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Perform acoustical sealant application work in accordance with ASTM C919.
C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Pre-compressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

I. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING

A. Section 01 77 00 - Closeout Procedures: Final cleaning.

B. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 73 00 - Execution: Protecting installed construction.

B. Protect sealants until cured.

3.6 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Perform field-test of joint-sealant in accordance with test recommended in ASTM C 1193, except as modified below. Method described is similar to method described in less detail in AAMA's "Aluminum Curtain Wall Series No. 13" and in SWRI's "Sealants: The Professionals' Guide."

1. Extent of Testing: Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and joint substrate.

B. Evaluation of Field-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 SCHEDULE

A. Exterior Joints for Which No Other Sealant Type is Indicated: Type GS.

B. Control and Expansion Joints in Paving: Type T.

C. Exterior Wall Seismic Movement Joints: Type G.

D. Exterior Wall Expansion Joints: Type G

E. Exterior Joints Between Wood and Wood: Type GP.

F. Joints Between Concrete Panels and Between Panels and Adjacent Work: Type GS.

G. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type GS with Sand.

H. Lap Joints in Exterior Sheet Metal Work: Type B.

I. Butt Joints in Exterior Metal Work and Siding: Type B.

J. Joints between Exterior Metal Frames and Adjacent Work (except masonry): Type GS.

K. Under Exterior Door Thresholds: Type B.

L. Interior Joints for Which No Other Sealant is Indicated: Type GI.

M. Control and Expansion Joints in Concrete Slabs and Floors: Type T.

N. Joints between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type W.

O. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction. Between Outlet Boxes and Gypsum Board: Type A.

END OF SECTION 07 92 00
SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes acoustical joint sealants.

1.2 ACTION SUBMITTALS
A. Product Data: For each acoustical joint sealant.
B. Acoustical-Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.3 INFORMATIONAL SUBMITTALS
A. Product test reports.
B. Sample warranties.

1.4 WARRANTY
A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.
2.2  ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.

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. GE Construction Sealants; Momentive Performance Materials Inc.
   b. Hilti, Inc.
   c. Pecora Corporation.
   d. Tremco Incorporated.
   e. United States Gypsum Company.
   f. Substitutions: See Section 01 25 00 – Substitution Procedures.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

B. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

C. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

D. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1  PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2  INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

END OF SECTION 07 92 19
SECTION 07 95 13.13 - INTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior expansion joint cover assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each expansion joint cover assembly.
   1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams and a tabular schedule of expansion joint cover assemblies.

C. Samples: For each expansion joint cover assembly and for each color and texture specified.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Expansion Joint Design Criteria:
   1. Type of Movement: Seismic.
      a. Joint Movement: As indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

A. Center-Plate Floor Joint Cover: Assembly consisting of center plate that slides over metal frames fixed to sides of joint gaps.
   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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
b. Balco, Inc.
c. Construction Specialties, Inc.
d. MM Systems Corporation – Basis-of-Design Model # SSP-800 Series.

2. Application: Floor to floor.

3. Installation: Surface mounted.

4. Load Capacity:
   a. Uniform Load: 100 lb/sq. ft.
   b. Concentrated Load: 300 lb.
   c. Maximum Deflection: 0.0625 inch.

5. Cover-Plate Design: Serrated.

6. Exposed Metal:
   a. Aluminum: Color anodic, Class I.
      1) Color: As selected by Architect from full range of industry colors and color densities.

2.4 WALL EXPANSION JOINT COVERS

A. Glide-Plate Wall Joint Cover: Assembly consisting of center plate that slides in and out of slots in metal frames fixed to sides of joint gap.

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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
   b. Balco, Inc.
   c. Construction Specialties, Inc.
   d. MM Systems Corporation – Basis-of-Design Model # SFX-K-4_STUD

2. Application: Wall to wall.

3. Exposed Metal:
   a. Aluminum: Color anodic, Class I.
      1) Color: As selected by Architect from full range of industry colors and color densities.

2.5 CEILING EXPANSION JOINT COVERS

A. Glide-Plate Ceiling Joint Cover: Assembly consisting of center plate that slides in and out of slots in metal frames fixed to sides of joint gap.

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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
   b. Balco, Inc.
   c. Construction Specialties, Inc.
   d. MM Systems Corporation – Basis-of-Design Model # ASC-8-8_STUD
2. Application: Ceiling to ceiling.
3. Exposed Metal:
   a. Aluminum: Color anodic, Class I.
      1) Color: As selected by Architect from full range of industry colors and color densities.

2.6 MATERIALS
A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
B. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.
C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M.

2.7 ALUMINUM FINISHES
A. Mill finish.
B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

2.8 ACCESSORIES
A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
   1. Provide where indicated on Drawings.
B. Manufacturer's standard attachment devices, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies.
C. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
D. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
   1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
   2. Install frames in continuous contact with adjacent surfaces.
      a. Shimming is not permitted.
3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
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.

E. Seals: 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. 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.

F. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

G. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

H. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.2 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete.

B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 95 13.13
SECTION 07 95 13.16 - EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes exterior building expansion joint cover assemblies.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For each expansion joint cover assembly.
      1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams and a tabular schedule of expansion joint cover assemblies.
   C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION
   A. Furnish units in longest practicable lengths to minimize field splicing.
   B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS
   A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   B. Expansion Joint Design Criteria:
      1. Type of Movement: Seismic.
         a. Joint Movement: As indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS
   A. Exterior Metal-Plate Joint Cover: Assembly consisting of sliding metal cover plate in continuous contact with gaskets mounted on metal frames fixed to sides of joint gap.
      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. Architectural Art Manufacturing Inc.; a division of Pittcon Architectural Metals, LLC.
b. Balco, Inc.
c. Construction Specialties, Inc.
d. MM Systems Corporation – Basis-of-Design below:

1) Roof – Model # RXJ-8-4
2) Wall – Model # VSS-800-E_CONC
3) Soffit – Model # SFX-K-8-4_STUD

2. Application: Wall to wall and soffit to soffit.
3. Installation: Surface mounted.
4. Exposed Metal:

   a. Aluminum: Color anodic, Class I.
      1) Color: As selected by Architect from full range of industry colors and color densities.

2.4 MATERIALS

   A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

   B. Elastomeri Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

   C. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ALUMINUM FINISHES

   A. Mill finish.

   B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

2.6 ACCESSORIES

   A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint.

      1. Provide where indicated on Drawings.

   B. Manufacturer's standard attachment devices, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 INSTALLATION

   A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

C. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

D. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
   3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
   4. Install frames in continuous contact with adjacent surfaces.
      a. Shimming is not permitted.
   5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

E. Seals: 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. 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.

F. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

G. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

H. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

I. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall and soffit expansion joint covers with roof expansion joint covers. Install factory-fabricated units at transition between exterior walls and soffits and roof expansion joint cover assemblies.

3.2 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.

END OF SECTION 07 95 13.16
SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes hollow-metal work.

1.2 DEFINITIONS
   A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Sustainable Design Submittals:
      1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   C. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
   D. Samples for Initial Selection: For units with factory-applied color finishes.
   E. Samples for Verification: For each type of exposed finish required.
   F. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.4 INFORMATIONAL SUBMITTALS
   A. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. Ceco Door; ASSA ABLOY.
      2. Curries Company; ASSA ABLOY.
      3. Steelcraft; an Allegion brand.
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.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite 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


1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
   
a. Type: As indicated in the Door and Frame Schedule.
c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
d. Edge Construction: Model 2, Seamless.
e. Core: Polyurethane.
f. Fire-rated Core: Manufacturer’s standard laminated mineral board core for fire-rated and temperature-rise-rated doors.

3. Frames:
   
a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded.


2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES


1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
   
a. Type: As indicated in the Door and Frame Schedule.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
d. Edge Construction: Model 2, Seamless.
e. Core: Polyurethane.
3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

4. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   b. Construction: Full profile welded.

5. Exposed Finish: Galvanize. Factory finish, paint color as scheduled.

2.5 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness to match adjacent door.

B. Construction: Full profile welded.

2.6 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

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.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer 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. Frame Anchors: 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.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
G. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).

J. Glazing: Section 08 80 00 “Glazing.”

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

2.8 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. 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.

2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.

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. Sidelite and Transom Bar 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: 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: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., 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: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

      1) 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.

c. Compression Type: Not less than two anchors in each frame.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
   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. 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.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow-metal work.
   5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer’s standard primer.

2.10 ACCESSORIES

A. Louvers: Provide sightproof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
   1. Fire-Rated Automatic Louvers: Movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, 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.
   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

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.

B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:
Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

Fire-Rated Doors: Install doors with clearances according to NFPA 80.
Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

ADJUSTING AND CLEANING

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.

Remove grout and other bonding material from hollow-metal work immediately after installation.

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.

Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer and plastic-laminate faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Custom stain with clear satin top coat. Match Architect's sample.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

D. Samples: For factory-finished doors.
1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

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. Construction Specialties, Inc.
2. Eggers Industries.
3. Graham Wood Doors; ASSA ABLOY Group company.
5. Vancouver Door Company.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Regional Materials: Wood doors shall be manufactured within 500 miles of Project site from materials
that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Regional Materials: Wood doors shall be manufactured within 500 miles of Project site.

D. Certified Wood: Wood doors shall be certified as "FSC Pure" or "FSC Mixed Credit" according to
FSC STD-01-00 and FSC STD-40-004.

E. Adhesives: Do not use adhesives that contain urea formaldehyde.

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."

G. Composite Wood Products: Products shall be made without urea formaldehyde.
H. Composite Wood Products: Products 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."

I. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: Where indicated.

J. 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.
   1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

K. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

L. Structural-Composite-Lumber-Core Doors:
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.

M. 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 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors - SCW:
   1. Grade: Custom (Grade A faces).
   2. Species: White Oak.
   5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   6. Pair and Set Match: Provide for doors hung in same opening.
   7. Core: Structural composite lumber.
   8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
2.4 LIGHT FRAMES AND LOUVERS

A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

C. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Air Louvers Inc.; a Division of the Activar Construction Products Group.
   b. Anemostat Products; a Mestek company.
   c. L & L Louvers, Inc.
   d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
   e. McGill Architectural Products.

2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

2.5 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 NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.
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.

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.

END OF SECTION 08 14 16
SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Samples: For each type of access door and frame and for each finish specified.
C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Concealed Flanges:
   1. Manufacturers: Basis-of-Design – Williams Brothers WD RDW 410-2 Series
   2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and hinged panel.
   3. Locations: Wall and ceiling as required.
   4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage, factory primed.
   5. Frame Material: Same material and thickness as door.
   7. Fire-rated assemblies in locations to match fire-rated walls and ceilings.

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. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. 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.

B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

C. Latch and Hardware: Screw driver operated.

2.5 FINISHES

A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13
SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulated service doors.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   2. Show locations of controls, locking devices, and other accessories.
   3. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: As indicated on Drawings.
B. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

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

   a. Clopay Building Products.
   b. Cookson Company.
   c. McKeon Rolling Steel Door Company, Inc.
   d. Overhead Door Corporation.
   e. Wayne-Dalton Corp.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000.

C. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Flat profile slats of 3-1/4-inch center-to-center height.

   1. Insulated-Slat Interior Facing: Metal.

F. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.

G. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

H. Hood: Match curtain material and finish.

   1. Mounting: As shown on Drawings.

I. Locking Devices: Equip door with locking device assembly and chain lock keeper.

   1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside with thumb turn.

J. Electric Door Operator:

   1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
   2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
   6. Control Station(s): Where shown on Drawings.

K. Curtain Accessories: Equip door with weatherseals and astragal.

L. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: As scheduled.
2. Factory Prime Finish: Color to match curtainwall mullions.
3. Interior Curtain-Slat Facing: Finish as selected by Architect from manufacturer’s full range.

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

   1. Insulation: Fill slats for insulated doors with manufacturer’s standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84 or UL 723. Enclose insulation completely within slat faces.
   2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch.

B. Curtain Jamb Guides: Manufacturer’s standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

   1. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
   2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.6 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock (See Section 08 71 00 Door Hardware), spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.
2.7 CURTAIN ACCESSORIES

A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

B. Astragal for Exterior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

2.8 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

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. Chamberlain Group, Inc. (The).

2. Comply with NFPA 70.

3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Motors: Reversible-type motor for motor exposure indicated.

1. Electrical Characteristics: As indicated on Electrical Drawings.
2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

D. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.


G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

I. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Power-Operated Doors: Install automatic garage doors openers according to UL 325.
C. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide tight fit around entire perimeter.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23
SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Design Wind Load: As indicated on Drawings for exterior locations. Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward for interior locations.
   2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.

C. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 DOOR ASSEMBLY

A. Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Clopay Building Products.
      b. Overhead Door Corporation.
      c. Raynor.
      d. Wayne-Dalton Corp.
      e. Windsor Door.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000.

C. Air Infiltration: Maximum rate of 0.4 cfm/sq. ft. at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.

D. Aluminum Sections: Full vision.

E. Track Configuration: Standard-lift.

F. Weatherseals: Fitted to bottom and top and around entire perimeter of door. Provide combination bottom weatherseal and sensor edge.

G. Windows: Approximately 24 by 11 inches, with square corners, and spaced apart the approximate distance as indicated on Drawings; in row(s) at height indicated on Drawings; installed with glazing of exterior doors to have insulated glazing units. Interior doors to have ¼” clear monolithic tempered glass.

H. Locking Devices: Equip door with locking device assembly and chain lock keeper.
1. Locking Device Assembly: Cremone type, both jamb sides, locking bars, operable from inside with thumbturn.

I. Electric Door Operator:

1. Usage Classification: Light duty, up to 10 cycles per hour.
2. Operator Type: Manufacturer’s standard for door requirements.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
6. Obstruction-Detection Device: Automatic electric sensor edge on bottom section.
7. Control Station: Where indicated on Drawings.

J. Door Finish:

2. Finish of Interior Facing Material: Match finish of exterior section face.

2.3 ALUMINUM DOOR SECTIONS

A. Sections: Extruded-aluminum stile and rail members with dimensions and profiles as indicated on Drawings; members joined by welding or with concealed, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.

1. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Ensure that reinforcement does not obstruct vision lites.
2. Provide reinforcement for hardware attachment.

B. Solid Panels: Aluminum sheet, set in continuous vinyl channel retained with rigid, snap-in, extruded-vinyl moldings or with rubber or neoprene glazing gasket with aluminum stop.

C. Full-Vision Sections: Manufacturer’s standard, tubular, aluminum-framed section fully glazed with 6-mm-thick, clear glazing set in vinyl, rubber, or neoprene glazing channel and with removable extruded-vinyl or aluminum stops.

2.4 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer’s standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings, Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.

1. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
C. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Provide removable stops of same material as door-section frames.

2.5 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Provide 3-inch-diameter roller tires for 3-inch-wide track and 2-inch-diameter roller tires for 2-inch-wide track.

2.6 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock (See Section 08 71 00 Door Hardware), spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.

C. Cables: Galvanized-steel, multistrand, lifting cables.

D. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.8 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-
prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Chamberlain Group, Inc. (The).

2. Comply with NFPA 70.

3. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   1. Electrical Characteristics: As indicated on Electrical Drawings.
   2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

E. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
   1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom section. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

F. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure, push-button control labeled "Close."
   1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure. See plan for locations.


H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks: Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

E. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

F. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08 36 13
SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior manual-swing entrance doors and door-frame units.

B. Related Requirements:
   1. Section 08 44 13 – Glazed Aluminum Curtain Walls.
   2. Section 08 80 00 – Glazing.
   3. Section 08 71 00 – Door Hardware.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For each exposed finish required.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts 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. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.
C. Field quality-control reports.

D. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

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

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Aluminum-framed entrances shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
      a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
   3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
      a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Entrance Doors:
      a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
      b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lb/sq. ft..

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 35 as determined according to NFRC 500.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Oldcastle
B. Kawneer
C. Tubelite

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: As indicated.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.
2. 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.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
   1. Door Construction: 2- to 2-1/4-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.
      a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
   2. Door Design: As indicated.
      a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware is specified in Section 08 71 00 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 08 80 00 "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.

Sealant shall have a VOC content of 250 g/L or less. Sealant 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."

2.7 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. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF or FEVE resign by weight in color coat.


PART 3 - EXECUTION

3.1 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 nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

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

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 80 00 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers’ written instructions using concealed fasteners to greatest extent possible.
   3. Auto operators to be fully concealed within head storefront framing.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of three tests in areas as directed by Architect.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.
SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes glazed aluminum curtain walls, including integral manual and motorized operable sashes. Aluminum doors integrated into curtainwall.

1.2 RELATED SECTIONS

A. Section 08 41 13 - Aluminum Framed Entrances and Storefront: Aluminum Doors.
B. Section 08 80 00 - Glazing.
C. Section 05 50 00 - Metal Fabrications: Sunshade Bar Grating.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Meeting to be held a minimum of one week prior to installation of curtain wall.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. LEED Submittals:
   1. Product Data for Credit IEQ 4.1: For sealants used inside of the weatherproofing system, in accordance with Section 01 81 13.13 – Sustainable Design Requirements.
C. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
D. Samples: For each exposed finish required.

Retain "Delegated-Design Submittal" Paragraph below if design services have been delegated to Contractor.

E. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Mockup Submittal: In accordance with section 01 83 16.
1.5 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

B. Product test reports.

C. Field quality-control reports.

D. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

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

D. Structurally-Sealed Glazing: Comply with ASTM C1401 for design and installation of structural-sealant-glazed curtain walls.

1.8 QUALITY ASSURANCE

A. Visual and Performance Mockups: In accordance with Section 01 40 00. Work of this section to be included in both visual and testing mock-ups.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Ten years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 “Quality Requirements,” to design glazed aluminum curtain walls.

1. Start curtain wall design at the primary structural members of the building frame and the edges of concrete slabs, and include all support angles and like ancillary framing members required for structural integrity and support of the curtain wall.

B. General Performance: Comply with performance requirements specified, as determined by 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 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.

C. Operable Sashes:

1. System Internal Drainage: Drain to exterior by means of weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.
2. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.
3. Forced Entry Resistance: Sashes within 15 feet of ground or accessible level: Conform to ASTM F588 requirements for performance level 10 for operable sashes.

D. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings

E. Deflection of Framing Members: At design wind pressure, as follows:

   Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 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. For spans over 13 feet 6 inches limit deflection to L/240 + ¼ inch.

1. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
2. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
   a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.


F. Structural: Test according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.

Minimum test duration according to ASTM E 330 is 10 seconds, which is historically U.S. practice.

3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
   1. Fixed Framing and Glass Area:
      Static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) in second option, equivalent to a 25-mph (40-km/h) wind, is ASHRAE 90.1 minimum; air-pressure differential in third option is equivalent to a 50-mph (80-km/h) wind.
      a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
   2. Operable Framing and Glass Area:
      a. Maximum air leakage, including swinging doors, of 0.10 cfm/sq. ft. of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential 6.24 lbf/sq. ft.

H. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
   1. No evidence of water penetration through fixed and operable glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: No evidence of water penetration through operable sashes, fixed glazing and framing areas when tested according too AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 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. Energy Performance: Certify and label energy performance according to NFRC as follows:

Primary energy performance requirements usually include thermal transmittance (U-factor), solar heat gain coefficient, and air infiltration. Options in subparagraphs below are examples only; revise values to suit climate zone of building envelope as defined by the IECC. Testing for visible light transmittance (VT) is specified in Section 088000 "Glazing."
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than .36 Btu/sq.ft. x h x deg F as determined according to NFRC 100.

2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than .27 as determined according to NFRC 200.

3. Condensation Resistance: Fenestration units shall have an NFRC-certified condensation resistance rating of no less than (55) for operable units and (64) for fixed openings.

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

Differential values in "Temperature Change" Subparagraph below (for aluminum in particular) are suitable for most of the U.S.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the following product groups:

   a. Reliance:  6 x 2.5 inch, 7.25x2.5 inch and 10.125x2.5 inch profile with pressure plate and structurally sealed glazing as shown on drawings
   b. Operable units: 30P Zero sightline
   c. Doors: Thermally broken door, heavy duty, medium stile

2. Kawneer

3. Substitutions: See Section 01 25 00 Substitution Procedures.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken
   a. Thermal isolators:
   
   Clamped between metal components:
   

2. Integral to extruded aluminum framing: AAMA TIR-A8.
   a. Continuous extruded polyamide 6/6 (nylon) with 25% glass fiber reinforcement, mechanically crimped to extrusions with knurled cavities.
   
   b. Polyurethane poured into a cavity of a single extrusion; debridged after polyurethane hardness. The cavity shall have closely spaced indentations to mechanically lock the polyurethane in place.

3. Provide separation distance are required to comply with specified thermal performance requirements.
2. Glazing System: Retained mechanically with gaskets on four sides, two sided and four sided structural glazed.
3. Glazing Plane: As indicated.
5. Fabrication Method: Either factory- or field-fabricated system.

B. Pressure Caps: Manufacturer's fiber-reinforced polycarbonate (FRP) components that mechanically retain glazing.
   1. Include snap-on aluminum trim that conceals fasteners.
   2. Provide fin caps model #.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Accessory extrusions and closures including but not limited to sill extensions, jamb extensions, closure piece, extruded surrounds for structure encased by curtain wall.

E. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and Plate: ASTM B 209.
      b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      d. Structural Profiles: ASTM B 308/B 308M.
   2. 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.
      a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
      b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
      c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 GLAZING

A. Glazing: Comply with Section 08 80 00 "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. Structural Sealant: ASTM C1183, chemically curing silicon 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.
      a. Sealants used inside the weatherproofing system shall have a VOC content of 100 g/L or less when calculated
b. Sealants used inside the weatherproofing system shall comply with the testing and product requirement 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. Color: Black

2. Weatherseal Sealant: ASTM C920 for Type S, Grade NS; Class 25; Uses NT, G, A and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact/ recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturer for this use.

a. 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).

b. Sealants used inside the weatherproofing system shall comply with the testing and product requirement 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. Color: Matching structural sealant.

2.5 SUN SHADES

A. Brackets: Solar Eclipse RCW CW250 Anchor. Refer to drawings for profile. Painted to match curtainwall. Engineered to support aluminum bar grating. Aluminum bar grating to be painted to match curtainwall and adjacent brackets as specified in Section 05 50 00.

2.6 OPERABLE UNITS

A. Rainscreen Principal: Incorporate rainscreen design principal in installation of operable unit within surrounding curtain wall frame. Provide a continuous interior sealant joint, outer water shedding seals, and a path to drain for the interstitial space.

B. Hardware, General: Provide manufacturer’s standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close and securely lock and sized to accommodate ventilator weight and dimensions.

1. Do not use aluminum in frictional contact with other metals, except at head of Awning windows.
2. Where exposed, provide extruded, cast or wrought aluminum or nonmagnetic stainless steel.

C. Hardware, Automated: Provide manufacturer’s standard venting window unit with automated hardware as shown on drawings.

1. Operators to be Clearline Mondo operators at motorized operable windows at Commons as part of smoke exhaust system. Windows to open 18" clear. Color to be black.
2. Motorized operable window operators at offices to be Clearline Sleekline operators at motorized operable windows as part of natural ventilation system. Windows to open 10" clear. Color to be black.
3. Coordinate operation with low voltage systems and HVAC control systems. Low voltage wiring to be fully concealed. Coordinate location with Architect of remote control panels prior to installation.
D. Awning type sash. Structurally glazed with the outside face of the flazing flush to the same face of the adjoining curtainwall.

1. Manually operated sashes
   a. Hardware:
      1) Operator: Geared rotary handle fitted to projecting sash arms with limit stops.
      2) Sash lock: Lever handle with cam lock.
      3) Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
      4) Bottom Rollers: Stainless steel, adjustable.
      5) Limit Stops: Resilient rubber.
      6) Operable Sash Weatherstripping: Resilient plastic; permanently resilient, profiled to achieve effective weather seal. Provide two separate lines of weatherstripping.

2. Actuator operated sashes:
   a. Motor description: 24V DC current, magnetic linear electric actuator with movement by a flat link chain contained inside an aluminum shell finished to match the curtain wall. Provide with remote.
   b. Provide complete system wired and ready to connect with building control and security.
      1) D+H Megatronic AG Magnetic SRL:
         a) Horizontally hinged windows: 12" opening: KA34-BSY + UL.
         b) Horizontally hinged windows: 18" opening: KA54-BSY + UL
   c. Controller description: 24V DC controller and external power supply:
      1) VCP-M 8408 (max 4 openings per controller)
         a) Interconnect with building management system.
   d. 24V DC power
      1) SNT2-115V power supply
      2) Provide as located on the drawings
   e. Actuator limiter
   f. Basis of Design:
      1) Verify with manufacturer

E. Screening of operable units

1. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
2. Insect Screens: Woven aluminum mesh; 14/18 mesh size.
3. Color: Charcoal or black.

F. Manual Override: Provide manual override mechanism for each actuator-operated sash. See drawings for locations.

2.7 ENTRANCE DOOR SYSTEMS

A. Manufacturer’s heavy duty glazed entrance doors for manual-swing operation and automated-swing operation as specified in Section 08 42 13 – Aluminum-Framed Entrances and Storefronts.

2.8 ACCESSORY MATERIALS

A. Refer to Section 07 21 00 - Thermal Insulation for insulation at spandrel conditions.

1. R value per inch: 4.2.
2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible. All exposed fasteners shall be countersunk. Architect to approve all locations.
7. Components curved to indicated radii.

D. Fabricate components to resist water penetration as follows:

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. Factory-Assembled Frame Units:

1. Rigidly secure non-movement joints.
2. Prepare surfaces that are in contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
3. Preparation includes, but is not limited to, cleaning and priming surfaces.
4. Seal joints watertight unless otherwise indicated.
5. Install glazing to comply with requirements in Section 08 80 00 "Glazing."

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.


PART 3 - EXECUTION

3.1 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. Where welding is required, 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 is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in 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. Electrical Actuators
   1. Follow manufacturer’s recommendations.
   2. Coordinate with other trades, e.g. electrical.

F. Install glazing as specified in Section 08 80 00 "Glazing."

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Verify testing requirements with Commissioning Plan for air infiltration testing requirements.

B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls as selected by the Architect.

C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls as selected by the Architect.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of two tests in areas as directed by Architect.

D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Repair and Touch-up
   1. Field touch-up shall be limited to repairing minor abraded or scratched surfaces. Repair minor scratches and blemishes with coating manufacturer’s recommended products or system. Such repairs
shall match the original finish for color and gloss and shall adhere to original finish when tested as per AAMA 26-5. The Architect must approve touch-up work.

END OF SECTION 08 44 13
SECTION 08 62 00 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Self-flashing unit skylights with integral curbs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of unit skylight.
B. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
C. Samples: For each type of exposed finish required and each type of glazing.
D. Product Schedule: For unit skylights.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification data.
B. Product test reports.
C. Field quality-control reports.
D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Ten years from date of Substantial Completion.
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. American Skylites Inc.
2. C/S Groups.
5. Velux America, LLC.

2.2 PERFORMANCE REQUIREMENTS

A. Unit Skylight Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Performance Class and Grade: Class CW-PG 50.
2. Certification: AAMA-, WDMA-, or CSA-certified unit skylights with label attached to each.

B. Thermal Transmittance: NFRC 100 maximum U-factor of 0.30 Btu/sq. ft. x h x deg F.

2.3 UNIT SKYLIGHTS

A. Unit Shape and Size: As indicated.

B. Polycarbonate Glazing: Thermoformable, extruded monolithic sheets, UV resistant, burglar-resistance rated according to UL 972, and with average impact strength of 12 to 16 ft-lb/in. of width when tested according to ASTM D 256, Test Method A (Izod).

   a. Thicknesses: Not less than thicknesses required to exceed performance requirements.
   b. Inner Glazing Color: As selected by Architect from full range of industry colors.
   c. Outer Glazing Color: As selected by Architect from full range of industry colors.

2. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested according to ASTM D 1929.

3. Smoke-Production Characteristics: Smoke-developed index of 450 or less when tested according to ASTM E 84, and smoke density of 75 or less when tested according to ASTM D 2843.

4. Burning Characteristics: Tested according to ASTM D 635. Class CC1, burning extent of 1 inch or less for nominal thickness of 0.060 inch or thickness indicated for use.

C. Integral Curb: Extruded-aluminum, self-flashing type.

2. Height: As indicated.
3. Construction: Double wall.
4. Insulation: Manufacturer’s standard rigid or semirigid type.
D. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

E. Thermal Break: Fabricate unit skylights with thermal barrier separating exterior and interior metal framing.

F. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened. Provide nonremovable fastener heads.

2.4 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. After completion of installation and nominal curing of sealant and glazing compounds but before installation of interior finishes, test for water leaks according to AAMA 501.2.

C. Perform test for total area of each unit skylight.

D. Work will be considered defective if it does not pass tests and inspections.

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

3.3 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer’s written instructions. Touch up damaged metal coatings and finishes.

END OF SECTION 08 62 00
SECTION 08 71 00 - FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Finish hardware for doors as scheduled and specified herein, including:
   a. Mechanical hardware for swinging doors.
2. Electro-mechanical devices and access control components as specified herein.
3. Any parts, components, materials, and accessories, whether specified or not, that are required for a complete and operational access control system. Provide access control system with features, capabilities, and operation at each door as specified herein.

B. Related Sections

1. Provide hardware complying with division 01 section “references” as well as the following publications to the extent referenced within this specification.
   a. Division 06 Section: “Finish Carpentry”
   b. Division 08 Section: “Hollow Metal Doors and Frames”
   c. Division 08 Section: “Wood Doors”
   d. Division 08 Section: “Aluminum-Framed Entrances and Storefronts”
   e. Division 08 Section: “Overhead Coiling Doors”
   f. Division 08 Section: “Sectional Doors”
   g. Division 28 Section: “Access Control”
   h. Division 28 Section: “Fire Detection and Alarm Interfaces”

1.02 REFERENCED STANDARDS

A. Provide hardware in accordance with the following standards in addition to those specified in Division 01 Section “References.”

2. Builders Hardware Manufacturer’s Association (BHMA)
   b. ANSI/BHMA A156.18: Materials and Finishes, 2006 edition
3. Door and Hardware Institute (DHI)
   e. Sequence and Format for the Hardware Schedule, 2001 edition
4. National Fire Protection Association (NFPA)
   a. NFPA 80: Standard for Fire Doors and Other Opening Protectives, edition as adopted by local AHJ.
   b. NFPA 105: Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, edition as adopted by local AHJ.
   c. NFPA 252: Standard Methods of Fire Tests of Door Assemblies, edition as adopted by local AHJ.
1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination
1. Coordinate layout, templating, and installation of work with other sections as required. Provide templates, product information, schedules, and diagrams required to fully coordinate the work.
   a. Coordinate blocking for wall stops and other surface-applied hardware with Division 06 Section “Rough Carpentry.”
   b. Coordinate hardware locations and templating with the appropriate Division 08 door and frame sections.
   c. Coordinate conduit, raceways, wiring, and connection as required for electrical and pneumatic hardware items with the appropriate electrical, access control, intrusion detection, and fire alarm sections.
   d. Fire Rated Openings: Coordinate with door and frame manufacturer to ensure that total opening complies with requirements for fire doors.

B. Pre-installation Meetings
1. Upon approval of hardware schedule and wiring diagram submittals and before hardware installation, conduct a pre-installation meeting complying with Division 01 Section “Project Management and Coordination.”
2. Meeting attendees shall include the owner’s representative, architect, contractor, hardware supplier, hardware installer, other affected trades, and manufacturer representative(s) for locks, exit hardware, operators, and closers.
3. Discuss the installation of continuous hinges, locksets, door closers, exit devices, electromechanical finish hardware, and finish hardware. Coordinate installation between trades.
   a. Discuss special installation requirements.
   b. Inspect and discuss electrical rough-in and other preparatory work performed by other trades.
   c. Review sequence of operation for each electrified door opening.
   d. Review and finalize construction schedule and verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
   e. Review required testing, inspecting, and certifying procedures
4. At the meeting, distribute installation manuals, templates, wiring diagrams, and approved hardware schedule submittals to each attendee.
5. Notify participants at least five (5) working days before meeting.

C. Keying Conference
1. Upon approval of hardware schedule and before ordering locking hardware and key system, conduct a keying meeting complying with Division 01 Section “Project Management and Coordination.”
2. Meeting attendees shall include the owner, owner’s security consultant, construction manager, contractor, architect, and hardware supplier’s Architectural Hardware Consultant.
3. Discuss key system requirements and incorporate decisions made during the meeting into the keying schedule submittal.
   a. Review each locking function and determine degree of security required at each opening.
   b. Review function of building, flow of traffic, and purpose of each area.
   c. Determine degree of security at each opening.
   d. Determine requirements for future expansion.
   e. Discuss requirements for shipping and delivery of keys and cylinders/cores.
   f. Discuss requirements to interface new cylinders/cores with owner’s existing key system.

1.04 SUBMITTALS

A. General
1. Provide submittals in accordance with Division 01 Section “Submittal Procedures.”
2. Advise architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.
3. Submittals shall be prepared by or under the supervision of Architectural Hardware Consultant. Stamp submittals with the DHI certification seal and signature of the supervising Architectural Hardware Consultant.
   a. Submittals submitted without the above certification seal shall be marked incomplete and returned.

4. Submittal sequence: Submit product data, hardware schedule, samples, and qualification data concurrently. Coordinate submission of finish hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in project construction schedule. Upon approval of first submittal package, submit wiring diagrams and key schedule.

B. Product Data
1. Submit manufacturer’s technical product data for each item of finish hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Highlight relevant product information such as model, function, trim, finish, options, electrical requirements, and accessories.

C. Hardware Schedule
1. Submit hardware schedule detailing fabrication and assembly of finish hardware, as well as procedures and diagrams. Coordinate the final finish hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of finish hardware.
2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions.
   a. Format schedule complying with the vertical format in DHI's "Sequence and Format for the Hardware Schedule" publication. Double space entries, and number and date each page. Use same scheduling sequence and door numbers as in the Contract Documents
   b. Include the following information:
      1) Numerical door index indicating door number, heading number, and architect’s specified hardware set number.
      2) Identification number, location, hand, fire rating and material of each door and frame.
      3) Type, style, function, size, quantity, and finish of each finish hardware item. Include description and function of each lockset and exit device.
      4) Complete designations of every item required for each door or opening including name and manufacturer.
      5) Fastenings and other pertinent information.
         a) Where universal-type closers are scheduled, indicate the application method to be used for installation at each door (e.g. regular arm, parallel arm, or top jamb).
      6) Location of each finish hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      7) Explanation of abbreviations, symbols, and codes contained in schedule.
      8) Mounting locations for finish hardware.
      9) Door and frame sizes and materials.
     10) Description of each electrified finish hardware function, including location, sequence of operation, and interface with other building control systems.
         a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit; loss of power; fire alarm sounds.
      11) List of related door devices specified in other Sections for each door and frame.
   c. Submit, with the hardware schedule, a list of lead times for hardware items.

D. Keying Schedule
1. Submit keying schedule detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations complying with DHI's "Keying Systems and Nomenclature" publication.

E. Shop Drawings
1. Submit details of electrified finish hardware, indicating the following:
   a. System schematic.
   b. Point-to-point wiring diagram.
   c. Riser diagram.
   d. Elevation of each door.
2. Detail interface between electrified finish hardware and fire alarm, access control, security building control system.
3. Operation Narrative: Describe the operation of doors controlled by electrified finish hardware.
4. Include specific cable requirements; indicate twisted, shielded, and plenum rated cable requirements where required by manufacture or relevant building codes and standards.

F. Manufacturer's Templates
1. After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of finish hardware. Check shop drawings of other work to ensure that adequate provisions are made for locating and installing finish hardware to comply with indicated requirements. Provide additional templates, template lists, hardware schedules, and product information to other trades upon request.

G. Qualification Certificates
1. For installer, supplier, and Architectural Hardware Consultant provide letters of certification that indicate compliance with the requirements specified herein. Submit certifications concurrently with hardware schedule submittal. Submittals will not be considered without certifications.
   a. Installer: Provide documentation showing installer's past experience.
   b. Supplier: Provide letters of certification from the hardware manufacturer stating that the supplier is a factory direct authorized distributor. Provide documentation showing suppliers past experience.
   c. Architectural Hardware Consultant: Provide certificate showing consultant holds the required certificate(s) from DHI.

1.05 CLOSE OUT SUBMITTALS
A. General
1. Upon substantial completion, provide two (2) copies of the closeout submittals complying with Division 01 Section "Close Out Submittals."

B. Operation And Maintenance Data
1. Provide operation and maintenance manuals that include the following for each hardware item:
   a. Project information including contact information for architect, contractor, supplier, installer, Architectural Hardware Consultant, and local representative of each hardware manufacturer
   b. Complete information on care, maintenance, adjustment, repair and replacement of parts, and preservation of finishes
   c. Product data, templates, installation information, service manual, and parts lists.
   d. Copy of final hardware and keying schedules and wiring diagrams for each opening connected to either 120V or low voltage power. Edit schedules and diagrams to reflect "As installed" conditions.

C. Warranty Documentation
1. Provide information required for warranty service or replacement of each hardware item including:
a. Warranty certificates from manufacturer stating warranty period and conditions, complying with warranty requirements specified herein.
b. Copy of manufacturer's order confirmation or original packing slip with manufacturer's original order #, date of manufacture, and ship date.

D. Maintenance Material Submittals
1. Maintenance Tools: Furnish a complete set of specialized tools and maintenance instructions needed for owner's continued adjustment, maintenance, removal, and replacement of finish hardware. Include the following items:
   a. 3 each Closer adjustment wrenches
   b. 3 each Lockset lever removal tools
   c. 1 each Complete key pinning kit
   d. 1 each Exit Device Parts Maintenance Kit
   e. 1 each Lockset Parts Maintenance Kit

1.06 QUALITY ASSURANCE

A. Qualifications
1. Supplier Qualifications: Supplier shall have documented experience in the supply of finish hardware for five (5) years or for three (3) prior projects similar in scope, size, and quality. Supplier shall have an Architectural Hardware Consultant, complying with the requirements specified herein, available to properly handle, detail, and service hardware in a satisfactory manner. Architectural Hardware Consultant shall be available during the course of the work to consult with contractor, architect, and owner about finish hardware and keying.
   a. Supplier shall be a certified direct distributor and be a full sales and service organization for the manufacturer(s) listed.
2. Installer Qualifications: Installer shall have documented experience in the installation of finish hardware for (5) years or for three (3) prior projects similar in scope, size, and quality.
3. Manufacturer Sourcing Qualifications: Obtain each type of finish hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
   a. Provide electrified hardware from same manufacturer as mechanical finish hardware unless otherwise indicated. Manufacturer’s that perform electrical modifications that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction (AHJ) are acceptable.
4. Architectural Hardware Consultant Qualifications: A person who is certified by DHI as an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC) and is enrolled in the DHI Continuing Education Program. Consultant shall be experienced in providing consulting services for finish hardware installations that are comparable in material, design, and extent indicated.

B. Fire Door Assemblies
1. Provide finish hardware for fire rated openings that complies with NFPA 80 and the requirements of the AHJ. Provide only items of finish hardware that are listed by a testing and inspecting agency acceptable to the AHJ for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with fire-rated door and frame labels.
   a. Where exit devices are required on fire rated doors (with supplementary marking on door label indicating “Fire Door to be Equipped with ‘Fire Exit Hardware’”), provide label on exit device indicating “Fire Exit Hardware.”
   b. Provide proper latching hardware, non-flaming door closers, approved bearing type hinges, and required gasketing if not furnished with door or frame.

C. Smoke And Draft Control Door Assemblies
1. Where smoke and draft control door assemblies are required, provide finish hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Marking And Packaging
   1. Package hardware items manufacturer’s standard packaging, clearly marked with hardware set number correlating to finish hardware schedule and architect’s door number.

B. Delivery And Acceptance
   1. Coordinate with construction schedule and deliver packaged hardware items to place of installation (e.g. project site, fabrication shop). Upon delivery, inspect and inventory finish hardware. Immediately notify supplier of defective or missing items.
   2. Deliver keys and cores to owner by registered mail or overnight package service. Ship keys separately from cores.

C. Storage And Handling
   1. Provide secure, dry storage area complying with Division 01 Section “Product Storage and Handling Requirements” for finish hardware delivered to the project site, but not yet installed. Store items on shelves or pallets to prevent damage.
   2. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

D. Packaging Waste Management
   1. Upon delivery and installation of finish hardware, discard packaging and other waste items in accord with Division 01 Section “Cleaning and Waste Management.”

1.08 WARRANTY

A. General Warranty
   1. Warrant finish hardware against defects in material and workmanship as set forth in Division 01 Section “Warranties.”
   2. Special warranties specified herein shall not deprive owner of other rights specified in the contract documents, but shall be in addition to, and run concurrent with, other warranty requirements.

B. Special Warranty
   1. Provide a written warranty, executed by the product manufacturer agreeing to repair or replace components of finish hardware that fail in materials or workmanship within the specified warranty period.
      a. Failures include, but are not limited to, the following:
         1) Structural failures including excessive deflection, cracking, or breakage.
         2) Faulty operation of operators and finish hardware.
         3) Deterioration of metals, metal finishes, and other materials beyond normal wear.
      b. Warranty Period: Two (2) years from date of Substantial Completion, except for:
         1) Mortise Locks: Three (3) years from date of substantial completion
         2) Cylindrical Locks: Ten (10) years from date of substantial completion
         3) Exit Devices: Three (3) years from date of substantial completion
         4) Door Closers: Thirty (30) years from date of substantial completion
         5) Auto Operators: Two (2) years from date of substantial completion
         6) Electrified Hardware: One (1) years from date of substantial completion
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Substitutions submitted, no later than 10 business days prior to bid and complying with Division 01 Section "Substitutions" requirements will be reviewed for conformance to basis of design. Substitutions found in compliance will be approved by bid addendum.

2.02 MATERIALS

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
   1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

2.03 FASTENERS

A. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish stainless steel (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

B. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Use through bolts only as indicated in this section unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.04 HINGES

A. Products that may be incorporated into the Work:
   1. Ives: 5BB1 5BB1HW
   2. Stanley: FBB179 FBB168
   3. McKinney: TB2714 T4B3386

B. Requirements:
   1. Screws: Provide Phillips flat-head screws complying with the following requirements:
      a. For metal doors and frames install machine screws into drilled and tapped holes.
      b. For wood doors and frames install wood screws.
      c. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
   2. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
b. Interior Doors: Non-rising pins.
c. Tips: Flat button and matching plug, finished to match leaves.

3. Number of Hinges: At non-rated openings, provide two hinges for each door leaf 60 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof. At fire rated openings, provide no less than three ball bearing hinges for each door leaf 86 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof.

4. Hinge Width: Where applied trim or closer templating require hinge widths wider than 4-1/2 inches, provide minimum width required. Otherwise, provide hinges 4-1/2 inches in width.

5. Hinge Height: Provide hinges 5 inches in height where door leaf exceeds 3'0 in width or where door is a high-use door utilizing panic or push/pull hardware. Otherwise, provide hinges 4-1/2 inches in height.

6. Hinge Weight: Provide heavy weight hinges where door leaf exceeds 3'0 in width, exterior doors, and at doors scheduled with swing clear hinges, panic hardware, push/pull hardware, edge guards, or armor plates. Otherwise provide standard weight hinges.

2.05 CONTINUOUS HINGES

A. Products that may be incorporated into the Work:
   1. Ives: 112HD
   2. Stanley: 661HD
   3. Select: SL11HD

B. Requirements:
   1. Geared Continuous Hinges: Shall utilize a single gear section for the door leaf and a separate gear section for the frame side of the door. Provide full mortise or surface applied hinge as scheduled in each set. Geared hinges are to be UL 10C tested and approved for 90 minutes.

2.06 SLIDING DOOR HARDWARE

A. Manufacturers that may be incorporated into the Work:
   1. Richards Wilcox
   2. Adams Rite
   3. Substitutions as approved by Architect/Owner

B. Requirements:
   1. Provide complete sets of sliding door hardware as recommended by manufacturer for door type and weight.
   2. Include track, channels, brackets, hangers, fasteners, guides, pulls, and other hardware as required for complete installation.

2.07 OPERATING DOOR TRIM

A. Door Bolts
   1. Manufacturers that may be incorporated into the Work:
      a. Ives
      b. Door Controls
      c. Trimco
   2. Requirements:
      a. Provide bolt model recommended by manufacturer for door material type.

B. Coordinators
1. Manufacturers that may be incorporated into the Work:
   a. Ives
   b. Door Controls
   c. Trimco

2. Requirements:
   a. Provide bar type coordinator and filler bar of size as recommended by manufacturer for each opening.
   b. Provide mounting brackets as required for soffit mounted hardware to be compatible with coordinator.

C. Push Plates, Pull Plates, and Pulls
   1. Products that may be incorporated into the Work:
      a. Ives: 8200 8303
      b. Rockwood: 70C 111x70C
      c. Trimco: 1001 1018
   2. Requirements:
      a. Push Plate: Provide 6 inch by 16 inch by .050 inch push plate constructed of brass, bronze, or stainless steel. Bevel all four edges.
      b. Pull Plate: Provide 4 inch by 16 inch by .050 inch push plate constructed of brass, bronze, or stainless steel, bevel all four edges. Provide 10 inch center to center (CTC) pull constructed of brass, bronze, or stainless steel with a diameter of 1 inch.

2.08 LOCKS AND LATCHES

A. Mortise Locks
   1. Products that may be incorporated into the Work:
      a. Schlage: L Series
      b. Best: 40H Series
   2. Requirements:
      a. Exceeds ANSI Grade: BHMA/ANSI A156.13, Series 1000, Grade 1 Operational, Grade 1 Security.
      b. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
      c. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
      d. Thumbturns: Provide thumbturns as enlarged, ADA designated style thumbturns.
      e. Visual Indicator: Where scheduled, provide visual indicator showing “Vacant” or “Occupied.”

B. Heavy Duty Bored Locks
   1. Products that may be incorporated into the Work:
      a. Schlage: ND Series, Rhodes Lever
      b. Best: 9K Series, 15D Lever
   2. Requirements:
      a. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1.
      c. Lockset must be extra heavy-duty
      d. Backset 2 3/4 inch or greater as need to accommodate frame, door or other hardware, with a 9/16 inch throw latch bolt
      e. Lockset provide for 7 pin interchangeable core for the Medeco Keymark X4
      f. Lockset to have solid shank with no opening for access to keyed lever keeper
      g. Keyed lever to be removable only after core is removed by authorized control key, to allow access to lever keeper.
      h. Lockset and latches must conform to ANSI A156.2 Series 4000, Grade 1, and be UL listed
2.09 ACCESS CONTROLLED LOCKS

A. Keypad Only Access Controlled Locks
1. Products that may be incorporated into the Work:
   a. Schlage Electronics: CO-100, RHO Lever
   b. Substitutions as approved by Architect/Owner

2. Requirements:
   a. Provide battery-operated standalone keypad lock with non-handed chassis of type scheduled.
   b. Lock shall have an incorporated 12 button keypad.
   c. Lock shall have capacity for a minimum of 100 pin codes at least 4 digits in length.
   d. Provide lock with functions and keying as scheduled.
   e. Provide lock with emergency key override.

2.10 CYLINDERS AND KEYING

A. Products that may be incorporated into the Work:
   1. Medeco: Keymark X4

B. Requirements:
1. Small Format Interchangeable Cylinders: Provide cylinders of quantity and type and with the appropriate cam/tailpiece to be compatible with the locking hardware provided. Provide cylinder housings ready to accept Small Format Interchangeable Cores (SFIC).

2. Requirements:
   a. Hardware supplier and/or Contractor to supply and install construction cores that will fit into the permanent locks and/or cylinders.
   b. Contractor will supply to Montana State University (MSU) Locksmith shop with a copy of the construction core master and core key.
   c. Contractor will supply 3 keys per permanent core to be cut as directed by the MSU Locksmith Shop.
   d. Contractor will turn over to MSU locksmith shop throw member for installed locks/cylinders.
   e. Contractor will supply 3 keys per permanent core to be delivered to the MSU Locksmith.
   f. Cores are to shipped to Montana State University Locksmith Shop.
   g. Montana State University Locksmith to install all permanent cores.

3. Temporary Construction Keying: Provide each cylinder with temporary keying during the construction period. At substantial completion, accompany the owner’s representative while voiding construction keying. Provide temporary construction keying to comply with the following:
   a. Keyed Temporary Cores: Provide interchangeable core compatible cylinders and levers with keyed construction cores during the construction period. Cores will remain property of the contractor and will be returned upon installation of owner’s permanent key system.

4. Keys: Provide cylinder manufacturer’s standard keys. Keys shall be shipped separate from cores directly to owner’s representative. For estimating purposes, provide keys in the following quantities:
   a. Construction Control Keys: 2 each
   b. Construction Change Keys: 12 each
   c. Permanent Change Keys: 3 per core

2.11 EXIT DEVICES
A. Products that may be incorporated into the Work:
   1. Von Duprin: 98 Series

B. Requirements:
   1. Device Construction:
      a. Exit device(s) shall have a mechanism case constructed of extruded aluminum or wrought stainless steel, base plates constructed of cold rolled or cast steel, push pad of extruded aluminum with stainless steel covering or wrought stainless steel, and end caps with flush mounted, sloped design. At full-glass doors, provide exit devices with no exposed fasteners or rivets visible through glass. Where required by stile width, provide narrow-stile type device.
      b. Latch return springs shall be compression type.
      c. Dogging Mechanism: where dogging or latch-retraction options are not specifically scheduled for non-fire rated doors, provide device with a hex-key activated hook-type dogging mechanism constructed of steel.
      d. Plastic or nylon used for the push pad, or parts in the dogging mechanism or latchbolt mechanism is unacceptable.
      e. Sound Dampening: Device shall be provided with factory-installed sound dampening materials.
      f. Provide device type, function, and trim style as indicated in hardware schedules.
   2. Where exit device(s) are provided for fire rated door, provide with fire listing and label indicating “Fire Exit Hardware.” If device is mounted on wood doors, provide sex nuts and bolts.
   3. Provide shim kits, filler plates, and other accessories as required for each opening.
   4. Unless otherwise indicated in the sets, provide device with roller-type strike.
   5. Where scheduled, provide removable mullions by same manufacturer as provided exit devices. Provide mullion stabilizers, strike preps, and fire rating as indicated in sets.
   6. Concealed Vertical Cable Exit Devices: provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods not permitted.
      a. Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.
      b. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper-infiltrated steel, with molybdenum disulfide low friction coating.
      c. Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
      d. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
      e. Product Cycle Life: 1,000,000 cycles.
      f. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
      g. Latch release does not require separate trigger mechanism.
      h. Cable and latching system characteristics:
         i. Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
         j. Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.
         k. Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
         l. Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
         m. Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.
n. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.

2.12 MECHANICAL DOOR CLOSERS

A. General:
1. Valves: Closers shall have separate valves for latch speed, main speed, and back check. Valves shall be staked to prevent accidental removal. Internal Pressure Relief Valves (PRVs) are prohibited.
2. Provide the appropriate closer body, handing, and brackets to mount closer inside the building on the least-public side of the door.
   a. Where closers are to be mounted parallel arm, provide with heavy duty, fully forged arms.
   b. Where closers are to be mounted regular arm and the opening can otherwise be opened to 180 degrees, provide closer with the appropriate special templating to allow 180 degree door swing. Where a special template is not available for 180 degree swing, provide closer arm with integrated stop.
3. Integrated Stop Closer Arms: Where a closer with integrated stop is required, provide the appropriate closer and arm as follows:
   a. Parallel arm with spring-cushioned stop arm: Provide where door is otherwise able to open to 95 degrees and requires a parallel arm mount closer.
   b. Parallel arm with dead stop arm: Provide where door is obstructed from opening to 95 degrees and requires a parallel arm mount closer.
   c. Regular arm with push side surface-mounted overhead stop: Provide where door closer should mount on pull side of door.
4. Hold Open Arms: Provide closer arms with mechanical hold-opens as scheduled.
5. Provide closers with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware. Provide closers with screw packs containing thru-bolts, machine screws, and wood screws.
6. Closers shall be provided with all-weather fluid and shall not require readjustment from 120 degrees F to -30 degrees F. Fluid shall be non-flaming and shall not fuel door or floor covering fires. Upon request, provide data indicating thermal properties of fluid.
7. Closers shall close and latch door when adjusted to meet accessibility requirements for door opening force: 8.5 lbs at exterior doors, 5 lbs at interior doors, and 15 lbs at labeled fire doors.

B. Heavy Duty Door Closers:
1. Products that may be incorporated into the Work:
   a. LCN: 4040XP
2. Requirements:
   a. Closer Construction: Closer shall have cast iron or aluminum alloy body with 1-1/2 inch steel piston, double heat treated pinion, 3/4 inch bearing journals, and full complement needle bearings. Closer shall be adjustable from sizes 1 through 6.
   b. Provide closers with spring size adjustment dial for ease of adjusting.

2.13 CLOSER RELEASE DEVICES

A. Products that may be incorporated into the Work:
1. LCN: SEM7800 Series
2. Rixson: 900 Series

B. Requirements:
1. Provide 35 pound electro-magnetic hold open device constructed of die cast metal or plastic. Electromagnet shall accept 120VAC, 24VDC, and/or 12VDC power from fire alarm. Provide mounting style as scheduled.
2.14 AUTOMATIC OPERATORS (PNEUMATIC)

A. Products that may be incorporated into the Work:
   1. LCN: 4800 Series

B. Requirements:
   1. Provide low energy automatic operator units that are pneumatically powered complying with ANSI A156.19.
   2. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door:
      a. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
      b. Power: Continuously adjustable over full range of closer sizes, with reduced opening force for physically handicapped.
      c. Regulation: By tamper-proof, non-critical valves. Provide closers with separate adjustment for latch speed, general speed, and back check.
   3. Provide drop plates, brackets, or adapters for arms as required for details.
   4. Provide actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
   5. Provide complete assemblies of compressor, control boxes, tubing, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf.
   6. Provide control box or module with inputs and outputs, which allow sequencing operation, fire alarm system connections, actuators, swing side sensors, stop sensors, and SPDT relay for interfacing with latching or locking devices. Where required provide control box for “blow open” operation controlled by smoke evacuation system.

2.15 ARCHITECTURAL DOOR TRIM

A. Protection Plates and Edge Guards
   1. Products that may be incorporated into the Work:
      a. Ives: 8400 Series
      b. Rockwood: K1050
      c. Trimco: K Series
   2. Requirements:
      a. Provide .050 inch thick stainless steel protection plates with height as scheduled. Plate shall have four beveled edges. Provide no screw holes and adhesive as required by door manufacturer’s fire labeling requirements. Otherwise provide plate manufacturer’s standard countersunk fasteners.
      b. Provide plate with width as follows:
         1) Pairs of Doors: Provide plate to be 1 inch less door width.
         2) Single Doors: Provide plate to be 2 inches less door width on push side, pull side mounted plates to be 1 inch less door width.

B. Door Stops and Holders
   1. Products that may be incorporated into the Work:
      a. Ives: WS407
      b. Rockwood: 405/406
      c. Trimco: 1270
   2. Requirements:
      a. Provide stops and holders as indicated in the HW sets.
2.16 OVERHEAD STOPS AND HOLDERS

A. Products that may be incorporated into the Work:
   1. Glynn Johnson: 100 Series 90 Series 450 Series
   2. Rixson-Firemark: 6 Series 9 Series 10 Series

B. Requirements:
   1. Provide overhead stops and holders as scheduled, sized per manufacturer’s recommendations based on door width.
   2. Provide concealed overhead stops with adjustable jamb bracket.
   3. Where possible without conflicting with other hardware, mount surface overhead stops on least public side of door.
   4. Provide stops with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware.

2.17 SADDLE AND PANIC THRESHOLDS

A. Manufacturers that may be incorporated into the Work:
   1. Zero International
   2. National Guard
   3. Pemko

B. Requirements:
   1. Provide saddle thresholds with length equal to the width of the opening.
   2. Provide stainless steel machine screws and lead anchors for each threshold.

2.18 WEATHERSTRIP AND GASKET

A. General:
   1. Provide weather strip and gasketing as scheduled.
   2. Size weather strip and gasket to provide a continuous seal around opening and at meeting stiles.

B. Perimeter Seals
   1. Manufacturers that may be incorporated into the Work:
      a. Zero
      b. National Guard
      c. Pemko

C. Astragals, Meeting Stiles, and Mullion Seals
   1. Manufacturers that may be incorporated into the Work:
      a. Zero
      b. National Guard
      c. Pemko
   2. Requirements
      a. Where overlapping astragals are scheduled on exterior doors, provide with thru-bolts.

D. Door Bottoms
   1. Manufacturers that may be incorporated into the Work:
      a. Zero
      b. National Guard
      c. Pemko
E. Rain Drips
   1. Manufacturers that may be incorporated into the Work:
      a. Zero
      b. National Guard
      c. Pemko

2.19 MISCELLANEOUS HARDWARE

A. Silencers
   1. Products that may be incorporated into the Work:
      a. Ives: SR64
      b. Rockwood: 608
      c. Trimco: 1229A
   2. Requirements:
      a. Where indicated on single openings, provide 3 each grey rubber silencers on lock jamb.
      b. Where indicated on paired openings, provide 2 each grey rubber silencers on header.

2.20 ELECTRONIC ACCESSORIES

A. Power Supplies
   1. Products that may be incorporated into the Work:
      a. Von Duprin: PS900 Series
   2. Requirements:
      a. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
      b. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
      c. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.
      d. Options: Provide the following options.
         1) Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
         2) Provide sealed batteries for battery back-up at each power supply where specified.
         3) Provide keyed power supply cabinet.
         4) Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.
      e. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.

B. Electric Power Transfers
   1. Products that may be incorporated into the Work:
      a. Von Duprin: EPT-10
   2. Requirements:
      a. Provide edge-mounted electric power transfer with either two 18 gauge wires or ten 24 gauge wires.
2.21 HIGH SECURITY EMERGENCY KEY BOX

A. Products that may be incorporated into the Work:
   1. Knox, Inc. 3200 Series x RMK
   2. Substitutions as approved by Architect/Owner

B. Requirements:
   1. Provide recess-mounted emergency key box as approved by the local fire jurisdiction. Key box to be master-keyed as dictated by local fire jurisdiction.

2.22 KEY CONTROL CABINET

A. Products that may be incorporated into the Work:
   1. Lund, Inc. 1200 Series
   2. Substitutions as approved by Architect/Owner

B. Requirements:
   1. Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet.
   2. Provide complete cross-index system set up by Owner, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
   3. Provide hinged-panel type cabinet for wall mounting.

2.23 FINISHES

A. Match items to the manufacturer's standard color and texture finish for the latch and locksets (or push-pull units if no latch or locksets).

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

D. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.
   1. Brushed Chrome and/or Stainless Steel Appearance
      e. Weatherstrip and Gasket: Clear Anodized Aluminum finish.

PART 3 - EXECUTION

3.01 EXAMINATION
A. Verify conditions of walls, flooring, doors, frames, and hardware are satisfactory for installation of hardware.
   1. Prior to installing doors and hardware, wash down of masonry and painting or staining of doors and frames shall be completed.
   2. Verify that walls have blocking behind wall mounted stop locations.
   3. Verify that flooring does not interfere with door or hardware operation.
   4. Ensure that frames are installed plumb, square, and true. Verify that doors and frames are properly sized and handed and are correctly prepared for hardware installation.
   5. Verify function, quantity, type, hand, and finish of hardware to be installed with the approved hardware schedule.
   6. Verify that electrical rough-in is complete and correctly located for each door.

B. Conditions that do not allow proper installation of hardware shall be corrected before proceeding.

3.02 INSTALLATION

A. General
   1. Install door hardware as detailed in the approved hardware schedule using only approved fasteners and in accordance with manufacturer’s recommended procedures and methods.
   2. Install hardware and signage at fire rated openings in accordance with NFPA 80 requirements.

B. Hardware Mounting Heights
   1. Mount door hardware units at heights indicated, as follows, unless otherwise indicated or required to comply with governing regulations.
      b. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
      c. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

C. Clearances
   1. Install doors, both rated and non-rated, in accordance with NFPA 80 requirements for door clearances as follows:
      a. 1/8 inch between door and frame head and jambs for wood doors
      b. 3/8 inch between door and frame head and jambs for metal doors
      c. 1/8 inch at meeting stiles of pairs of doors.
      d. 3/4 inch undercut maximum.

D. Surface Mounted Door Closers
   1. Install surface mounted door closers on room side of openings, except where prohibited by scheduled hardware. Use appropriate arms, spacers, brackets, and accessories to properly install surface mounted door closers. Adjust spring power to the appropriate setting to ensure the doors reliably close under normal operating conditions.

E. Wall Mounted Door Stops
   1. Locate wall mounted door stops at the appropriate height and location to properly contact protruding door trim.

F. Gasketing
   1. Install gasketing to provide a continuous seal around the perimeter of the opening. Install soffit mounted hardware using the proper brackets, spacers, and accessories to allow proper installation without cutting or notching gasketing material or mounting channels.
G. Overlapping Astragals
1. Install astragals at exterior doors using thru-bolts.
2. Where overlapping astragals are scheduled on out-swinging doors, provide for mounting on the pull-side of the active leaf. Otherwise, provide for mounting on the push-side of the inactive leaf.
3. Notching astragal is not acceptable. Where strike lip conflicts with astragal, provide strike as specified in "Locks and Latches" article of this section.

H. Thresholds And Saddles
1. Trim, cut, and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Thresholds and saddles shall be set in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.03 FIELD QUALITY CONTROL
A. Architectural Hardware Consultant: Architect will engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
B. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.04 ADJUSTING
A. After building HVAC system is balanced and adjusted, conduct final adjustment of door closers. Verify spring power of the surface mounted door closer is properly adjusted to close and latch the door and to comply with the opening force requirements of ANSI A117.1 as follows:
1. Doors with Closers shall take five (5) seconds to close from 90 degrees to 12 degrees.
2. Interior, non-fire rated swinging doors shall open with a maximum of 5 lbs of pressure.
3. Exterior doors and fire rated doors shall open with the minimum amount of pressure required to positively close and latch the door.

3.05 CLEANING AND PROTECTION
A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.06 SCHEDULE
A. The following schedule of hardware sets shall be considered a guide and the supplier is cautioned to refer to general conditions, special conditions, and the full requirements of this section. It shall be the hardware supplier's responsibility to furnish all required hardware.
B. Where items of hardware are not definitely or correctly specified and are required for completion of the Work, a written statement of such omission, error, conflict, or other discrepancy shall be sent to the Architect, prior to date specified for receipt of bids, for clarification by addendum.
C. Adjustments to the Contract Sum will not be allowed for omissions or items of hardware not clarified prior to bid opening.

D. **Hardware Group No. 01**
For use on mark/door #(s):
0197S3.2

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<td>488S-BK @ HEAD &amp; JAMBS</td>
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**Hardware Group No. 01.01**
For use on mark/door #(s):
0198S2.2

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For use on mark/door #(#s): 0164.2

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**OPERATIONAL DESCRIPTION**

1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
3. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

### Hardware Group No. 03

For use on mark/door #(#s): 0401.1 0403.1

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### Hardware Group No. 04

**DOOR NUMBER(S): HW SET NOT USED**

FINISH HARDWARE 08 71 00 - 20
## Hardware Group No. 04.01
For use on mark/door #s: 0301.1

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## Hardware Group No. 04.02
For use on mark/door #s: 0197S3.1 0198S2.1 0297S3.1 0298S2.1 0397S3.1 0398S2.1

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### Operational Description
1. DOORS ARE NORMALLY HELD OPEN ON MAGNETIC HOLD OPENS.
2. UPON LOSS OF POWER OR SIGNAL FROM FIRE ALARM; MAGNETIC HOLD OPENS RELEASE DOORS, ALLOWING DOORS TO CLOSE AND LATCH.
Hardware Group No. 05
For use on mark/door #(s):
0194.2

EACH TO HAVE:

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OPERATIONAL DESCRIPTION
1. DOORS ARE NORMALLY HELD OPEN ON MAGNETIC HOLD OPENS.
2. UPON LOSS OF POWER OR SIGNAL FROM FIRE ALARM; MAGNETIC HOLD OPENS RELEASE DOORS, ALLOWING DOORS TO CLOSE AND LATCH.

Hardware Group No. 06
For use on mark/door #(s):
0201.1 0201.2

EACH TO HAVE:

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FINISH HARDWARE 08 71 00 - 22
Hardware Group No. 06.01

DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. 07

For use on mark/door #(#s):

0203.3

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A) PROVIDE ROUGH IN FOR FUTURE ACCESS CONTROL AT OPENING.

Hardware Group No. 08

For use on mark/door #(#s):

0152.1

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# Hardware Group No. 09
For use on mark/door #s: 0011.1

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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

# Hardware Group No. 10
For use on mark/door #s: 00146.1

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A) Door stop has been intentionally omitted.

# Hardware Group No. 11
For use on mark/door #s: 00110.1 00210.1 00310.1

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A) Door stop has been intentionally omitted.
**Hardware Group No. 11.01**

For use on mark/door #(s): 
0150.1

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**Hardware Group No. 12**

For use on mark/door #(s): 
0337.1 0337.2

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For use on mark/door #(#s):
0140.1  0156.1

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<td>DP1/DP2 AS REQ'D</td>
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<td>ND70HD RHO</td>
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## Hardware Group No. 13.01
For use on mark/door #(#s):
0334.1

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## Hardware Group No. 14
For use on mark/door #(#s): HW SET NOT USED

FINISH HARDWARE

08 71 00 - 26
Hardware Group No. 15
For use on mark/door #(s):
0140.2

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<td>POWER SUPPLY PS902</td>
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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
3. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Group No. 16
For use on mark/door #(s):
B097S3.1

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**Hardware Group No. 17**

For use on mark/door #(s):

0164C.1 0164D.1

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**Hardware Group No. 18**

DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. 19**

For use on mark/door #(s):

0149.1 0149.2 0153.1 0153.2 0359.1 0359.2

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For use on mark/door #(s): 0137.1 0137.2 0165.1 0165.2

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For use on mark/door #(s): 0175.1 0191.1

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<td>POWER SUPPLY PS902</td>
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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

**OPERATIONAL DESCRIPTION**
1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
3. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
Hardware Group No. 22
For use on mark/door #(#s):
0256.1 0264.1

EACH TO HAVE:
Qty Description Catalog Number FIN Mfr
4 EA HINGE 5BB1 4.5 X 4.5 652 IVE
1 EA CLASSROOM LOCK ND70HD RHO 626 SCH
1 EA SFIC PERMANENT CORE KEYMARK X4 626 MED
1 EA SURFACE CLOSER 4040XP SCUSH 689 LCN
3 EA SILENCER SR64 GY IVE

A) PROVIDE ROUGH IN FOR FUTURE ACCESS CONTROL AT OPENING.

Hardware Group No. 23
For use on mark/door #(#s):
0258.1

EACH TO HAVE:
Qty Description Catalog Number FIN Mfr
4 EA HW HINGE 5BB1HW 5 X 4.5 652 IVE
1 EA ELEC CLASSROOM LOCK CO-100-CY-70-KP-RHO-BD 626 SCE
1 EA SFIC PERMANENT CORE KEYMARK X4 626 MED
1 EA OH STOP 90S 630 GLY
1 EA SURFACE CLOSER 4040XP RW/PA (INSTALL ON PULL SIDE) 689 LCN
1 EA MOUNTING PLATE 4040-18 AS REQ'D 689 LCN
3 EA SILENCER SR64 GY IVE

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. LOCKSET IS NORMALLY SECURE.
3. NORMAL CREDENTIAL UNLOCKS THE LOCK MOMENTARILY WHEN IN NORMALLY SECURED STATE.
4. VALID TOGGLE CREDENTIALS ON THE EXTERIOR MAY BE USED TO CHANGE TO A PASSAGE OR SECURED STATUS.
Hardware Group No. 24
For use on mark/door #(s):
0220.1 0226.1 0324.1 0324.2 0360.1 0360.2

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A) PROVIDE ROUGH IN FOR FUTURE ACCESS CONTROL AT OPENING.

Hardware Group No. 25
For use on mark/door #(s):
0212.1

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A) PROVIDE ROUGH IN FOR FUTURE ACCESS CONTROL AT OPENING.
**Hardware Group No. 26**

For use on mark/door #(s): 0200.1

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A) PROVIDE ROUGH IN FOR FUTURE ACCESS CONTROL AT OPENING.
B) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

**Hardware Group No. 27**

For use on mark/door #(s): 0164A.1 0402.1

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FINISH HARDWARE 08 71 00 - 32
**Hardware Group No. 28**
For use on mark/door #s:
0331.1 0331.2

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**Hardware Group No. 29**
For use on mark/door #s:
0267.3 0267E.1 0347A.1

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DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. 31**
For use on mark/door #s:
0156.2

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For use on mark/door #(#s):

0156B.1

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For use on mark/door #(#s):

0237J.1  0256.2  0264.2

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For use on mark/door #(#s):

0301A.1

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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

Hardware Group No. 35
For use on mark/door #(s): 0185.1

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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.
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For use on mark/door #(s):
0180.1 0188.1

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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

### Hardware Group No. 37
For use on mark/door #(s):
0237.1 0237N.1 0237.2 0237N.2 0237N.3

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0253.1 0253.2

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<td>626</td>
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<td>626</td>
<td>MED</td>
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<tr>
<td></td>
<td>WALL STOP WS407CCV</td>
<td>630</td>
<td>IVE</td>
<td></td>
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<tr>
<td>1 EA</td>
<td>MOUNTING PLATE 4040-18 AS REQ'D</td>
<td>689</td>
<td>LCN</td>
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<tr>
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<td>SURFACE CLOSER 4040XP SCUSH</td>
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<td>GASKETING 488S-BK @ HEAD &amp; JAMBS</td>
<td>S-BK</td>
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Hardware Group No. 37.02
For use on mark/door #(s): 0347.1

EACH TO HAVE:

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<td>ND70HD RHO</td>
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<td>KEYMARK X4</td>
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<td>4040XP RW/PA</td>
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<td>4040-18 AS REQ'D</td>
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<td>GASKETING</td>
<td>488S-BK @ HEAD &amp; JAMBS</td>
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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

Hardware Group No. 38
For use on mark/door #(s): 0237.2

EACH TO HAVE:

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<td>KEYMARK X4</td>
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<td>OH STOP</td>
<td>90S</td>
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<td>SURFACE CLOSER</td>
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OPERATIONAL DESCRIPTION
1. KEY IN EITHER LEVER LOCKS AND UNLOCKS OWN LEVER.
### Hardware Group No. 39

For use on mark/door #\(s\): 0111.4

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<td>SCH</td>
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<tr>
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<td>KEYMARK X4</td>
<td>626</td>
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<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4040XP HW/PA</td>
<td>689</td>
<td>LCN</td>
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<tr>
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<td>WALL STOP</td>
<td>WS407CCV</td>
<td>630</td>
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### Hardware Group No. 40

For use on mark/door #\(s\): 0190.1

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<td>IVE</td>
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<td>CLASSROOM LOCK</td>
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<td>90S</td>
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<td>1</td>
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<td>SP</td>
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<td>ASTRAGAL</td>
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<td>2</td>
<td>SILENCER</td>
<td>SR64</td>
<td>GY</td>
<td>IVE</td>
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**A)** A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

FINISH HARDWARE

08 71 00 - 38
Hardware Group No. 40.01
For use on mark/door #(s):
0176.1

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<td>DUST PROOF STRIKE</td>
<td>DP1/DP2 AS REQ'D</td>
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<td>CLASSROOM LOCK</td>
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<td>SR64</td>
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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.

Hardware Group No. 41
DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. 42
For use on mark/door #(s):
0230.1 0316.1

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<td>WS407CCV</td>
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# Hardware Group No. 43

For use on mark/door #s: **0190.2**

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# Hardware Group No. 44

For use on mark/door #s:

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# Hardware Group No. 45

**DOOR NUMBER(S): HW SET NOT USED**

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Hardware Group No. 46
For use on mark/door #(s):
0188.3  0190.3

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OPERATIONAL DESCRIPTION
1. KEY IN EITHER LEVER LOCKS AND UNLOCKS OWN LEVER.

Hardware Group No. 47
For use on mark/door #(s):
0170.1  0208.1  0216.1

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Hardware Group No. 47.01
For use on mark/door #(s):
0308.1

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For use on mark/door #s: 0102.1 0270.1 0302.1 0370.1

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For use on mark/door #s: 0117.1 0119.1 0121.1 0244.1 0362.1

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## Hardware Group No. 50
For use on mark/door #s: 0123.1 0127.1 0164B.1 0364.1 0396S.1 B097S3.2

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For use on mark/door #s:
- B015.1
- B015.2
- B027TU.1

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- 0217.1
- 0261.1
- 0266.1
- 0317.1
- 0350.1
- 0353.1

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For use on mark/door #s:
- 0198.22

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<td>1</td>
<td>STOREROOM LOCK</td>
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A&E # 14080
PPA # 13-0200
A/E # 2014-02-07

NORM ASBJORNSON HALL
MONTANA STATE UNIVERSITY
OCTOBER 6, 2016

Hardware Group No. 53
For use on mark/door #(s):
0157.1  0403.1-PR

EACH TO HAVE:

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Hardware Group No. 54
DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. 55
For use on mark/door #(s):
0250.1

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<td>DP1/DP2 AS REQ'D</td>
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<td>SILENCER</td>
<td>SR64</td>
<td>GY</td>
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A) A CONFLICT MAY OCCUR BETWEEN THE OVERHEAD STOP THRU BOLT AND THE DOOR CLOSER CYLINDER. IF THIS CONFLICT OCCURS A DROP PLATE WILL HAVE TO BE USED AND THE PLATE DRILLED OUT TO PROVIDE CLEARANCE FOR THRU BOLT HEAD.
**Hardware Group No. 56**
For use on mark/door #(s):

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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
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<td>WS407CCV</td>
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**Hardware Group No. 57**
For use on mark/door #(s):

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<td>3</td>
<td>SILENCER</td>
<td>SR64</td>
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**Operational Description**

1. LATCHBOLT RETRACTED BY KNOB/LEVER FROM EITHER SIDE UNLESS OUTSIDE IS LOCKED BY INSIDE THUMBTURN.
2. TURNING INSIDE KNOB/LEVER OR CLOSING DOOR UNLOCKS OUTSIDE KNOB/LEVER.
3. TO UNLOCK FROM OUTSIDE, REMOVE EMERGENCY BUTTON, INSERT EMERGENCY THUMBTURN (FURNISHED) IN ACCESS HOLE AND ROTATE.
4. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.
5. ADA THUMBTURN.
6. LOCK INDICATOR WILL READ OCCUPIED/VACANT
## Hardware Group No. 58
For use on mark/door #s:

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A) BALANCE OF HARDWARE BY DOOR MANUFACTURER.

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For use on mark/door #s:

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A) BALANCE OF HARDWARE BY DOOR MANUFACTURER.

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A) DOOR NOT IN SCOPE.
### Hardware Group No. 61

For use on mark/door #s:
0111.1

**EACH TO HAVE:**

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Hardware Group No. 62
For use on mark/door #s:
0111.2

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For use on mark/door # (s):  
0111.3

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**Hardware Group No. A-AL-04**  
DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. AL-01**  
DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. AL-02**  
DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. AL-03**  
DOOR NUMBER(S): HW SET NOT USED

**Hardware Group No. AL-04**  
DOOR NUMBER(S): HW SET NOT USED
Hardware Group No. AL-05
For use on mark/door #s: 0197.7

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Hardware Group No. AL-06
DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. AL-08
DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. AL-09
DOOR NUMBER(S): HW SET NOT USED

Hardware Group No. AL-10
For use on mark/door #s: 0298C.1

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<td>AS REQ'D TO INSTALL CLOSER</td>
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A) HARDWARE SUPPLIER TO CONFIRM HARDWARE SCHEDULED ABOVE WILL MAINTAIN FIRE RATING WHEN USED WITH FIRE RATED ALUMINUM DOORS.
Hardware Group No. GATE-01
For use on mark/door #(s):
0110.G  0210.G  0310.G

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A) HARDWARE SUPPLIER TO COORDINATE SCHEDULED HARDWARE ABOVE WITH GATE FABRICATOR.
### Hardware Group No. VEST-0194-01

For use on mark/door #s:

0194.1

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### OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
3. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
4. DEVICE LATCH MAY BE ELECTRICALLY HELD IN RETRACTED STATE.
5. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
6. INNER ACTUATOR IS ALWAYS ENABLED.
7. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
8. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
Hardware Group No. VEST-0194-02
For use on mark/door #(s):
0194.3

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Hardware Group No. VEST-0195-01
For use on mark/door #(#s):
0195.1

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OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
3. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
4. DEVICE LATCH MAY BE ELECTRICALLY HELD IN RETRACTED STATE.
5. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
6. INNER ACTUATOR IS ALWAYS ENABLED.
7. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
8. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
9. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0195-02
For use on mark/door #(s):
0195.2

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A) VESTIBULE ACTUATOR (8310-855) SCHEDULED WITH DOOR 0195.1.

OPERATIONAL DESCRIPTION
1. ACTUATORS ARE ALWAYS ENABLED.
2. PRESSING EITHER ACTUATOR SIGNALS OPERATOR TO OPEN DOOR.
3. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0196-01
For use on mark/door #s: 0196.2

EACH TO HAVE:

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A) 0196.2: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0196.4.
B) 0196.2: SHARE POWER SUPPLY WITH 0196.1.
C) 0196.2 WILL HAVE CARD READER IN FUTURE.

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
5. INNER ACTUATOR IS ALWAYS ENABLED.
6. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
7. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
8. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0196-02
For use on mark/door #(#s):
0196.1

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A) 0196.1: SHARE 7949ES BLOW OPEN BOX WITH DOOR 0196.3.
B) 0196.1: SHARE POWER SUPPLY WITH 0196.2.

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
5. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0196-03
For use on mark/door # (s): 0196.3

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A) 0196.3: SHARE 7949ES BLOW OPEN BOX WITH DOOR 0196.1.

OPERATIONAL DESCRIPTION
1. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.

Hardware Group No. VEST-0196-04
For use on mark/door # (s): 0196.4

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A) 0196.4: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0196.2.
B) VESTIBULE ACTUATOR (8310-855) SCHEDULED WITH DOOR 0196.2.

OPERATIONAL DESCRIPTION
1. ACTUATORS ARE ALWAYS ENABLED.
2. PRESSING EITHER ACTUATOR SIGNALS OPERATOR TO OPEN DOOR.
3. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0197-01
For use on mark/door #(s):
0197.3

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A) 0197.3: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0197.6.
B) 0197.3: SHARE POWER SUPPLY WITH 0197.1, 0197.2.

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
3. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
4. DEVICE LATCH MAY BE ELECTRICALLY HELD IN RETRACTED STATE.
5. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
6. INNER ACTUATOR IS ALWAYS ENABLED.
7. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
8. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
9. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0197-02
For use on mark/door #s:
0197.1       0197.2

EACH TO HAVE:

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A) 0197.1, 0197.2: SHARE POWER SUPPLY WITH 0197.3.
B) 0197.1 AND 0197.2 TO SHARE ONE (1) 7949ES BLOW OPEN BOX.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. ES7949 WILL SIGNAL 0197.1 AND 0197.2 TO RETRACT LATCH.
5. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
6. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0197-03
For use on mark/door #(s):
0197.4  0197.5

EACH TO HAVE:

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A) 0197.4 AND 0197.5 TO SHARE ONE (1) 7949 BLOW OPEN BOX.

OPERATIONAL DESCRIPTION
1. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.

Hardware Group No. VEST-0197-04
For use on mark/door #(s):
0197.6

EACH TO HAVE:

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A) 0197.6: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0197.3.
B) VESTIBULE ACTUATOR (8310-855) SCHEDULED WITH DOOR 0197.3.

OPERATIONAL DESCRIPTION
1. ACTUATORS ARE ALWAYS ENABLED.
2. PRESSING EITHER ACTUATOR SIGNALS OPERATOR TO OPEN DOOR.
3. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0198-01
For use on mark/door #0198.1

**EACH TO HAVE:**

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A) 0198.1: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0198.4.
B) 0198.1: SHARE POWER SUPPLY WITH 0198.2, 0198.3.
C) 0198.1 WILL HAVE CARD READER IN FUTURE.

**OPERATIONAL DESCRIPTION**

1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
5. INNER ACTUATOR IS ALWAYS ENABLED.
6. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
7. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
8. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0198-02
For use on mark/door #((s):
0198.2 0198.3

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A) 0198.2, 0198.3: SHARE POWER SUPPLY WITH 0198.1.
B) 0198.2 AND 0198.3 TO SHARE ONE (1) 7949ES BLOW OPEN BOX.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. ES7949 WILL SIGNAL 0198.2 AND 0198.3 TO RETRACT LATCH.
5. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
6. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0198-03
For use on mark/door #(s):
0198.5 0198.6

| EACH TO HAVE: | | | | |
|---|---|---|---|
| Qty | Description | Catalog Number | FIN | Mfr |
| 1 EA | CONT. HINGE | 112HD | 628 | IVE |
| 1 EA | DUMMY PUSH BAR | 330-DT | 626 | VON |
| 1 EA | OH STOP | 100SE ADJ (TEMPLATE TO 95 DEGREES) | 630 | GLY |
| 1 EA | SURF. AUTO OPERATOR | 4822 WMS | 689 | LCN |
| 1 EA | BLOW-OPEN BOX | 7949 | NA | LCN |
| 1 SET | SEALS | BY ALUM DOOR/FRAME MFG | | |

A) 0198.5 AND 0198.6 TO SHARE ONE (1) 7949 BLOW OPEN BOX.

OPERATIONAL DESCRIPTION
1. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.

Hardware Group No. VEST-0198-04
For use on mark/door #(s):
0198.4

| EACH TO HAVE: | | | | |
|---|---|---|---|
| Qty | Description | Catalog Number | FIN | Mfr |
| 1 EA | CONT. HINGE | 112HD | 628 | IVE |
| 1 EA | DUMMY PUSH BAR | 330-DT | 626 | VON |
| 1 EA | OH STOP | 100SE ADJ (TEMPLATE TO 95 DEGREES) | 630 | GLY |
| 1 EA | SURF. AUTO OPERATOR | 4822 WMS | 689 | LCN |
| 1 EA | ACTUATOR, WALL MOUNT | 8310-856T | 630 | LCN |
| 1 EA | FLUSH MOUNT BOX | 8310-867F | 689 | LCN |
| 1 SET | SEALS | BY ALUM DOOR/FRAME MFG | | |

A) 0198.4: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0198.1.
B) VESTIBULE ACTUATOR (8310-855) SCHEDULED WITH DOOR 0198.1.

OPERATIONAL DESCRIPTION
1. ACTUATORS ARE ALWAYS ENABLED.
2. PRESSING EITHER ACTUATOR SIGNALS OPERATOR TO OPEN DOOR.
3. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0199-01
For use on mark/door #s:
0199.2

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A) 0199.2: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0199.4.
B) 0199.2: SHARE POWER SUPPLY WITH 0199.1.
C) 0199.2 WILL HAVE CARD READER IN FUTURE.

OPERATIONAL DESCRIPTION
1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. OUTER ACTUATOR IS DISABLED BY LX SWITCH (INTEGRAL TO LOCKING HARDWARE). WHEN DOORS ARE LATCHED, ACTUATOR IS DISABLED.
5. INNER ACTUATOR IS ALWAYS ENABLED.
6. IF DOOR IS LATCHED WHEN ENABLED ACTUATOR IS DEPRESSED, OPERATOR RETRACTS LATCHES PRIOR TO OPENING.
7. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED UNLESS HEX KEY DOGGING IS BEING USED.
8. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0199-02
For use on mark/door #s: 0199.1

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A) 0199.1: SHARE 7949ES BLOW OPEN BOX WITH DOOR 0199.3.
B) 0199.1: SHARE POWER SUPPLY WITH 0199.2.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
3. DEVICE LATCH MAY BE MECHANICALLY HELD IN RETRACTED STATE BY MECHANICAL DOGGING FEATURE.
4. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
5. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
Hardware Group No. VEST-0199-03
For use on mark/door #0199.3

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1 SET SEALS BY ALUM DOOR/FRAME MFG

A) 0199.3: SHARE 7949ES BLOW OPEN BOX WITH DOOR 0199.1.

OPERATIONAL DESCRIPTION
1. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.

Hardware Group No. VEST-0199-04
For use on mark/door #0199.4

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A) 0199.4: SHARE CONTROL BOX AND BLOW OPEN BOX WITH 0199.2.
B) VESTIBULE ACTUATOR (8310-855) SCHEDULED WITH DOOR 0199.2.

OPERATIONAL DESCRIPTION
1. ACTUATORS ARE ALWAYS ENABLED.
2. PRESSING EITHER ACTUATOR SIGNALS OPERATOR TO OPEN DOOR.
3. UPON ACTIVATION OF BLOW OPEN SYSTEM; DOOR WILL OPEN TO 90 DEGREES AND HOLD UNTIL RELEASED.
## Miscellaneous Items

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites, storefront framing, glazed curtain walls, and sloped glazing.
2. Glazing sealants and accessories.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
E. 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. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for 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: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. AGC Glass Company North America, Inc.
2. Guardian Industries Corp.; SunGuard.
3. Oldcastle BuildingEnvelope™.
4. PPG Flat Glass; PPG Industries, Inc.
2.2 PERFORMANCE REQUIREMENTS

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

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Design Snow Loads: As indicated on Drawings.
3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with enhanced protection testing requirements in ASTM E 1996 for Wind Zone 3 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.

1. Large-Missile Test: For glazing located within 30 feet of grade.
2. Small-Missile Test: For glazing located more than 30 feet above grade.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. 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.
2. 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.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.


B. Safety Glazing Labeling: Where safety glazing 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.
C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Ultraclear Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent and solar heat gain coefficient of not less than 0.87.

B. 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.

C. Water-based silicone coated spandrel glass

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. 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 or butyral interlayer.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:

1. Polyvinyl butyral interlayer.
2. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.


   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) Technoform Glass Insulation NA, Inc.
   2) Thermix; a brand of Ensinger USA.
2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they 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. Sealant shall have a VOC content of 250 g/L or less.

4. Sealant 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."

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

   a. Dow Corning Corporation.
   b. GE Construction Sealants; Momentive Performance Materials Inc.
   c. Pecora Corporation.
   d. Sika Corporation.
   e. Tremco Incorporated.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

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

   a. BASF Corporation; Construction Systems.
   b. Dow Corning Corporation.
   c. GE Construction Sealants; Momentive Performance Materials Inc.
   d. Pecora Corporation.
   e. Sika Corporation.
   f. Tremco Incorporated.

D. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

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

   a. Bostik, Inc.
   b. Dow Corning Corporation.
   c. GE Construction Sealants; Momentive Performance Materials Inc.
   d. Pecora Corporation.
   e. Sika Corporation.
   f. Tremco Incorporated.
E. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation; Construction Systems.
   b. Bostik, Inc.
   c. Dow Corning Corporation.
   d. GE Construction Sealants; Momentive Performance Materials Inc.
   e. Pecora Corporation.
   f. Sika Corporation.
   g. Tremco Incorporated.

2.8 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.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. 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.
PART 3 - EXECUTION

3.1  GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. 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.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

G. 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.

3.2  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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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. Apply heel bead of elastomeric sealant.

F. 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.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.
3.3 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.

3.4 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 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.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.
3.6 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-10: Clear fully tempered float glass.
   1. Minimum Thickness: 1/4 inch thick
   2. Application: As shown on drawings.
   3. Safety glazing required.

B. Glass Type GL-10A: Fritted fully tempered float glass.
   1. Minimum Thickness: 1/4 inch thick
   2. Application: As shown on drawings.
   3. Safety glazing required.
   4. Frit as selected by Architect.

C. Glass Type GL-12: Backpainted fully tempered float glass.
   1. Minimum Thickness: 1/4 inch thick
   2. Application: As shown on drawings.
   3. Safety glazing required.
   4. Basis-of-Design Product: Skyline Design
   5. Product: Vitracolor
   6. Color: White
   7. Backpainted glass

D. Glass Type GL-5: Water-based silicone spandrel glass; fully tempered float glass.
   2. Glass: Clear float glass.
   3. Tint Color: None (clear).
   4. Coating Color: #3-0586 Medium Gray
   5. Minimum Thickness: ¼” thick minimum

E. Glass Type GL-6: Water-based silicone spandrel glass; fully tempered float glass.
   2. Glass: Ultraclear float glass.
   3. Tint Color: None (clear).
   4. Coating Color: #3-0318 Bone White
   5. Minimum Thickness: ¼” thick minimum
   7. Factory apply manufacturer’s standard opacifier to coated second surface of lites, with resulting products complying with Specification No. 89-1-6 in GANA’s “Engineering Standards Manual”.

F. Glass Type GL-13: Colored Film, fully tempered float glass
   1. Basis-of-Design Product: 3M Glass Finishes
   2. Glass: Clear float glass
   3. Tint Color: To be selected by Architect
   4. Minimum Thickness: ¼” tempered
   5. Film Location: Second surface.
   6. Location: As indicated in the drawings.
3.7 LAMINATED GLASS SCHEDULE

A. Glass Type GL-11: Clear laminated glass with two plies of fully tempered float glass.
   2. Minimum Thickness of Each Glass Ply: ¼ inch thick 3/16" thick
   3. Interlayer Thickness: 0.090 inch.
   4. Safety glazing required.

B. Glass Type GL-15: Clear laminated glass with two plies of fully tempered float glass.
   1. Basis-of-Design Product: PPG North America
   2. Minimum Thickness of Each Glass Ply: 3/8 inch thick
   3. Interlayer Thickness: 0.090 inch.
   4. Interlayer color to be selected by Architect
   5. Safety glazing required.

3.8 INSULATING GLASS SCHEDULE

A. Glass Type GL-1: Low E clear insulating glass.
   1. Basis-of-Design Product: PPG Solarban 60 on #2 face.
   2. Overall Unit Thickness: 1 inch.
   3. Minimum Thickness of Each Glass Lite: ¼ inch thick minimum.
   4. Outdoor Lite: Fully tempered low iron clear float glass.
   5. Interspace Content: Argon.
   6. Indoor Lite: Fully tempered clear float glass.
   8. Safety glazing required.

B. Glass Type GL-2: Thermochromic clear insulating glass.
   1. Basis-of-Design Product: Pleotint Suntuitive, self-tinting glass
   2. Overall Unit Thickness: 1 inch
   3. Minimum Thickness of Each Glass Lite: 3/16" thick minimum
   4. Outdoor Lite: Clear, fully tempered laminated float glass w/ self-tinting interlayer.
   5. Interspace Content: Argon.
   6. Indoor Lite: Fully tempered float glass.
   7. Winter Nighttime U-Factor: 0.23 maximum.
   8. Safety glazing required.

C. Glass Type GL-3: Low E clear insulating glass.
   2. Overall Unit Thickness: 1 inch.
   3. Minimum Thickness of Each Glass Lite: ¼ inch thick minimum.
   4. Outdoor Lite: fully tempered low iron clear float glass.
   5. Interspace Content: Argon.
   6. Indoor Lite: fully tempered clear float glass.
   7. U-Factor: .27 maximum.
   8. Safety glazing required.
D. Glass Type GL-7: Translucent clear insulating glass.

1. Basis-of-Design Product: Okalux Light diffusing Insulated Glass
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: ¼ inch thick minimum.
4. Outdoor Lite: Fully tempered low iron clear float glass.
5. Interspace Content: B.O.D. OKAPANE 12mm PMMA acrylic UV stable capillary slab encased in fiber tissue.
6. Indoor Lite: Fully tempered clear float glass.
10. Safety glazing required.

E. Glass Type GL-8: Low E Electrochromic insulating glass.

2. Overall Unit Thickness: 1 inch
3. Minimum Thickness of Each Glass Lite: ¼ inch minimum.
4. Outdoor Lite: 2-ply laminated float glass.
   a. Surface 4 coated with electrochromic layers.
5. Tint Color: Variable upon electronic switching
6. Interspace Content: Air.
7. Indoor Lite: Clear fully tempered float glass.
10. Visible Light Transmittance: 60 percent minimum.
12. Safety glazing required.

3.9 FIRE RESISTANCE GLASS

A. Glass Type GL-14

1. Minimum Thickness: 1/4 inch thick
2. Application: Glazed lites in fire doors, fire windows, sidelights, borrowed lites and all other glazing in partitions indicated as having an hourly fire rating and as shown on drawings.
3. Type: Annealed float glass.
4. Labeling: Provide permanent label on fire-rated glazing in compliance with ICC (IBC) and authorities having jurisdiction.
5. Provide products listed by Underwriters Laboratories in Intertek Warnock Hersey.
7. Glazing Method: As required for fire rating.
8. Markings for Fire-Rated Glazing Assemblies:
   a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
   b. OH" - meets fire window assembly criteria including the hose stream test of NFPA 257 or UL 9 fire test standards.
   c. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
   d. "H" - meets fire door assembly "Hose Stream" test of NFPA 252, UL 10B, or UL 10C fire test standards.
   e. "NH" - does not meet the hose stream test requirements of tests.
   f. "T" - meets 450 degrees F temperature rise criteria for 30 minutes of NFPA 252, UL 10B, or UL 10C fire test standards.
   g. "NT" - does not meet the temperature requirements of tests.
9. Manufacturers:
   a. SAFTIFIRST, a division of O’Keeffe’s Inc; SUnperlite II-XL: www.safti.com
   c. Vetrotech Saint-Gobain North America; Contraflam: www.vetrotechusa.com

END OF SECTION 08 80 00
SECTION 09 05 02 – FINISH MATERIALS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. This Section contains a coordinated color and finish system for materials specified below and in the various Sections of this Specification.

1. Each item is defined by codes in the first column.
2. The “Code” defined here in the “Finish Materials Legend” refers to the material finish, color, texture and pattern for each material which is further specified in the various specification sections.
3. These codes are keyed to the Floor finish plans and interior elevations.

B. Revisions to any item resulting from actions of the Contractor (or failure to act) may result in adjustments to other items at the option of the Owner.

1. These adjustments shall be implemented by the Contractor at no change in Contract Sum or Contract Time.

PART 2 - PRODUCTS

SECTION 03 35 18 POLISHED CONCRETE

CONC-1 Polished Concrete finish for certain interior concrete slabs, natural, no color additives. Refer also to Section 03 30 00 – Cast-in-Place Concrete for mix design details.

SECTION 05 75 00 DECORATIVE FORMED METAL

INTERIOR DECORATIVE PANELS

M-1 Product: Perforated metal plate, custom perforations: 4” x ½” round end slots, horizontal spacing: 1” on center; vertical spacing: 4 ½” on center, staggered, custom panel sizes.
Location: Guardrail
Finish: Match paint color P-1.

M-2 Product: Custom perforated metal with acoustical insulation
Location: Inspiration Hall – Feature wall (part of graphics package)
Finish: Match paint color P-1.

M-3 Product: Steel shapes and 1/8” steel plates
Location: Classroom and office entrances
Finish: Match paint color P-3.

M-4 Product: Perforated metal, 1” x 1/8” round end slots, horizontal spacing: 1/4” on center; vertical spacing: 1 1/8”, staggered, custom size panels with 1” border.
Location: Café Counter
Finish: Match paint color P-5

M-5  Product: Steel shapes and 1/8” steel plates
   Location: Innovation Alley Walls, Vestibule 0197, and as noted on drawings
   Finish: Edges sanded smooth, surface cleaned, primed, and painted to match paint color P-5.

M-6  Product: 1/8” Pre-weathered steel, similar to exterior steel soffit panels MTL-3
   Location: Inspiration Hall walls
   Finish: Clear sealer with satin finish.

SECTION 06 20 00 INTERIOR FINISH CARPENTRY, SECTION 09 64 00 WOOD FLOORING

WD-1  Species: White Oak
   Cut: 1” x 3” solid tongue and groove planks, tight joint. Fabricated into panels and cleated to walls per drawings.
   Finish: Clear satin

WD-2  Species: White Oak
   Cut: 1” x 3” solid tongue and groove plank flooring
   Location: Inspiration Hall, Seating Stair, Level-1 Treehouse, Central Stair Plinth
   Finish: Clear satin

WD-3  Description: Reclaimed, live edge 2” thick, solid slab, live edge on one side per drawings
   Location: Common Benches
   Finish: Clear Satin

WD-4  Species: White Oak
   Cut: Solid 3” thick stair treads
   Location: Central Stair
   Finish: Clear satin

WD-5  Species: Reclaimed Douglas Fir
   Cut: 1” x 6” solid tongue and groove planks, tight joint. Fabricated into panels and cleated to walls per drawings.
   Location: Café, Inspiration Hall entrances
   Finish: Ebonized/distressed with clear, durable finish, match architects’ sample

WD-6  Species: MDF
   Dimensions: 4 1/2”h x ½”
   Location: Treehouse gypsum board partitions
   Finish: Paint to match adjacent wall

WD-7  Species: White Oak
   Dimensions: 1 ¾” diameter
   Location: Handrail at Stair #1 and Sitting Stair
   Finish: Clear Satin

WD-8  Product: Birch plywood, rotary cut
   Thickness: ½”
   Face Grade: A
   Back Grade: 2
   Location: Medium classroom TEAL and medium classroom Flex

FINISH MATERIALS
Finish: Clear Satin

SECTION 06 41 16 PLASTIC LAMINATE-FACED ARCHITECTURAL CABINETS

PLASTIC LAMINATE

PL-1 Manufacturer: Nevamar  
Name: Serene Stardom  
Number: VA5001-T  
Location: Empower/Collaboration

PL-2 Manufacturer: Treefrog  
Name: Ash Lati Groove  
Number: 64717  
Finish: Grooved Texture  
Location: Honors Boardroom, Reception, Breakroom

PL-3 Manufacturer: Formica  
Name: White Twill  
Number: 9285-58  
Finish: Matte  
Location: Storage, work rooms, breakrooms, classroom trash/recycle units.

PL-4 Manufacturer: Nevamar  
Name: Bailey  
Number: WK0027-FL  
Finish: Fine Line  
Location: Trash/Recycle in Commons

SECTION 06 64 00 PLASTIC PANELING

FRP Thickness: 1/8”  
Texture: Smooth  
Color: White  
Trim Color: White

SECTION 08 14 16 WOOD DOORS

SCW-1 Veneer: White Oak  
Cut: Rift  
Finish: Stain with clear satin finish coat to match architect’s sample.

SECTION 09 30 00 TILING

TILE

Note on Grout: All specifications listed below include the following:

- Epoxy Grout: showers, mens toilets at walls with urinals and as noted
- Polymer Modified Grout: All other locations
Non-Sanded Grout of either type: recommended for use with glass tile and joints 1/16 inch or less

T-1  Distributor: Statements Tile  
Name: White Wall  
Color: White Matte  
Number: MGW624  
Finish: Matte  
Sizes: 6x24  
Grout Joint Width: 1/8"  
Location: Restrooms

T-2  Distributor: Pental  
Name: Manhattan  
Color: Jeans  
Finish: Gloss  
Sizes: 4 x 12  
Grout Joint Width: 1/8"  
Location: Cafe

T-3  Distributor: Dal Tile  
Name: Keystones  
Color: Black D311  
Finish: Matte  
Sizes: 1" x 1" (12 x 12 sheet)  
Location: Restroom floors

T-3a  C813 Cove base tile in Black D311  
Use CK 813 coved base inner corner and CS 813 outer corner in Black D311 as required

SECTION 09 51 00 ACOUSTICAL PANEL CEILINGS
CEILING PANELS

APC-1  Manufacturer: Armstrong  
Name: Optima  
Number: 3250  
Color: White  
Size: 24x24  
Edge Detail: Square Tegular  
Grid: Armstrong Prelude XL 15/16"  
Location: Classrooms, offices, and as noted on reflected ceiling plans  
Note: At all ceiling clouds use 2" Axiom trim by Armstrong

APC-2  Not used

APC-3  Manufacturer: Armstrong  
Name: Optima Health Zone  
Number: 3216  
Color: White  
Size: 24x24  
Edge Detail: Square Tegular
Grid: Armstrong Prelude XL 15/16"
Location: Café kitchen and prep

APC-4  Base Bid
Manufacturer: Armstrong
Name: Ultima
Number: 1911
Color: White
Size: 24x24
Edge Detail: Beveled, Tegular
Grid: Armstrong Prelude XL 15/16"
Location: See Room Finish Schedule.

APC-4  Bid Alternate Option
Manufacturer: Armstrong
Name: Ultima
Number: 1911HRC (High Recycled Content)
Color: White
Size: 24x24
Edge Detail: Beveled, Tegular
Grid: Armstrong Prelude XL 15/16"
Location: See Room Finish Schedule.

APC-5  Manufacturer: Armstrong
Name: METALWORKS Plank Microperforated plank, hook on smooth texture
Number: 5331 with M2 perforations
Color: White
Size: 16x72
Perimeter Edge Detail: 4 ½” Plank Trim #5336
Location: See Room Finish Schedule.

METAL SUSPENSION SYSTEM

Armstrong Prelude XL 15/16"

Ceiling Cloud Edge Trim: 2” Axiom trim by Armstrong.

SECTION 09 65 00 RESILIENT FLOORING

RESILIENT BASE

RB-1  Manufacturer: Johnsonite
Color: Black
Style: 4” coved
Note: All other rubber accessories to match RB-1

RB-2  Manufacturer: Johnsonite
Color: Black
Style: Mandalay 4 1/2"h x 1/4” thick straight rubber base
Location: Commons, Inspiration hall
RUBBER SHEET FLOORING

RBS-1  Manufacturer: Nora Systems, Inc.
       Product: Noraplan Sentica
       Type: 3mm Sheet
       Color: 6522 Expedition
       Location: Level 2 and Level 3 labs

RBS-2  Manufacturer: Nora Systems, Inc.
       Product: Norament Grano Rubber Sheet
       Type: 3.5mm Sheet
       Color: 4899 Black Pearl
       Location: Café 0111 and 0111A

SECTION 09 68 13 TILE CARPETING

CPT-1  Manufacturer: JJ/Invision
       Name: Sentica
       Number: 7609
       Color: 443 Sketch
       Size: 24 x 24
       Installation Pattern: Ashlar
       Location: Classrooms/offices

CPT-2  Manufacturer: Milliken
       Collection: Unearthed
       Name: Mantle
       Number: 00657000
       Color: Larimar
       Size: 1 m x 1m tile
       Pattern repeat: 4m x 4m
       Installation Pattern: multile repeat
       Location: Commons seating areas

CPT-3  Manufacturer: Milliken
       Collection: Unearthed
       Name: Gypsum Glyph
       Number: 00661304
       Color: Larimar
       Size: 1 m x 1m tile
       Pattern repeat: 4m x 4m
       Installation Pattern: multile repeat
       Location: Café, Treehouse at L2 and L3
       Contact: Juliet Schwalbach juliet.schwalbach@milliken.com

SECTION 09 72 00 WALL COVERINGS

WC-1  Manufacturer: Koroseal
       Product: Wall Talkers
       Surface: Matte Rite
       Color: White
       Width: 60"
Repeat: None
Location: Classrooms, Commons - south wall, Offices, Honors Boardroom, Empower/Collaboration

SECTION 09 84 33 SOUND-ABSORBING WALL UNITS

FWP-1 Manufacturer: Bolyu
Name: Svelte, unbacked
Number: SVL 55
Color: Uppity Gray
Width: 76" Roll
Repeat: None
Backing: 1" fiberglass
Location: Inspiration Hall

FWP-2 Manufacturer: Bolyu
Name: Svelte, unbacked
Number: SVL 51
Color: Thundersnow
Width: 76" Roll
Repeat: None
Backing: Homosote
Location: Pin up boards

FWP-3 Manufacturer: Bolyu
Name: Svelt, unbacked
Number: SVL 51
Color: Thundersnow
Width: 76"
Repeat: None
Backing: 1" fiberglass
Location: Classrooms

SECTION 09 91 23 INTERIOR PAINTING

P-1 Manufacturer: Sherwin Williams
Color: High Reflective White
Number: SW 7757
Sheen: Eggshell – walls, Flat – ceiling
Location: General wall and ceiling color

P-2 Manufacturer: Sherwin Williams
Color: On The Rocks
Number: SW 7671
Location: pipes, ducts, conduits, walls above datum, and as noted

P-3 Manufacturer: Scuffmaster
Color: Match Sherwin Williams Porpoise
Number: SW 7047
Finish: Scrubtough
Location: Door alcoves

P-4  Manufacturer: Scuffmaster  
Color: Match color P-1  
Number:  
Finish: Scrubtough  
Location: South Commons walls

P-5  Manufacturer: Sherwin Williams  
Color: Iron Ore  
Number: SW 7069  
Location: Exposed steel structure, railing stanchions, miscellaneous metal

P-6  Manufacturer: Sherwin Williams  
Color: Foothills  
Number: SW 7514  
Sheen: Eggshell  
Location: Boardroom Accent Color

P-7  Manufacturer: Paint on Screen  
Color: Digital Theater White  
Number: NA  
Sheen: Per Manufacturer  
Location: Projection screen walls in Amphitheater Classroom  
Note: Final paint selection to be made after selection of projectors  
Verify with MSU ITC, Brad Haderlie  
Submit color samples  
Wall required to be extremely smooth level 5+ finish  
Flat white latex primer or as recommended by manufacturer

SECTION 10 11 00 VISUAL DISPLAY UNITS

TACK BOARD

TB-1  Manufacturer: Forbo  
Name: Bulletin Board  
Number: 2182  
Color: Potato Skin  
Gauge: ¼”

SECTION 10 21 13.19 PLASTIC TOILET COMPARTMENTS

TCP-1  Manufacturer: Comtec  
Name: Evertuff  
Finish: EX05  
Color: Black  
Mounting: Overhead braced, floor anchored  
Material: Solid plastic

SECTION 12 24 13 ROLLER WINDOW SHADES

RWS-1  Manufacturer: Mechoshade
Fabric: Ecoveil
Color: Silver Birch
Openness Factor: 1% open at south and west exposures, 3% at north and east exposures

RWS-1 Manufacturer: Mechoshade
Fabric: Equinox Blackout
Color: 0114 Marble
Openness Factor: 0100 Series Opaque

SECTION 12 36 61.16 SOLID SURFACING COUTERTOPS

SSM-1 Manufacturer: Corian
Color: Cameo White
Thickness: ½"

SSM-2 Manufacturer: Richlite
Color: Black Diamond
Thickness: 3/4"

SSM-3 Manufacturer: Corian
Color: Deep Mink
Thickness: ½"

SSM-4 Manufacturer: Corian
Color: Concrete
Thickness: ½"

SECTION 12 48 13 ENTRANCE FLOOR MATS

Roll up mat surface: To be selected from manufacturer’s full range of options
Roll up mat color: To be selected from manufacturer’s full range of options
Frame color: To be selected from manufacturer’s full range of options

EXECUTION (Not Applicable)

END OF SECTION 09 05 02
SECTION 09 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS
   A. Product Data: For each component of gypsum board shaft wall assembly.
   B. Sustainable Design Submittals:
      1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
      2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
   B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.
   C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
   D. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
   E. Regional Materials: Products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
   F. Regional Materials: Products shall be manufactured within 500 miles of Project site.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES
   A. Fire-Resistance Rating: As indicated.
   B. STC Rating: As indicated.
C. Gypsum Shaftliner Board:
   1. Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) CertainTeed Corporation.
         2) Georgia-Pacific Building Products.
         3) National Gypsum Company.
         4) United States Gypsum Company.

D. Non-Load-Bearing Steel Framing, General: Complying with ASTM C 645 requirements for metal unless otherwise indicated and complying with requirements for fire-resistance-rated assembly indicated.

E. Studs: Manufacturer's standard profile for repetitive, corner, and end members as follows:
   1. Depth: As indicated.
   2. Minimum Base-Metal Thickness: As indicated.

F. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
   1. Minimum Base-Metal Thickness: Matching steel studs.

G. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Blazeframe Industries.
      b. CEMCO; California Expanded Metal Products Co.
      c. Fire Trak Corp.
      d. GCP Applied Technologies Inc. (formerly Grace Construction Products).
      e. Metal-Lite.
      f. Steel Network, Inc. (The).

H. Elevator-Hoistway-Entrance Struts: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.

I. Finish Panels: As indicated.

J. Sound Attenuation Blankets: As specified in Section 09 29 00 "Gypsum Board."

2.3 AUXILIARY MATERIALS

A. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written instructions for application indicated.
B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

C. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

D. Reinforcing: Galvanized-steel reinforcing strips with 0.033-inch minimum thickness of base metal (uncoated).

E. Acoustical Sealant: Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged.

D. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

E. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
2. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.

F. Penetrations: Install supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.

G. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.

H. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

I. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

J. Gypsum Board Cants: At projections into shaft exceeding 4 inches, install gypsum board cants covering tops of projections.
K. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

L. Remove and replace panels that are wet, moisture damaged, or mold damaged.

END OF SECTION 09 21 16.23
SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior partitions.
   2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation reports for firestop tracks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, 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.

2.2 FRAMING SYSTEMS

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

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Steel Studs and Runners:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Custom Stud.
      2) MBA Building Supplies.
      3) MRI Steel Framing, LLC.
      4) Phillips Manufacturing Co.
      5) Steel Network, Inc. (The).
   b. Minimum Base-Metal Thickness: As indicated on Drawings.
   c. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 2-inch minimum vertical movement.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) ClarkDietrich Building Systems.
      2) Fire Trak Corp.
      3) Steel Network, Inc. (The).
      4) Super Stud Building Products Inc.

2. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

3. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

4. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Blazeframe Industries.
      2) ClarkDietrich Building Systems.
      3) MBA Building Supplies.
      4) Metal-Lite.
      5) Perfect Wall, Inc.
      6) Steel Network, Inc. (The).

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Blazeframe Industries.
   b. ClarkDietrich Building Systems.
   c. Fire Trak Corp.
   d. Metal-Lite.
   e. Perfect Wall, Inc.
   f. Steel Network, Inc. (The).

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. MRI Steel Framing, LLC.
   2. Minimum Base-Metal Thickness: As indicated on Drawings.

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. MRI Steel Framing, LLC.
   2. Depth: 1-1/2 inches.
   3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. MRI Steel Framing, LLC.
   2. Minimum Base-Metal Thickness: As indicated on Drawings.
   3. Depth: As indicated on Drawings.

I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. MRI Steel Framing, LLC.
2. Configuration: Asymmetrical or hat shaped.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. MRI Steel Framing, LLC.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Hanger Attachments to Concrete:
   1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
   2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
   1. Depth: 2-1/2 inches.

F. Furring Channels (Furring Members):
b. Depth: As indicated on Drawings.

   a. Minimum Base-Metal Thickness: As indicated on Drawings.

4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
   a. Configuration: Asymmetrical or hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.
D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:
1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:
1. Erect insulation, specified in Section 072100 “Thermal Insulation,” vertically and hold in place with Z-shaped furring members spaced 24-inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   5. Do not attach hangers to steel roof deck.
   6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16
SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
   2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
   3. Product Data: For adhesives and sealants, indicating VOC content.
   4. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

C. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

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."
2.2 GYPSUM BOARD, GENERAL

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

B. Regional Materials: Products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Regional Materials: Products shall be manufactured within 500 miles of Project site.

D. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   
   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Georgia-Pacific Building Products.
   e. Temple-Inland Building Products by Georgia-Pacific.
   f. United States Gypsum Company.

2. Thickness: 5/8 inch.


B. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

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

   a. American Gypsum.
   b. CertainTeed Corporation.
   c. Georgia-Pacific Building Products.
   e. Temple-Inland Building Products by Georgia-Pacific.
   f. United States Gypsum Company.

2. Core: 5/8 inch, Type X.


4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CertainTeed Corporation.
   b. Georgia-Pacific Building Products.
   c. National Gypsum Company.
   d. Temple-Inland Building Products by Georgia-Pacific.
   e. United States Gypsum Company.

2. Core: 5/8 inch, Type X.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CertainTeed Corporation.
      b. James Hardie Building Products, Inc.
      c. National Gypsum Company.
      d. United States Gypsum Company.

   2. Thickness: 5/8 inch.

   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

   A. Interior Trim: ASTM C 1047.

      1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

      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.
         g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.6 JOINT TREATMENT MATERIALS

   A. General: Comply with ASTM C 475/C 475M.

   B. Joint Tape:

      1. Interior Gypsum Board: Paper.
      2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
      3. Tile Backing Panels: As recommended by panel manufacturer.
C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

   1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

   1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
   2. 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 instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

   1. Adhesives shall have a VOC content of 50 g/L or less.
   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."

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.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

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

E. Acoustical 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hilti, Inc.
b. Pecora Corporation.
c. United States Gypsum Company.

2. Sealant shall have a VOC content of 250 g/L or less.
3. Sealant 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."

F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 07 26 00 "Vapor Retarders."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C 840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Prefill open joints, beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for acoustical tile.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

   a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

H. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

I. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 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.
SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glazed ceramic wall tile.
   2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Laboratory Test Reports: For sealers, indicating compliance with requirements for low-emitting materials.

C. Samples:
   1. Each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
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 mockup of each type of wall tile installation.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL
   A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
   B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS – See Drawings and Section 09 05 02 Finish Schedule

2.3 TILE BACKING PANELS
   A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A.
      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. Custom Building Products.
         b. Georgia-Pacific Building Products.
         c. United States Gypsum Company.
      2. Thickness: 1/2 inch or as indicated.
   B. Fiber-Cement Backer Board: ASTM C 1288.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. CertainTeed Corporation.
         b. James Hardie Building Products, Inc.
      2. Thickness: 1/2 inch or as indicated.

2.4 SETTING MATERIALS
   A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
4. For wall applications, provide nonsagging mortar.

2.5 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. Laticrete International, Inc.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.

2. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
3. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.

B. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Bonsal American, an Oldcastle company.
   b. Bostik, Inc.
   c. Custom Building Products.
   d. Laticrete International, Inc.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.

C. Non-Sanded Grout: As recommended for use with glass tile or joints 1/16 inch or less.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Schluter Systems L.P.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

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

3.2 PREPARATION

A. 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.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

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. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in pattern shown on drawings. 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.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths: 1/8”

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
I. 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.

J. Metal Edge Strips: Install at locations indicated.

K. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer’s written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer’s written instructions.

L. 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.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations with Metal Studs or Furring:

1. Ceramic Tile Installation: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
   a. Ceramic Tile Type: See Finish Materials.
   b. Thinset Mortar: Improved modified dry-set mortar.

2. Ceramic Tile Installation: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
   a. Ceramic Tile Type: See Finish Materials.
   b. Thinset Mortar: Improved modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

B. Shower Receptor and Wall Installations:

1. Ceramic Tile Installation: TCNA B415; water-cleanable, tile-setting epoxy on waterproof membrane over cementitious backer units or fiber-cement backer board.
   a. Ceramic Tile Type: See Finish Materials.
   b. Thinset Mortar: Improved modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 13
SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

   1. **Product Data**: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   2. **Laboratory Test Reports**: For ceiling products, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For seismic restraints for ceiling systems.

   1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Product test reports.

C. Research reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic restraints for ceiling systems.

C. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. 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: Class A according to ASTM E 1264.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS – APC – See Drawings and Section 09 05 02 Finish Materials.

2.3 METAL SUSPENSION SYSTEM – See Drawings and Section 09 05 02 Finish Materials.

A. Metal Suspension-System Standard: Manufacturer’s standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M.

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

2.4 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Seismic Clips: Manufacturer’s standard seismic clips designed to secure acoustical panels in place during a seismic event.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design: Armstrong.

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.
PART 3 - EXECUTION

3.1 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 unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
3. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
4. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform inspections.

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

END OF SECTION 09 51 13
SECTION 09 64 00 - WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Field-finished wood flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
   4. Product Data: For adhesives, indicating VOC content.
   5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   6. Product Data: For coatings, indicating VOC content.
   7. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
   8. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
   10. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each type of floor assembly and accessory. Include plans, sections, and attachment details. Include expansion provisions and trim details.

D. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

C. Hardwood Flooring: Comply with NWFA A500 for species, grade, and cut.
   1. Certification: Provide flooring that carries NWFA grade stamp on each bundle or piece.

D. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.
   1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.

2.2 FIELD-FINISHED WOOD FLOORING

A. Solid-Wood Flooring – WD-2: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
   1. Grade and Species: White Oak.
   2. Cut: Quarter/rift sawn.
   3. Thickness: 1 x 3 solid tongue and groove plank flooring.
   4. Face Width: As detailed.
   5. Lengths: Random-length strips complying with applicable grading rules.

B. Solid-Wood Stair Treads – WD-4: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.
   1. Grade and Species: White Oak.
   2. Cut: Quarter/rift sawn.
   3. Thickness: 3-inch solid stair treads.
   4. Face Width: As detailed.
   5. Lengths: As detailed.

C. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Basic Coatings, Inc.
      b. BonaKemi USA Inc.
      c. Dura Seal.
      d. Hillyard, Inc.
      e. PoloPlaz Coatings.
   2. VOC Content: Provide coating with VOC content of 350 g/L or less.
3. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Stain: Penetrating and nonfading type.
   a. Color: As selected by Architect from manufacturer's full range.

5. Floor Sealer: Pliable, penetrating type.


D. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved samples, provide pigmented filler.

2.3 ACCESSORY MATERIALS

A. Wood Sleepers and Subfloor: As drawn and specified in Section 06 10 53 "Miscellaneous Rough Carpentry."

B. Asphalt-Saturated Felt: ASTM D 4869/D 4869M, Type II.

C. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.
   1. Adhesive shall have a VOC content of 100 g/L or less.
   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."


E. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines."

F. Thresholds and Saddles: To match wood flooring. Tapered on each side.

G. Reducer Strips: To match wood flooring. As detailed.

H. Cork Expansion Strip: Composition cork strip.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Slabs:
   1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
a. 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.
b. 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. Perform additional moisture tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. Concrete Slabs:
   1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
   2. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, and depressions in substrates.
   3. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines."

B. Wood Sleepers and Subfloor: Install according to requirements in Section 06 10 53 "Miscellaneous Rough Carpentry."

C. Provide expansion space at walls and other obstructions and terminations of flooring to account for seasonal swelling of wood.

D. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
   1. Plank Flooring: For flooring of face width more than 3 inches:
      a. Hardwood: Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.

E. 3” Solid Wood Stair Treads
   1. Attach with lag screws from below so not visible on top.

3.4 FIELD FINISHING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that are noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
1. Comply with applicable recommendations in NWFA’s “Installation Guidelines.”

B. Fill open-grained hardwood.

C. Fill and repair wood flooring defects.

D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.
   1. Apply stains to achieve an even color distribution matching approved samples.
   2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

E. Cover wood flooring before finishing.

F. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
   1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 64 00
SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Laboratory Test Reports: For resilient base, indicating compliance with requirements for low-emitting materials.

C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Resilient base 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."

2.2 RESILIENT BASE – RB – See Drawings and Finish Materials.

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
   2. Johnsonite; a Tarkett company.
   3. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

   1. Style and Location:
b. Style B, Coved – RB-1: Provide in all other areas with concrete or resilient flooring.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.


2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. 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.
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."

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 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. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 12 inches in length.
      a. Miter or cope corners to minimize open joints.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protecting resilient products.

B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13
SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes rubber sheet flooring.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   3. Product Data: For chemical-bonding compounds, indicating VOC content.
   4. Laboratory Test Reports: For chemical-bonding compounds, indicating compliance with requirements for low-emitting materials.
   5. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
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.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance data.

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. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 UNBACKED RUBBER SHEET FLOORING - RBS

A. Basis-of-Design: See Finish Materials.

   1. Type: Type I (homogeneous rubber sheet).

C. Wearing Surface: Smooth.

D. Sheet Width: 4.0 feet.


F. Colors and Patterns: See Finish Materials.

2.3 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. Adhesives shall have a VOC content of 50 g/L or less.
   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."

C. Seamless-Installation Accessories:
   2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
   3. Chemical-Bonding Compound shall have a VOC content of 510 g/L or less.
   4. Chemical-Bonding Compound 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. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.
PART 3 - EXECUTION

3.1 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. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.2 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: 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.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16
SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular carpet tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for testing and product requirements of CRI's "Green Label Plus" testing program.
4. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet 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.

D. Samples: For each exposed product and for each color and texture required.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranty.
1.5 CLOSEOUT SUBMITTALS
   A. Maintenance data.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: Certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.7 WARRANTY
   A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
      1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS


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 comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
      1. Adhesives shall have a VOC content of 50 g/L or less.
      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."

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Concrete Slabs:
      1. Moisture Testing: Perform tests so that each test area does not exceed 500 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. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. 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. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. General: Comply with CRI’s “CRI Carpet Installation Standards” and with carpet tile manufacturer’s written installation instructions for preparing substrates indicated to receive carpet tile.

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. Concrete Substrates: 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 adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI’s “CRI Carpet Installation Standard,” Section 18, “Modular Carpet” and with carpet tile manufacturer’s written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. 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 09 68 13
SECTION 09 72 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dry erase wall covering

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

C. Samples: For each type of wall covering and for each color, pattern, texture, and finish specified, full width by 36-inch-long in size.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

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: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. 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: 25 or less.
   b. Smoke-Developed Index: 50 or less.

2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265.

2.2 VINYL WALL COVERING – WC – See Drawings and Finish Materials.

A. Basis-of-Design – WC-1 Wall Talkers, Koroseal, #MP-60
   1. Color: White
   2. Width: 60”
   3. Location: Including but not limited to Classrooms, Commons – south wall, Offices, Honors Boardroom, Empower/Collaboration, as shown on the interior elevations.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
   1. Adhesives shall have a VOC content of 50 g/L or less.
   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."

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 09 91 23 "Interior Painting" and recommended in writing by primer/sealer and wall-covering manufacturers for intended substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
   1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
   2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
   3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.2 WALL-COVERING INSTALLATION

A. Comply with wall-covering manufacturers’ written installation instructions applicable to products and applications indicated.

B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install wall covering without lifted or curling edges and without visible shrinkage.

E. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. Horizontal seams are not permitted.

F. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

H. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.

I. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00
SECTION 09 84 33 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes shop-fabricated, sound-absorbing acoustical panel units tested for acoustical performance.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
4. Chain-of-Custody Qualification Data: For manufacturer and vendor.
5. Product Data: For adhesives, indicating VOC content.
6. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
7. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
8. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
9. Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For unit assembly and installation.

D. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.
1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

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: Units 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 SOUND-ABSORBING WALL UNITS – See Drawings and Finish Materials.

A. Sound-Absorbing Wall Panel - FWP: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back edge border of core.

1. Mounting: Edge mounted with splines secured to substrate.
2. Core: As indicated.
   1. Edge Construction: As indicated on Drawings.
   2. Edge Profile: As indicated on Drawings.
   3. Corner Detail in Elevation: Square with continuous edge profile indicated.
   4. Reveals between Panels: As indicated on Drawings.

2.3 MATERIALS

A. Composite Wood Products: Products shall be made without urea formaldehyde.

B. Composite Wood Products: Products 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. **Recycled Content**: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. **Regional Materials**: Products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

E. **Regional Materials**: Products shall be manufactured within 500 miles of Project site.

F. **Certified Wood**: Wood products shall be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004.

G. **Core Materials**: Manufacturer's standard.
   1. Glass-Fiber Board: ASTM C 612; of type standard with manufacturer, unfaced, and dimensionally stable, molded rigid board; and with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.
   2. Mineral-Fiber Board: Maximum flame-spread and smoke-developed indexes of 25 and 10, respectively, and with perforated surface.
   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.
   4. Impact-Resistant, Acoustically Transparent, Copolymer Sheet for Face Layer: 1/16- to 1/8-inch-thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.
   5. Wood and Plywood: Manufacturer's standard plywood or clear, vertical grain, straight, kiln-dried hardwood.
      a. Fire-retardant treated by pressure process with a flame-spread index of 25 or less when tested according to ASTM E 84 or UL 723, 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) Treated material shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity.
         2) Kiln-dry material after treatment to 19 percent or less for lumber and 15 percent or less for plywood.

H. **Facing Material**: Fabric from same dye lot; color and pattern as indicated on Drawings.
   1. **Applied Treatments**: Stain resistance.

I. **Mounting Devices**: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
   1. **Adhesives shall have a VOC content of 70 g/L or less.**
   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."
2.4 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. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.

C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; 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. 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 units.

D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with manufacturer’s written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

C. Align fabric pattern and grain with adjacent units.

3.2 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 09 84 33
SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Steel and iron.
   2. Galvanized metal.

1.2 DEFINITIONS
A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
B. Samples: For each type of paint system and each color and gloss of topcoat.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Coatings.
   3. Pratt & Lambert.

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As indicated in a color schedule.

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. 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 in "MPI Architectural Painting Specification Manual" 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.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
B. 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.

3.4 CLEANING AND PROTECTION

A. 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.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.1C:
   b. Prime Coat: Shop primer specified in Section where substrate is specified.
   d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.3J:
   a. Prime Coat: Primer, galvanized, water based, MPI #134.
   c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5), MPI #163.

END OF SECTION 09 91 13
SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete.
   2. Steel and iron.
   4. Aluminum (not anodized or otherwise coated).
   5. Wood.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current “MPI Approved Products List” for each product category specified, with
      the proposed product highlighted.

B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for
      low-emitting materials.
C. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.
   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Benjamin Moore & Co.
2. PPG Architectural Coatings.
3. Pratt & Lambert.

B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
1. Nonflat Paints and Coatings: 150 g/L.
2. Dry-Fog Coatings: 400 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Pretreatment Wash Primers: 420 g/L.

D. Low-Emitting Materials: Interior paints and 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."

E. Colors: See Drawings and Finish Materials.

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.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.
4. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. 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 in "MPI Architectural Painting Specification Manual" 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 if any.
3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

B. 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.

3.4 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. High-Performance Architectural Latex System MPI INT 3.1C:
   a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
      1) Sherwin Williams.
      1) Sherwin Williams.
   d. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.
      1) Sherwin Williams.

B. Steel Substrates – P-5:

1. High-Performance Architectural Latex System MPI INT 5.1R:
   a. Prime Coat: Shop primer specified in Section where substrate is specified.
   c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.
      1) Sherwin Williams.

2. Water-Based Dry-Fall System P-5 - MPI INT 5.1C:
   a. Prime Coat: Shop primer specified in Section where substrate is specified.
   b. Topcoat: Dry fall, latex (MPI Gloss Level 5), MPI #226.
      1) Sherwin Williams.

C. Galvanized-Metal Substrates:

1. High-Performance Architectural Latex System MPI INT 5.3M:
   a. Prime Coat: Primer, galvanized, water based, MPI #134.
1) Sherwin Williams.


c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

1) Sherwin Williams.

D. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. High-Performance Architectural Latex System MPI INT 5.4F:

   a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.

      1) Sherwin Williams.


   c. Topcoat: Latex, interior, high performance architectural, semi-gloss (MPI Gloss Level 5), MPI #141.

      1) Sherwin Williams.

E. Gypsum Board Substrates – P-1, P-2, P-5, and P-6

1. High-Performance Architectural Latex System MPI INT 9.2B:

   a. Prime Coat: Primer sealer, latex, interior, MPI #50.

      1) Sherwin Williams.


   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

      1) Sherwin Williams

F. Gypsum Board Substrates – P-3 and P-4 (for high use, high exposure locations)

1. High-Performance Architectural Latex System MPI INT 9.2B:

   a. Prime Coat: Primer sealer, latex, interior, MPI #50.

      1) PPG Speedhide Zero


   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

      1) Benjamin Moore Ultra Spec 500

END OF SECTION 09 91 23
SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes surface preparation and application of wood stains and transparent finishes on the following substrates:
   1. Interior Substrates:
      a. Dressed lumber (finish carpentry or woodwork).
      b. Wood-based panel products.

1.2 DEFINITIONS
A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
   2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
C. Samples: For each type of finish system and in each color and gloss of finish required.

1.4 QUALITY ASSURANCE
A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
   b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.
   a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. Pratt & Lambert.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated in wood finish systems schedules or comparable products by one of the following:
   1. Sherwin-Williams Company (The).

C. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:
   1. Materials for use within each paint system shall be 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, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Clear Wood Finishes, Varnishes: 350 g/L.
   2. Clear Wood Finishes, Lacquers: 550 g/L.
   3. Shellacs, Clear: 730 g/L.
   4. Stains: 250 g/L.
D. Low-Emitting Materials: Interior paints and 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."

E. Stain Colors: See Finish Materials.

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 Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.
   1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
   1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
   2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
3.3 APPLICATION

A. Apply finishes according to manufacturer’s written instructions and recommendations in “MPI Architectural Painting Specification Manual.”

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates: Wood trim, architectural woodwork, and doors.

1. Semitransparent Stain System MPI INT 6.3C:
   b. Topcoat: Stain, exterior, solvent based, semitransparent, MPI #13.
      1) Sherwin-Williams Company (The).

2. Polyurethane Varnish over Stain System MPI INT 6.3E:
   a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.
      1) Sherwin-Williams Company (The).
   d. Topcoat: Varnish, interior, polyurethane, oil modified, satin (MPI Gloss Level 4), MPI #57.
      1) Sherwin-Williams Company (The).
   e. Topcoat: Varnish, interior, polyurethane, oil modified, gloss (MPI Gloss Level 6), MPI #56.
      1) Sherwin-Williams Company (The).

3. Polyurethane Varnish System MPI INT 6.3K:
   c. Topcoat: Varnish, interior, polyurethane, oil modified, satin (MPI Gloss Level 4), MPI #57.
      1) Sherwin-Williams Company (The).
   d. Topcoat: Varnish, interior, polyurethane, oil modified, gloss (MPI Gloss Level 6), MPI #56.
      1) Sherwin-Williams Company (The).

4. Moisture-Cured Clear Polyurethane over Stain System MPI INT 6.3Y:
a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90.  
   1) Sherwin-Williams Company (The).


d. Topcoat: Varnish, polyurethane, moisture cured, gloss (MPI Gloss Level 6), MPI #31.  
   1) Sherwin-Williams Company (The).

5. Moisture-Cured Clear Polyurethane System MPI INT 6.3X:

   c. Topcoat: Varnish, polyurethane, moisture cured, gloss (MPI Gloss Level 6), MPI #31.  
      1) Sherwin-Williams Company (The).

6. Danish Oil System MPI INT 6.3M:

   a. Prime Coat: Danish oil matching topcoat.  
   b. Topcoat: Danish oil, MPI #92.  
      1) Sherwin-Williams Company (The).

END OF SECTION 09 93 00
SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass markerboards.
   2. Tack board.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints.

C. Samples: For each type of visual display unit indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 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. Warranty Period: 50 years from date of Substantial Completion.
   2. Warranty Period: Life of the building.
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: 50 or less.

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.

2.2 VISUAL DISPLAY BOARD ASSEMBLY

A. Clarus "Glassboard"

B. Visual Display Board Assembly: Factory fabricated.

   1. Assembly: Glass.
   2. Corners: Square.
   3. Size: As indicated in the drawings

C. Chalktray

   1. Clarus "T"

2.3 TACKBOARD PANELS

A. Tackboard Panels:

   1. Facing: 1/4-inch thick natural cork.
   2. Core: Manufacturer's standard.

PART 3 - EXECUTION

3.1 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.

END OF SECTION 10 11 00
SECTION 10 14 23.13 – ROOM-IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Excerpts from the MSU Interior Signage Standard are included at the end of this section
C. Refer to Drawings for Sign Schedule and further information.

1.2 SUMMARY
A. This Section includes the following:
1. Room Signs – See Sign Schedule.
2. Restroom Signs.
3. Elevator Signs.
4. Stairwell Signs.
5. Specialty Signs.
6. Other signs as requested by Owner.
B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for temporary project identification signs.
2. Division 15 Section "Mechanical Identification" for labels, tags and nameplates for mechanical equipment.
3. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
4. Division 16 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS
A. Product Data: For each type of product indicated include construction details, material descriptions, dimensions of individual components, profiles and finishes, and maintenance recommendations for each type of sign.
B. Shop Drawings: Include construction details, material descriptions, dimensions of individual components, profiles and finishes, and fabrication and installation details for each type of sign. Shop drawings shall be approved by Owner prior to sign manufacture.
   1. Show sign mounting heights and locations.
   2. Provide message list for each sign, including large-scale details of wording, lettering typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
C. Samples for Initial Selection: Manufacturer’s color charts consisting of actual units or sections of units showing the full range of colors available.
D. Samples for Verification: For the selected color, texture and sign material indicated, of sizes indicated:
   1. Provide a full scale sample sign for the A2 sign type.
   2. Approved samples will not be returned to Vendor.
   3. Samples will at no cost to the Owner.

E. Sign Schedule: Use same designations indicated on Drawings and/or “Room Numbering Designations” schedule, as provided by the Owner.

1.4 QUALITY ASSURANCE
A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. References may be requested and used for evaluation of vendor and product.
B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
C. Regulatory Requirements: Sign types shall consist of room number and room function to meet referenced standards.

1.5 COORDINATION
A. Coordinate installation with all other trades.
   1. Example: Paint shall be dry and completely cured before wall signs are adhered with tape to the walls.

1.6 WARRANTY
A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering.
      b. Deterioration of colors or sign lamination.
   2. Warranty Period: One year from date of Substantial Completion.

1.7 DELIVERY, STORAGE AND HANDLING
A. Store products of this section in manufacturer’s unopened packaging until installation.
B. Maintain dry, heated storage area for products of this section until installation of products.
C. Failure to meet delivery deadlines may result in disqualification of Vendor.

1.8 REFERENCED STANDARDS
PART 2 – PRODUCTS

2.1 GRAPHIC PROCESS

A. All signs shall be manufactured so that:

1. All text shall be accompanied by Grade 2 Braille. Braille shall be separated 1/2-inch from the corresponding raised characters or symbols. May be machine or hand placed. If hand placed, Braille does not have to match the raised border color. Braille to comply with ANSI A117.1. Braille to have domed or rounded shape.

   Grade 2 Braille translation to be provided by signage manufacturer.

2. All letters, numbers and/or symbols, and borders shall be Architectural Gray 3279 or approved alternate. Background shall be White 225 or approved alternate. If a backer plate is used it shall be Architectural Gray 3279, or approved alternate, to match border color. Characters and backgrounds shall have a non-glare finish and comply with ANSI A117.1.

B. Plaque material shall be Special Purpose SP125 decorative thermosetting high pressure laminate or approved alternate. Material to be 1/8-inch thick laminate with melamine resin surfacing and a phenolic resin core which provides resistance to abrasion, stains, alcohol, solvents, boiling water, and heat. The material shall be NEMA rated and have flammability and smoke values that meet the standards for flammability of interior materials.

C. Font shall be Franklin Gothic Book, upper case letters and numbers. Character spacing and line weight to comply with ANSI A117.1.

D. Size of letters and numbers shall be as follows:

   1. Room numbers shall be 3/4-inch high.

   2. Symbol size shall be 4 inches high.

   3. Outside corners of sign shall be square. Inside corners shall be filleted 1/16-inch maximum.

2.2 SIGN DESIGN

A. The sign design is based on the Montana State University Interior Signage Standard Catalog, current edition.

2.3 LOCATION

A. Signs under this contract may be purchased for any MSU affiliate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to receive signs have been finished and that finishes are dry and correctly cured.
B. Examine substrates, areas, and conditions, with Contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

C. Verify that items, including anchor device (double sided foam tape), provided under other sections of work are sized and located to accommodate signs.

D. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

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

3.2 INSTALLATION

A. Refer to Owner’s “Interior Panel Sign – Mounting Instructions” for graphical representation of installation.

B. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer’s instructions, except where more stringent requirements apply.

C. Install signs level, plumb and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

D. Sign shall be mounted on the latch side of the door. The top edge of the sign shall be mounted 60 inches above finish floor (AFF), typical. Mount sign with centerline of tactile text a minimum of nine inches from door opening, typical.

E. Where there is no wall space on the latch side of a single door, sign shall be mounted on the nearest adjacent wall. Signs shall be located so that a clear floor area 18 inches minimum by 18 inches minimum centered on the tactile text is provided beyond the arc of any door swing between the closed position and a 45-degree open position.

F. Where a tactile sign is provided at double doors with two active leaves, the sign shall be mounted to the right of the right-hand door.

G. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Mount sign with centerline of tactile text on centerline of inactive leaf.

H. Where there is no wall space on the right side of the double doors, sign shall be mounted on the nearest adjacent wall. Signs shall be located so that a clear floor area 18 inches minimum by 18 inches minimum centered on the tactile text is provided beyond the arc of any door swing between the closed position and a 45 degree open position.

I. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

J. Mount the signs to the wall using the double sided foam tape on the back of the sign. For sand blasted or etched signs, use 100% silicon adhesive in addition to the double sided foam tape if the sign is heavy.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer’s written instructions. Protect signs from damage until acceptance by Owner.
INTERIOR PANEL SIGN
TYPE: A1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
A1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: A4

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
A4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: A5

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
A5-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: B6

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
B6-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009
INTERIOR PANEL SIGN
TYPE: B8

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

B8-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
STAIR S1
(BASEMENT TO LEVEL 9)

PROCEED DOWN TO
LEVEL 1 TO EXIT BUILDING

FIREMAN'S ROOF ACCESS

INTERIOR PANEL SIGN
TYPE: C4

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
C4-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: C5

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
C5-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: D1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

D1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009
INTERIOR PANEL SIGN
TYPE: D2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
D2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: D3

NORM ASBJORNSON HALL
MONTANA STATE UNIVERSITY
OCTOBER 21, 2016

NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK
NOTE: CORNER FILLETS TO BE 1/16" (TYPICAL)

0.65 x SCALE

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
D3-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009
INTERIOR PANEL SIGN
TYPE: E1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

E1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE

0.5 x SCALE
10431
SPEC. SECTION
2007
DATE

NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK
NOTE: CORNER FILLETS TO BE 3/16" (TYPICAL)
COMM ROOM

NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.
NOTE: CORNER PILLOWS TO BE 3/8" (TYPICAL).

BACKGROUND: WHITE 225

1/8" RAISED BORDER ARCH GRAY 3271

1/32" RAISED COPY ARCH GRAY 3271

BACKGROUND: WHITE 225

1/32" RAISED BORDER ARCH GRAY 3271

BACKGROUND: WHITE 225

1/8" ACRYLIC BACKER PLATE MATCH RAISED BORDER COLOR

1/8" (3 PLY) PE PLASTIC

SECTION A-A

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: E2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION
E2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
MECHANICAL

NOTE: RAISED COPY LETTERING TO BE FRANKLIN GOTHIC BOOK.
NOTE CORNER BULLET TO BE 3/8" (TYPICAL).

0.5 x SCALE

INTERIOR PANEL SIGN
TYPE: F1

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

F1-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

ROOM-IDENTIFICATION SIGNAGE
INTERIOR PANEL SIGN
TYPE: H2

FACILITIES PLANNING, DESIGN AND CONSTRUCTION

H2-SHOP - Interior Panel Signs - Master Set.dwg - Issued Sep 22, 2009

END OF SECTION 10 14 23.23
ROOM-IDENTIFICATION SIGNAGE

10 14 23.13 - 23
SECTION 10 21 13.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes solid-plastic toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Sustainable Design Submittals:
      1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   C. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.
   D. Samples for each type of toilet compartment material indicated.

1.3 INFORMATIONAL SUBMITTALS
   A. Product certificates.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance data.

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. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
   C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for toilet compartments designated as accessible.
2.2 SOLID-PLASTIC TOILET COMPARTMENTS

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

1. Accurate Partitions Corp.; ASI Group.
2. Bradley Corporation.

B. Toilet-Enclosure Style: Overhead braced, floor anchored.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

E. Pilaster Shoes: Manufacturer's standard design; stainless steel.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.

2. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

B. Hardware and Accessories: Manufacturer's heavy-duty stainless-steel operating hardware and accessories.

1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

D. 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 compatible with related materials.
2.4 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: Provide manufacturer’s standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-Anchored Units: Provide manufacturer’s standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

D. 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 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.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
   a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

3.2 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 10 21 13.19
SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Corner guards.
B. Related Requirements:
   1. Section 08 71 00 "Door Hardware" for metal protective trim units, according to BHMA A156.6, used for armor, kick, mop, and push plates.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: For each type of wall and door protection showing locations and extent.
   1. Include plans, elevations, sections, and attachment details.
D. Samples: For each exposed product and for each color and texture specified, 12 inches long.

1.3 INFORMATIONAL SUBMITTALS
A. Product certificates.
B. Material certificates.
C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance data.

1.5 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.2 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards - CG: Manufacturer's standard 16-gauge; fabricated with 90- or 135-degree turn to match wall condition.

1. **Basis-of-Design:** Koroseal Wall Protection Systems, Korogard Series GS20.
   a. **Dimensions:** 2” x 2” by length as shown on drawings. 90 degree corner unless custom angle required.
   b. **Material:** Stainless steel, Type 304, Satin finish.
   c. **Holes for screw attachment** to be countersunk.

2.3 MATERIALS

A. **Fasteners:** Stainless-steel screws compatible with countersunk holes.

B. **Adhesive:** As recommended by protection product manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
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."

PART 3 - EXECUTION

3.1 INSTALLATION

A. **Installation Quality:** Install wall and door protection according to manufacturer's written instructions, 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. **Mounting Heights:** Install wall and door protection in locations and at mounting heights indicated on Drawings.
C. Attach to wall with adhesive and fasteners.

END OF SECTION 10 26 00
SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Public-use washroom accessories.
   2. Warm-air dryers.
   3. Childcare accessories.
   4. Underlavatory guards.
   5. Custodial accessories.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples: Full size, for each exposed product and for each finish specified.

1.3 INFORMATIONAL SUBMITTALS
A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance data.

1.5 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. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2.2 PUBLIC-USE WASHROOM ACCESSORIES – See drawings.

A. All public-use washroom accessories shall be from the same manufacturer and the same model series to provide a consistent style and finish. Possible exception: Toilet Tissue Dispenser.

B. Toilet Tissue (3 Roll) Dispenser TA-6:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   a. **Basis-of-Design:** Royce Rolls (MSU Campus Standard).
   b. **American Specialties, Inc.**
   c. **Bobrick Washroom Equipment, Inc.**
   d. **Bradley Corporation.**

2. **Description:** Three-roll dispenser with stainless steel frame and top shelf.
3. **Mounting:** Partition mounted, serving two adjacent toilet compartments and surface mounted.
4. **Operation:** Non-control delivery with theft-resistant spindle. Provide #TP-Clip to secure spindle.
5. **Capacity:** Three roll capacity minimum
6. **Roll Size:** Designed for 4-1/2- or 5-inch-diameter tissue rolls. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Paper Towel (Roll) Dispenser TA-11:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   a. **American Specialties, Inc.**
   b. **Bobrick Washroom Equipment, Inc.**
   c. **Bradley Corporation.**

2. **Description:** Lever-actuated mechanism permitting controlled delivery of paper rolls in preset lengths per stroke.
3. **Mounting:** Surface mounted.
4. **Minimum Capacity:** 8-inch-wide, 800-foot-long roll.
5. **Material and Finish:** Stainless steel, No. 4 finish (satin).
6. **Lockset:** Tumbler type.

D. Waste Receptacle TA-20:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   a. **American Specialties, Inc.**
   b. **Bobrick Washroom Equipment, Inc.**
   c. **Bradley Corporation.**

2. **Mounting:** Recessed.
3. **Minimum Capacity:** 12 gal.
4. **Material and Finish:** Stainless steel, No. 4 finish (satin).
5. **Liner:** Reusable vinyl liner.
6. **Lockset:** Tumbler type for waste receptacle.
E. Liquid-Soap Dispenser TA-10:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.

2. Description: Designed for dispensing antibacterial soap. Dispenser must be compatible with current MSU bulk soap inventory.


4. Capacity: 1.5 liter.

5. Materials: Stainless steel, No. 4 finish (satin).


7. Refill Indicator: Window type.

F. Grab Bars (TA-3 @ 42”; TA-13 @36”, TA-14 @ 18” vertical):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.


3. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1 1/2 inches.

5. Configuration and Length: As indicated on Drawings.

6. Location: One set per accessible stall.

G. Sanitary-Napkin Dispenser Unit TA-21:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.


3. Door or Cover: Locking

4. Function: Coin operated, $.25 per.

5. Material and Finish: Stainless steel, No. 4 finish (satin).

6. Quantity: One per restroom - Womens

H. Sanitary-Napkin Disposal Unit TA-8:
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.

2. **Mounting:** Surface and partition mounted, dual access, as shown on drawings.

3. **Door or Cover:** Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.

4. **Receptacle:** Removable.

5. **Material and Finish:** Stainless steel, No. 4 finish (satin).

6. **Quantity:** One per stall - Womens

I. **Mirror Unit TA-12:**

1. Individual sized custom mirror units (1/sink) consisting of ¼” mirror glass over ½” plywood with black steel frame

2. **Frame:** As detailed.

   a. Corners: Welded and ground smooth.
   b. **Finish:** Painted.

3. **Hangers:** Produce rigid, tamper- and theft-resistant installation, using method indicated below.

   a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
   b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

4. **Size:** As indicated on Drawings.

2.3 **WARM-AIR DRYERS – See drawings.**

A. **High-Speed Warm-Air Dryer TA-22:**

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

   a. **Basis-of-Design:** Toto, LTD.
      1) **Model # HDR101#WH Toto Clean Dry Automatic High Speed.**
      2) White ABS Cover
   b. American Dryer, Inc.
   c. American Specialties, Inc.
   d. Bradley Corporation.
   e. Excel Dryer Inc.
   f. World Dryer Corporation.
   g. Dyson.

2. **Description:** High-speed, warm-air hand dryer for rapid hand drying.

3. **Mounting:** Surface-mounted.

4. **Operation:** Electronic-sensor activated with operation time of 10 to 20 seconds.

5. **Cover Material and Finish:** ABS White
6. Electrical Requirements: 110/120 Volts, 3.3 Amps, 390 Watt, 60 Hz (Requires a dedicated 15 Amp circuit).
7. Warranty: One Year against manufacturer defects.

2.4 CHILD CARE ACCESSORIES – See drawings.
A. Diaper-Changing Station TA-5:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Specialties, Inc.
      b. Koala Kare Products.
   2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
      a. Engineered to support minimum of 250-lb static load when opened.
   3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.

2.5 UNDERLAVATORY GUARDS – See drawings.
A. Underlavatory Guard TA15:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Plumberex Specialty Products, Inc.
      b. Truebro by IPS Corporation.
   2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.

2.6 CUSTODIAL ACCESSORIES – See drawings.
A. All custodial accessories shall be from the same manufacturer and the same model series to provide a consistent style and finish.
B. Utility Shelf TA-23:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Specialties, Inc.
      b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation.

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: 24 inches long by 6 inches deep.
4. Material and Finish: Not less than nominal 0.05-inch-thick stainless steel, No. 4 finish (satin).

C. Mop and Broom Holder TA-19:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.

2. Description: Unit with hooks, holders, and rod suspended beneath shelf.

   1. Length: 36 inches, 96 inches (or 2 @ 48”.
   2. Hooks: Four for 36”, 10 for 96”.

2.7 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

END OF SECTION 10 28 00
SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance data.

1.4 COORDINATION
A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.5 SEQUENCING
A. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
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.

2.2 FIRE-PROTECTION CABINET - FEC
A. Cabinet Type: Suitable for fire extinguisher.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Specialties, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.

c. Larsens Manufacturing Company.

d. Potter Roemer LLC.


C. Cabinet Construction: As required per wall construction.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

D. Cabinet Material: Cold-rolled steel sheet.

E. Recessed Cabinet:

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).

F. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

G. Cabinet Trim Material: Same material and finish as door.

H. Door Material: Steel sheet.

I. Door Style: Vertical duo panel with frame.

J. Door Glazing: Tempered float glass (clear).

K. Door Hardware: Manufacturer’s standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

L. Accessories:

1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

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 in vertical lettering.
      2) Application Process: Decals.
      3) Lettering Color: Red.
      4) Orientation: Vertical.

M. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

   a. Finish: Clear anodized.

   b. Color: As selected by Architect from full range of industry colors and color densities.
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare recesses for recessed and semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply decals at locations indicated.

E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 10 44 13
SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes portable, hand-carried fire extinguishers.

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

1.3 INFORMATIONAL SUBMITTALS
   A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS
   A. Operation and maintenance data.

1.5 COORDINATION
   A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
      1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
   B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ansul Incorporated; Tyco International.
   b. JL Industries, Inc.; a division of the Activar Construction Products Group.
   c. Kidde Residential and Commercial Division.
   d. Larsens Manufacturing Company.
   e. Potter Roemer LLC.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type FE: UL-rated 10# nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ansul Incorporated; Tyco International.
   b. JL Industries, Inc.; a division of the Activar Construction Products Group.
   c. Larsens Manufacturing Company.
   d. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

   1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.
1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 10 44 16
SECTION 11 52 13 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manually operated, front-projection screens.
   2. Electrically operated, front-projection screens and controls.

B. Related Requirements:
   1. Section 115213.19 “Rear Projection Screens.”

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show layouts and types of front-projection screens. Include the following:
   1. Location of seams in viewing surfaces.
   2. Anchorage details, including connection to supporting structure for suspended units.
   3. Location of wiring connections for electrically operated units.
   4. Wiring diagrams for electrically operated units.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED, FRONT-PROJECTION SCREENS

A. General: Manufacturer’s standard spring-roller-operated units, consisting of case, screen, mounting accessories, and other components necessary for a complete installation.

   1. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.

B. Surface-Mounted, Metal-Encased, Manually Operated Screens without Tab Tensioning: Units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch (0.7 mm) thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide units with matching end caps and concealed mounting.

   1. Dalite Model C with CSR or approved equal

C. Recessed-Mounted, Metal-Encased, Manually Operated Screens without Tab Tensioning: Units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch (0.7 mm) thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide units with matching end caps and concealed mounting.
2.2 ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

A. General: Manufacturer’s standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation.

1. Controls: Remote, key-operated three-position control switch for the following rooms:
   - Sitting Stair 206 – Switch control located in AV rack in room 0123
   - Medium Classroom 0337 – Switch control located at West end of room
   a. Provide locking cover plates for switches.
   b. Provide key-operated, power-supply switch.

2. Controls: Remote, Low Voltage Controls wiring for control via Extron AV system provided by others for the following room:
   - Inspiration Hall 201 – Wire low voltage wire to AV rack in room 0301A

3. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, and positive-stop action to prevent coasting.

4. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch-(9.5-mm-) diameter metal rod with ends of rod protected by plastic caps.

5. Tab Tensioning: Provide units that have a durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of screen by tabs to pull screen flat horizontally.

B. Surface-Mounted, Metal-Encased, Electrically Operated Screens with Tab Tensioning: Motor-in-roller units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch (0.7 mm) thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide with matching end caps and concealed mounting.

1. Dalite Tensioned Cosmopolitan Electrol - Electric Screen or approved equal

2.3 FRONT-PROJECTION SCREEN MATERIAL

A. Matte-White Viewing Surface: Peak gain of not less than 1, and gain of not less than 0.8 at an angle of 60 degrees from the axis of the screen surface.

1. Dalite Da-Mat or approved equal

B. Material: Vinyl-coated, glass-fiber fabric or vinyl sheet, or approved equal.

C. Seamless Construction: Provide screens, in sizes indicated, without seams.

D. Edge Treatment: Black masking borders.

E. Size of Viewing Surface:
   1. 45 by 72 inches (qty 6)
2. 60 by 96 inches (qty 2)
3. 84 by 136 inches (qty 2)
4. 144 by 192 inches (qty 1)
5. 180 by 288 inches (qty 2).
6. Projection screen types sizes and locations shown in “TA” set of plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.
   a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

END OF SECTION 115213
SECTION 11 53 10 - LABORATORY CASEWORK AND OTHER FURNISHINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood Laboratory Casework and Tables
B. Metal Laboratory Casework
C. Mobile Workstation
D. Cabinet Hardware
E. Laboratory Work Surfaces
F. Mobile Workstation
G. Shelving Assemblies
H. Overhead Service Carriers
I. Cable Tray System
J. Pipe Drop Enclosure
K. Welding Screen
L. Finish for Miscellaneous Wood Items
M. Metal Fabrications
N. Stainless Steel Fabrications
   1. Work Surfaces
   2. Laboratory Sinks
O. Slotted Channel Framing (Strut)
P. Sealant

1.2 RELATED SECTIONS

A. Division 09 – Flooring (wall base)
B. Section 11 53 13 – Fume Hoods and Other Air Containment Units
C. Section 11 53 43 – Laboratory Service Fittings and Fixtures
D. Division 22 – Plumbing
E. Division 23 – Heating, Ventilated, and Air-Conditioning
F. Division 26 – Electrical
G. Division 27 - Communications

1.3 REFERENCES


H. Scientific Equipment and Furniture Association: SEFA 8-M-2010 Recommended Practices for Laboratory Grade Metal Casework.


J. Underwriters Laboratory: UL61010A-1 Electrical Equipment for Laboratory Use.

K. Underwriters Laboratory: UL962A Furniture Power Distribution Units.


1.4 BID SUBMITTALS

A. Certification of Compliance: All bidders (including those listed in 2.01-A) must submit a compliance certification statement indicating that their bid includes products and installation which comply with every requirement of the project specifications and drawings (accounting for any RFI responses received during the bidding phase).
B. Certification of Qualifications: All bidders must submit a certification of compliance with the Qualifications requirements outlined below. List specific project experience as evidence of compliance.

C. Substitution Requests: All substitution requests for this scope of work in this section must be made during the bidding phase. No substitution requests will be considered post-bid.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable items shall be deleted or struck.

5. Product data submittals provided in PDF format shall consist of fully collated PDF files allowing for collated printing from a single file.

6. Shop drawings shall meet the requirements of the Architectural Working Standards (AWS), except in cases where stricter requirements are identified in this section.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for work in this section.

1. Product data shall not be duplicative or redundant with shop drawings. Do not include drawings in the product data submittal that are included in the shop drawings.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules.

1. Show relationship to adjoining materials and construction.

2. Show seaming pattern layout of all joints in work surfaces.

3. Shop Drawings shall be in the form of reproducible, PDF files, or photocopies, to scale, sheet size not to exceed 11 inches x 17 inches (A3).

4. Shop drawing submittals provided in PDF format shall consist of fully collated files allowing for collated printing from a single file. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

F. LEED Submissions: Provide documentation and certification as required relative to the work of this section to support the project’s submission to the USGBC for the credits indicated below.
G. Submit detailed anchorage and attachment drawings provided by a licensed Structural Engineer complying with applicable codes, regulations, and guidelines in the state of installation.

H. Samples: Accompanying Materials List, submit for Architect's approval two (2) samples of each type of specified finish and color range available for casework, laboratory work surfaces, painted steel fabrications, cabinet hardware, and shelving.

I. Certifications/ Test Data: Submit certifications and test data as required elsewhere in this section, including SEFA structural performance test reports, and finish performance test reports.

J. AWI/WI Certified Compliance Submittals:
   1. Before delivering casework, provide a Woodwork Institute Certificate of Compliance indicating the millwork products being provided and certifying that these products meet the requirements of Architectural Woodwork Standards for the Grade or Grades specified and of the plans and specifications.
   2. Provide a Woodwork Institute Certified Compliance Label on each elevation of casework.
   3. At completion of installation provide a Woodwork Institute Certificate of Compliance indicating the products installed and certifying that the installation thereof meets the requirements of the AWS for the Grade or Grades Specified and of the plans and specifications.
   4. All costs of Woodwork Institute Certification are the responsibility of the millwork manufacturer and/or installer.

K. Operations/Maintenance Manuals: At project close-out, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

L. Warranty: Submit manufacturer's warranty including any additional certifications as needed to meet the requirements specified.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 ENVIRONMENTAL CONDITIONS

A. It is the responsibility of the general contractor or construction manager to provide appropriate environmental conditions within the laboratory spaces throughout the period of installation of wood and composite wood casework products until substantial completion of the project and turnover to the owner. The relative humidity standards as delineated by the Architectural Woodwork Standards should be followed.
   1. Humidity must be controlled between 25% and 55% in all areas where laboratory casework is stored and/or installed.
   2. The range of relative humidity change should not exceed 30 percentage points.

B. It is the responsibility of the laboratory furniture subcontractor to assess building environmental conditions prior to the delivery and installation of laboratory casework. Wood laboratory casework shall
not, under any circumstances, be installed in spaces which do not comply with the requirements outlined above.

1.8 QUALIFICATIONS

A. Work in this section shall be manufactured by and installed by a company/companies having a minimum of eight years documented experience providing and installing products similar to those specified in laboratory applications; an established organization; and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified work of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.9 ENVIRONMENTAL COMPLIANCE

A. Certified Wood: All wood products used in the fabrication shall comply with the FSC’s (Forest Stewardship Council’s) Principles and Criteria as required to contribute towards USGBC LEED Credit MR7.

1. All lumber shall come from forestry sources that are certified under the Forestry Stewardship Council’s (FSC) Forest Management Certification program.
2. The casework manufacturer must have FSC Chain-of-Custody (COC) Certification.
3. Documentation:
   a. Provide manufacturer’s Chain of Custody Certification.
   b. Provide documentation of the cost, volume, and weight of all wood products provided for this project, including any non-FSC wood products or components.
   c. Provide documentation of the cost, volume, and weight of FSC wood products provided for this project.
   d. In the case of assemblies where some components are FSC-certified and other components are not – provide separate cost, volume, and weight information for each assembly component.

B. Low-Emitting Materials – Composite Wood and Agrifiber Products: Composite wood and agrifiber products used in casework products shall contain no added urea-formaldehyde resins, as required to meet USGBC LEED Credit EQ4.4.

1. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
2. Provide certification as required.

C. All steel used in the product fabrication shall comply with the recycled steel content requirements to contribute towards achievement of the USGBC LEED Green Building Rating System MR Credits 4.1 and/or 4.2.

1. All steel used in the fabrication of laboratory cabinets, fume hoods and modular laboratory systems shall have a minimum of 25% recycled steel content, as defined by ISO 14021-1999, calculated as follows:
2. \( \text{(% of Post Consumer Recycled Steel Content by Weight)} + 0.5 \times \text{(% of Pre-Consumer Recycled Content by Weight)} \geq 20\% (30\%) (40\%)
3. Documentation:
   a. The manufacturer shall submit documentation (i.e. “Source of Materials”, Invoices, Third Party Validation, etc.) for steel purchased for this project providing recycled content.
b. Provide documentation of the cost of each component which contains recycled steel.
c. Provide percentages (by weight) and costs of post-consumer recycled material and pre-consumer recycled material within each component.

1.10 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the client’s academic/research schedule and may therefore require evening and/or weekend work.

PART 2 PRODUCTS

2.1 WOOD LABORATORY CASEWORK AND TABLES

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

B. The contract for the work of this section must be held directly by one of the manufacturers named below.

1. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
2. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
3. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
4. Diversified Woodcrafts, Inc., 300 South Krueger Street, Suring, WI 54174 Tel: 920 842-2136.
5. Pacific Cabinets Inc., 2010 Front Street, Ferdinand, Idaho 83526 Tel: 208 962-5546.
6. Approved substitution.

C. Quality Standards:

1. Wood casework shall comply with all requirements of AWS Custom Grade architectural cabinets, unless otherwise specified in this section.

D. Design Requirements:

1. Door and drawer design: Square edged full flush overlay design with eased edges. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction. Reveals shall be within the ranges indicated below; however, they shall be consistent across a given project.
   a. Reveal from top of door/drawer fronts to top of cabinet: 3/32 inch to 3/8 inch.
   b. Reveal from bottom of door/drawer fronts to bottom of cabinet bottom panel: Flush.
   c. Horizontal and vertical reveals between door and drawer fronts: 3/32 inch to 3/16 inch.
   d. Vertical reveal between side of door and drawer fronts and the side of the cabinet: one-half of the typical horizontal and vertical reveal.

2. Pulls on doors shall be mounted vertically and on drawers horizontally.

3. Grain Pattern:
   a. Vertical Matched Grain Pattern: Grain pattern on all exposed surfaces shall be vertical. Entire cabinet front must be cut from a single panel.

4. Toe Kicks/Toe Spaces:
   a. All tall storage cabinets to have toe space to match base units.
b. Provide toe spaces at all fully-exposed sides of cabinets, including locations such as the end of island benches, the end of peninsula benches, and outside-corner cabinets. Toe spaces shall run continuously through all items such as knee opening side panels and end panels.

5. Full-Flush Construction and Installation: All finished panels and surfaces shall be in the same plane as the front of cabinet doors/drawers to provide a true flush overlay appearance.
   a. Filler panels: Provide filler panels where casework units meet perpendicular walls to create a continuous appearance.
      1). Full-flush end-of-run filler panels are required at all conditions where the joint width is one inch or larger. At conditions where the joint width is less than one inch, filler panel should be flush with cabinet body.
   b. Flush panels: Provide fixed fully-edgebanded flush panels at sink cabinets, knee opening drawer units, filler panels, and elsewhere, so that all finished panels are in the same plane as cabinet doors and drawers to provide a true flush overlay appearance.
   c. Applied panels may be required in areas such as sink cabinets and knee spaces with pencil drawers to complete the flush construction.
   d. At outside corners, align side panel of cabinet with the face of the door of adjacent cabinet.
   e. At inside corners, mount filler panels flush with face of adjacent cabinet doors.
   f. At open cabinets (without doors), align face of cabinet with face of adjacent cabinet door. Adjust the depth of the cabinet and toe kick accordingly.
   g. Align other filler panels and applied panels with face of adjacent cabinet doors.
   h. Align face of end panels and knee-opening side panels with face of adjacent cabinet doors.
   i. Provide filler/trim panels at locations where undercounter dishwashers or glasswashers are shown and the units provided do not completely fill the opening indicated.
   j. Filler panels shall follow the profile of toe kicks.

6. Where cabinets are installed in an end-to-end configuration (for example, within a drywall alcove or across the complete width of a wall), adjust the width of at least one cabinet within the run so that filler panels at either end will not exceed two inches in width. Where knee openings are present, the knee opening width may be adjusted to meet this requirement.

7. Extended Ends:
   a. At end-of-run base cabinets, provide extended end to cabinet to create closure to the wall without the use of filler panels. Extended end shall be edgebanded on front and bottom edges. Back edge shall be scribed to the wall with a tight hairline joint. Field-applied panels do not meet this requirement.
   b. At ends of island benches and peninsula benches, provide a paired set of base cabinets, each with an extended end, resulting in a single joint. These extended end panels shall be edgebanded on the front and bottom edges and shall meet at a hairline joint. Applied panels do not meet this requirement.

8. Flush interiors: Set cupboard bottom flush with front-end facers. Surface mounted bottoms and offsets caused by front face frames that interfere with ease of cleaning are not acceptable.

9. Widths of drawer bodies in knee opening rails shall not be less than 18 inches (457 mm). As noted above, applied panel shall be provided to complete the flush construction on either side of the drawer head.

E. Materials and Finishes:

1. Wood:
   a. Definition of cabinet components by surface visibility:
      1). Exposed Surfaces:
         a). Surfaces exposed when doors and drawers are closed.
         b). Surfaces visible when behind glass doors, including tops and bottoms of shelves.
         c). All exterior surfaces of suspended casework.
         d). Open units.
         e). Bottoms of cabinets if 42 inches (1070 mm) or more above finished floor.
f). Tops of cabinets if less than 72 inches (1830 mm) above finished floor.
g). Front rail of web frames.

2). Semi-exposed surfaces:
a). Surfaces that are visible when solid (opaque) doors are open or drawers are extended, including backs of doors.
b). Tops of cabinets 72 inches (1830 mm) or more above finished floor when visible from an upper level.

3). Unexposed surfaces:
a). Surfaces not normally visible after installation with doors open and drawers extended.
b). Bottoms of cabinets less than 30 inches (750 mm) above finished floor.
c). Tops of cabinets over 78 inches (1980 mm) above finished floor and not visible from an upper level.

b. Wood Species and Veneer Cut: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.

c. Maple:
1). Lumber:
a). Exposed and semi-exposed: Plain sawn Maple, NHLA Grade FAS.
b). Unexposed: Select grade hardwood of a species suitable for the specified purpose.
c). All lumber shall be clean and free of defects; kiln and air dried to uniform moisture content of 6 percent.

2). Veneer:
a). Exposed: Plain sliced white select maple, grade A. Thickness: 1/50 inch (0.5 mm), minimum.
   1). Color and Matching:
      (a). 100% sapwood, no heartwood allowed.
      (b). Slight color streaks or marks.
      (c). Slight color variation.
      (d). No sharp contrast at veneer joints.

   2). Natural Characteristics:
      (a). Small conspicuous burls: combined average not to exceed 4 per 10 square feet (1 m²).
      (b). Conspicuous burl size: 3/8 inch (9.5 mm), maximum.
      (c). Conspicuous pin knots: combined average not to exceed 4 per 32 square feet (3 square meters). Maximum pin knot size – dark part: 1/8 inch (3.2mm). Maximum pin knot size – total: ¼ inch (6.4mm).
      (d). Scattered sound repair knots, bark pockets: not allowed.
      (e). Slight mineral streaks, worm tracks, cross bars and vine marks.

   3). Manufacturing Characteristics:
      (a). Rough cut or ruptured grain is not allowed.
      (b). Blended repaired tapering hairline Splits: two 1/16 inch (1.6 mm) x 6 inch (152 mm) on end panels only.

   4). Repairs: Small blending allowed.
   5). Flitch Width, Face Components: 5 inches minimum, except for outside components.

b). Semi-Exposed: Plain sliced white select maple Grade B sapwood – no heartwood allowed.

c). Unexposed: Plain sliced hardwood veneer.


2. Plywood
a). Typical, Unless Otherwise Noted: Hardwood Veneer Plywood
   1). Product shall be provided with hardwood face veneers as specified above.
2). Plies:
   a). ¾ inch (19 mm): minimum 7-ply, including face veneers.
   b). 1 inch (25 mm): minimum 9-ply, including face veneer.

3). Physical Properties:
   a). Screwholding: 355 lb at face.
   b). Average modulus of rupture: 7346 psi (50.65 N/mm²).

b. Drawer and Door Fronts: ANSI A208.1 M3 Grade Industrial Particleboard Core Plywood.
   1). Product shall be provided with hardwood face veneers as specified above.
   2). Plies:
      a). 3-ply, including face veneers.
   3). Minimum Physical Properties:
      a). Screwholding: 247 lbs at face, 225 pounds at edge.
      b). Average modulus of rupture: 2,393 lb/in².
      d). Hardness: 500 lbs.

c. Drawer box back, front and sides: Finnish or Baltic Birch Plywood

3. Hardboard: Dry process S2S hardboard made from compressed exploded wood fibers.

4. Edgeband/Facer: 1/8 inch (3 mm) hardwood; species as described above.

5. Dowels: 8 mm, diameter, minimum, hardwood, laterally fluted with chamfered ends.

6. Glue: Type 2 or Type 3 water resistant glue with gluing done in clamps and jigs.

7. Finish for Wood Laboratory Components:
   a. All wood components shall be fully sanded on all surfaces including the underside of exposed components, glazed door element inside edges, penetrations for the attachment of drawer heads, screws attaching adjacent cabinets, cutouts at grilles, and all other such locations. The final installation shall present no rough, splintered, or unfinished surfaces at any visible, exposed, semi-exposed, or touchable locations. This does not apply to components of surfaces which will be fully concealed in the final installation.
   b. Finish processes (stains and finishes) shall be by means of compression spray or a UV roll coater, providing high-transfer efficiency low waste generation. Solvent applied coatings are not acceptable and will not be considered. Manufacturer shall supply documentation that waste generated during the finishing process, is a non-hazardous material, eliminating liquid waste disposal in landfills.

   1). Chemically Resistance Finish: Finish for all wood products shall be environmentally friendly, highly chemically resistant, water-borne, laboratory-grade finish that satisfies the requirements specified herein for chemical and durability resistance. A letter from a third-party validator, verifying independent test results, shall be submitted.
   2). Operator Protection: The application shall be convenient and easily mastered, in a custom spray booth. The finish process shall be cleanly contained and shall have no solvent odor, and shall be applied in an air-conditioned room.
   3). VOC Emissions: Water-borne finishes shall be sprayed and cured with a near zero (2.0 lbs. per gallon for ‘clean finish’) VOC (Volatile Organic Compounds) emissions.
   4). Offgasing: After all wood products have cooled from the curing ovens, the coating shall be firm and stable. No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature.

   c. Manufacturer may uses either of the following finish systems:
      1). Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs.
      2). Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

d. Stain Color:
   1). To be selected by Architect from manufacturer’s full published color range.

e. Application:
1). Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.

2). Preparation: Sand exposed and semi-exposed surfaces smooth, free from dirt and defects.

3). Stain application: Apply stain of color selected to all exposed and semi-exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.

4). Finish application: Apply chemical resistant top finish to all stained surfaces. Apply to doors after any notching for hinges has been performed. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.

5. Glass: Framed glass doors:
   a. 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.
   b. Without imperfections or marred surfaces.
   c. All glass should have etched safety information, readable from outside the cabinet.

F. Construction:

1. Base Cabinets:
   a. Assembly: Dowel and/or mortise-and-tenon joinery secured with countersunk screws and pressure-glued.
   b. Cabinet Top:
      1). Front rail of ¾ inch plywood x 2¼ inches (57 mm) or 1 inch (25 mm) x 3 inches (76 mm) hardwood. Back rail: ¾ inch plywood or hardwood, 3-3/4 inches tall.
   c. Cabinet Bottom: ¾ inch (19 mm) thick plywood. Set flush and join to cabinet end panels. Front edge shall be edgebanded.
   d. Cabinets Ends/Sides and Backs Exposed to View from the Outside: ¾ inch (19 mm) thick plywood.
      1). Side panels and end panels: edgeband front edge and bottom edge.
   e. Cabinet Backs, Exposed to View from the Inside at Open Units and Units with Glazed Doors: 1/4 inch (19 mm) thick veneer core plywood.
   f. Cabinet Back, Semi-Exposed and Unexposed:
      1). Removable hardboard, 1/4 inch (6 mm) thick.
      2). Sink base back shall be half-height construction to allow for plumbing and sink waste connection.
      3). Provide split back on drawer cabinets.
   g. Cabinet Base: 3¾ inches (95 mm) x ¾ inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x 2½ inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
      1). If veneer core plywood option is used, edgeband bottom edge for moisture protection.
   h. Shelves: 1 inch (25 mm) thick full-depth, 9-ply hardwood plywood. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.
      1). Front edge of shelves shall be edgebanded.
      2). Pull-Out Shelves: Construction shall be similar to drawer body mounted on a full-extension pull-out slide, with ½ inch (12mm) hardwood plywood bottom.
      3). Shelf Adjustment: All shelves shall be adjustable on 32 mm centers.
      4). Shelf Tolerance: Shelves shall fit into cabinets or into shelf supports with a tolerance of 1/16 inch per side maximum.
   i. Drawer construction:
      1). Drawer box back, front and sides shall be of ½ inch (13 mm), 9-ply Finnish or Baltic Birch veneer plywood, with eased top edge, finished with a Gloss Level 7 polyester acrylic finish. The top edges of the completed drawer bodies shall be very smooth to
the touch and shall not present any rough or splintered surfaces. Sides shall be full height with 1 inch (25 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.

2). Acceptable drawer joinery options:
   a). Dowel: Glued under pressure; 32mm, minimum, dowel spacing to 4 inches (102 mm) high, 64 mm dowel spacing above 4 inches (102 mm).
   b). Multiple Dovetail: Tight fitting and glued.

3). Drawer bottom shall be ¼ inch (6mm) white PVC-clad hardboard. Bottom shall be grooved into the 4 sided drawer box and sealed with hot melt glue process around entire drawer bottom perimeter. For drawers greater than 24 inches (600 mm) wide, provide galvanized metal hat channel support at centerline of drawer.

j. Pull-Out Writing Boards: 1 inch plywood top with chemical-resistant plastic laminate on top surface and balancing liner on bottom surface. Color to be selected by Architect. Edgeband sides with wood edgebanding. Provide head as specified below.

k. Door and Drawer Heads: shall be ¾ inch (19 mm) thick plywood with edgebanding. Edges shall be as specified previously in this section. Drawer heads shall be screwed to drawer box.

l. Flush Panels: As described in the Design Requirements section of this specification.

m. Vertical Dividers: Full height dividers shall be ½ inch (38 mm) thick plywood. Edgeband exposed edge.

n. Front Horizontal intermediate Rail: ¾ inch (19 mm) x 1½ inches (38 mm) exposed hardwood rail shall be provided between doors and drawers. For all drawer units at benches where service fitting connections are not accessible via an adjacent knee opening filler or cabinet filler panel, drawer units to be provided with Keku fasteners (Keku fasteners not required at other locations). The drawer unit intermediate horizontal and vertical box frames must be removable. These components shall be assembled with Keku suspension fittings as manufactured by Häfele America Co. or approved so these members are easily removable at any time with no special tools to gain access to concealed piped services behind.

2. Wall and tall cases:
   a. Shall be manufactured with materials and joinery methods as specified for base units, unless otherwise indicated.
   b. Edgebanding:
      1). Edgeband front and top edges of upper cabinet side and end panels.
      2). Edgeband front, top, and bottom edges of tall cabinet side and end panels.
   c. Cabinet Interior Backs: 1/4 inch thick veneer core plywood, typical for all exposed, and semi-exposed interior backs.
   d. Hardwood plywood tops: 1 inch (25 mm) thick with front edge edgebanded.
   e. Wall and upper case hardwood plywood bottoms: 1 inch (25 mm) thick. Tall case hardwood plywood bottoms ¾ inch (19 mm) thick. Edgeband front edges.
   f. Bottom hardwood kick rail on tall cases: 3¼ inches (95 mm) x ¾ inch (19 mm) front hardwood or veneer core plywood toe space rail, mounted between end panels, forming a 4 inch (102 mm) high x 2½ inch (63 mm) deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels.
   g. Solid doors shall be the same construction as specified for base cabinets.
   h. Framed-glazed doors: Hardwood construction, ¼ inch (19 mm) x 2¼ inch (70 mm) machined to accept glass. Joints to be connected using pegged blind mortise and tenon construction. Ease all edges, including those that frame the glazing. Provide extruded vinyl retaining molding on interior designed so glass can be replaced without tools.
   i. Shelves: 1 inch (25 mm) thick full depth, 9-ply hardwood plywood. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.
      1). Front edge of shelves shall be edgebanded.
      2). Shelf adjustment:
      3). Wall units: All shelves shall be adjustable on 32 mm centers.
4). General purpose tall units: One fixed shelf. All others shall be adjustable on 32 mm centers.

3. Wood-Framed Laboratory Tables
   a. Tops: Refer to Laboratory Furnishing drawings for worktop materials, described in the Laboratory Work Surfaces section of this specification.
   b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless-steel faceplates, wiring, and junction boxes as required for a complete functional assembly.
      1). The first electrical device wired from the main cord shall be a 20-amp GFCI outlet with downstream protection capability.
      2). Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.
      3). Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.
      4). UL Listing:
         a). The table assembly shall be UL61010A-1 tested and labeled.
   c. Leveling Glide and Leg Shoe: Each leg other than those fitted with casters, shall have leveling glides and leg shoes.
      1). Leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, nonmarring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.
      2). Leg shoe: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.
   d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Moveable tables to have all 4 swivel and locking casters.
   e. Rails: Not less than ¾ inch x 4-5/16 inch (19 x 110 mm) solid lumber with attached heavy duty steel corner braces, grooved and screwed into both rails at each corner. Groove rails for "Z" irons or drill for top attachment.
   f. Reinforcing cross rails: Hardwood lumber doweled and glue into front and back rails and pinned at intervals not more than 33 inches (838 mm) on center in tables without drawers.
   g. Legs: Not less than 2 inch x 2 inch (50 x 50 mm).
      1). Construction: Either of the following is acceptable:
         a). Made of one solid piece of lumber
         b). Made from two pieces of solid lumber glued together. Individual components shall be carefully selected for color match. The glue joint shall be on the diagonal of the leg, as seen in plan. All legs shall be oriented so that the diagonals converge to create an “X” in plan.
      2). Veneered lumber or wood of any type is not acceptable for leg components.
   h. Leg rails and spreader rail: Not less than 1 ¼ inch x 2 ½ inch (32 x 63 mm) hardwood lumber.
   i. All exposed edges of legs and rails shall be eased, sanded smooth, and finished per the requirements for wood laboratory casework components.

4. Aprons and leg assemblies:
   a. Apron: Not less than ¾ inch (19 mm) x 4-5/16 inch (110 mm) hardwood.
   b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) hardwood.
   c. Leg rails: Not less than 1 ¼ inch (32 mm) x 2 ½ inch (63 mm) hardwood.
   d. All exposed edges of legs and aprons shall be eased, sanded smooth, and finished per requirements described above for wood laboratory casework components.
   e. Casters: Provide cabinets with lockable casters where indicated on the Laboratory Furnishing drawings.
   f. Venting:
1). Cabinets below or adjacent to fume hoods: Provide and install 2 inch (50 mm) diameter schedule 40 PVC vent pipe using PVC fittings. Termination of vent pipe may be one of the following:
   a). Extend vent pipe 4 inches (100 mm) above dished worktop, behind the baffle in the hood, as shown on the drawings. Provide hole through fume hood work surface above the corrosive storage cabinet to accommodate 2 inch (50 mm) diameter vent pipe. Seal gap around penetration with clear silicone sealant.
   b). Extend vent pipe up within fume hood side wall and vent through the hood side wall liner behind the upper portion of the fume hood baffle.

2). Cabinets not below or adjacent to fume hoods: Vent connection will be by Division 23. Provide holes in back of cabinet to accept exhaust connection.

g. Seismic Anchor: Provide seismic anchor for freestanding cabinets and cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments, but shall not attach to adjacent casework or work surfaces. Seismic anchors shall be accessible without removal of laboratory casework, furnishings, or equipment.

G. Hardware: As specified elsewhere in this Section.

H. Wood Finish Chemical Resistance Performance Requirements:

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.

2. Procedure: Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.
   a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the panel.
   b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.

3. Rating System: Evaluations shall use the following rating system:

   | Level 0  | No detectable change. |
   | Level 1  | Slight change in color or gloss. |
   | Level 2  | Slight surface etching or severe staining. |
   | Level 3  | Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration. |

4. Acceptance Level:
   a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
   b. There shall be no more than four (4) Level 3 conditions.

5. Table of reagents:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>2.</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>3.</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
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<tr>
<td>4.</td>
<td>Acetone</td>
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</tr>
<tr>
<td>5.</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
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<tr>
<td>6.</td>
<td>Alcohol, Butyl</td>
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<td>7.</td>
<td>Alcohol, Ethyl</td>
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</tr>
<tr>
<td>8.</td>
<td>Alcohol, Methyl</td>
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<tr>
<td>Test No.</td>
<td>Chemical Reagent</td>
<td>Test Method</td>
<td>Range</td>
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<td>9.</td>
<td>Ammonium Hydroxide, 28%</td>
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<td>10.</td>
<td>Benzene</td>
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<td>Carbon Tetrachloride</td>
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<td>Chloroform</td>
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<td>Chromic Acid, 60%</td>
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<tr>
<td>14.</td>
<td>Cresol</td>
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<tr>
<td>15.</td>
<td>Dichloroacetic Acid</td>
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<tr>
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<td>Dimethylformamide</td>
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<td>Ethyl Ether</td>
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<td>Formaldehyde, 37%</td>
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<td>Formic Acid, 90%</td>
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<td>Furfural</td>
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<td>23.</td>
<td>Hydrofluoric Acid, 37%</td>
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<td>24.</td>
<td>Hydrofluoric Acid, 48%</td>
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<td>25.</td>
<td>Hydrogen Peroxide, 30%</td>
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<td>Iodine, Tincture of</td>
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<td>Methyl Ethyl Ketone</td>
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<td>Monochlorobenzene</td>
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<tr>
<td>33.</td>
<td>Nitric Acid, 70%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>34.</td>
<td>Phenol, 90%</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>35.</td>
<td>Phosphoric Acid, 85%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>36.</td>
<td>Silver Nitrate Saturated</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>37.</td>
<td>Sodium Hydroxide 10%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>38.</td>
<td>Sodium Hydroxide 20%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>39.</td>
<td>Sodium Hydroxide 40%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid 70% equal parts</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>49.</td>
<td>Zinc Chloride, Saturated</td>
<td>B</td>
<td>0</td>
</tr>
</tbody>
</table>

2.2 METAL LABORATORY CASEWORK, TABLES AND CASEWORK SYSTEMS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer. Corrosive and flammable liquid/solvent storage cabinets may also be provided by the manufacturers listed with their descriptions.

1. Laboratory Casework:
   a. Air Master Systems, 6480 Norton Center Drive, Muskegon, MI 49441 Tel 231 798-1111.
b. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.

c. CIF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.

d. Jamestown Metal Products, Inc., 178 Blackstone Avenue, Jamestown, NY 14701 Tel: 716 665-5313.

e. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.

f. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825

g. Approved substitution.

B. Metal Laboratory Casework

1. Design Requirements:
   a. Door and drawer front design: Square edged inset metal construction with all front surfaces above the toe space in the same plane.
   b. Pulls on doors shall be mounted vertically and on drawers horizontally.
   c. All tall cases shall be provided with toe space to match base units.
   d. All cabinets shall be constructed and finished to be suitable for use as stand-alone units and to permit future rearrangement without the need for additional parts or finish.
   e. Widths of drawers in knee opening rails shall not be less than 24 inches (600 mm) or the width of the rail whichever is the lesser.
   f. Cabinets below fume hoods that conflict with ductwork, cup sinks, or waste connections shall be 19 inches deep to accommodate any obstructions.

2. Materials:
   a. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
      1). Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
      2). All gauges indicated are to be U.S. standard.
   b. Glass: Framed glass doors:
      1). 1/8 inch (3mm) to 7/32 inch (5.5 mm) nominal tempered glass.
      2). Without imperfections or marred surfaces.
      3). All glass should have etched safety information, readable from outside the cabinet.

3. Base and Tall Cabinets:
   a. General:
      1). Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.
      2). All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.
      3). End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.
      4). The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.
      5). An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.
      6). The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.
      7). The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.
      8). Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable
of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:
   1. Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.
   2. Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).

c. Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.
   1. Sink units shall be provided with fixed half-height backs to allow plumbing lines to enter and exit the cabinet through the open area.

d. Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside of shelf. Shelves shall be adjustable. Full-depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

e. Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.

f. Door and Drawer Heads:
   1. Metal, Flush Inset: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan formed as an extension of the drawer body, an outer pan having a channel formation on all four sides, and the interior space filled with a non-organic sound deadening material at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.
      a). All four corners of door and drawer heads shall be welded closed and ground smooth to eliminate exposure of raw edges and open gaps.
      b). Glazed Hinged Door Construction: Glazed swinging doors shall be 3/4 inch thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3 inches wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 16 gauge hinge reinforcements welded in place. Glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be prepared as necessary to accept attachment of pulls as specified elsewherein this section.

g. Drawer Construction:
   1. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.
   2. Drawer Suspension: Refer to Drawer Slides under Hardware section.
   3. Drawer stops: shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

h. Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.
Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

Security Panels: Provide security panels in frames between drawers and cabinets within a cabinet where keyed different locks are indicated.

Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

4. Metal-Framed Laboratory Tables

a. Tops: Refer to Laboratory Furnishing drawings for worktop materials, described in the Laboratory Work Surfaces section of this specification.

b. Electrical receptacles: Tables shown with electrical receptacles shall be pre-wired including cutouts for electrical receptacles, black cord, 90-degree NEMA 5-20P plug, back boxes, gray NEMA 5-20R decora-style electrical receptacles, stainless-steel faceplates, wiring, and junction boxes as required for a complete functional assembly.

1). The first electrical device wired from the main cord shall be a 20-amp GFCI outlet with downstream protection capability.

2). Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.

3). Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.

4). UL Listing:
   a). The table assembly shall be UL61010A-1 tested and labeled.

c. Leveling Glides and Leg Shoes:

1). Each leg other than those fitted with casters shall have leveling glides: (2 inch) (48 mm) diameter, two-piece pivot construction, steel housing, nonmarring, phenolic or translucent plastic insert, (1/2 inch) (12 mm) diameter, minimum (1 1/2 inch) (36 mm) long zinc plated stems. Each glide shall have a load bearing capacity of 150 lbs.

2). Each leg other than those fitted with casters and adjustable-height legs, shall have leg shoes: Black coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

d. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake at front wheels. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core. Movable tables to have all 4 swivel and locking casters.

a. Adjustable-Height Legs: Where indicated on Laboratory Furnishing drawings, provide a stainless-steel insert at the bottom of each leg. Height of each insert shall be adjustable in 2 inch (50mm) increments using stainless-steel pins. This shall result in a work-surface top height range between 30 inches (750mm) and 38 inches (1000mm). Include leveling glide at bottom of each insert.

b. Construction:

1). Table rails, legs, and spreader rails shall be fully welded into a single-piece table frame structure. No mechanical joints between members are permitted.
c. Rails: Not less than 1½ inch x 4½ inch 16 gauge (38 x 114 x 1.6 mm) channel steel sections, reinforced as necessary for leg attachment.
d. Legs: Not less than 2 inch x 2 inch 16 gauge (50 x 50 x 1.6 mm) square tubular steel sections.
e. Leg rails and spreader rail: Not less than 1¼ inch x 2½ inch 16 gauge (32 x 63 x 1.6 mm) steel sections, reinforced as necessary for leg attachment.
f. Materials and Finish: Refer to Metal Fabrication specifications in this Section for material and finish requirements.

5. Aprons and leg assemblies:
a. Apron: Not less than 1½ inch (38 mm) x 4 inch (114 mm) 16 gauge (x 1.6 mm thick) channel steel sections, reinforced as necessary for leg attachment.
b. Legs: Not less than 2 inch (50 mm) x 2 inch (50 mm) 16 gauge (x 1.6 mm thick) square tubular steel sections.
c. Leg rails: Not less than 1¼ inch (32 mm) x 2½ inch (63 mm) 16 gauge (x 1.6 mm thick) steel sections, reinforced as necessary for leg attachment. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2 inches (50 mm) in height.

6. Flammable Liquid/Solvent Storage Cabinets:
a. Manufacturers:
   1). Manufacturers of metal laboratory casework.
   2). Eagle Manufacturing Company, 2400 Charles St., Wellsburg, WV 26070 Tel: 304 737-3171.
   3). Justrite Manufacturing Company, 2454 Dempster St., Suite 300, Des Plaines, IL 60016 Tel: 800 798-9250.
   4). Approved substitution.
b. Purpose-designed double-walled metal cabinet for the storage of flammable, combustible and solvent liquids.
d. Label: “FLAMMABLE - KEEP FIRE AWAY” in conspicuous silk-screened lettering. Stick-on decals are not acceptable. Size and style of lettering shall match that of the Corrosive Storage Cabinet label. “FLAMMABLE” lettering shall be 2 ½ inches tall. “KEEP FIRE AWAY” lettering shall be 2 inches tall. Color of lettering shall be red. If cabinet color is red, lettering shall be yellow.
e. Locks: Cabinet doors shall be lockable.
f. Floor pan: Provide a 2 inch (50 mm) deep liquid tight pan to cover the entire bottom of the cabinet to contain liquid leaks and spills.
g. Shelves: Provide heavy-duty full-depth metal shelves using pan-type construction to create a liquid-tight containment tray.
h. Standards:
   1). Comply with the requirements of OSHA and NFPA 30.
   2). Comply with the requirements of Uniform Fire Code and the International Fire Code with with UL 1275 and FM 6050 labels.
i. Flammable liquid/solvent storage (base) cabinets shall not be vented. Seal vent openings with bungs as provided by manufacturer.
j. Electrical grounding:
   1). Provide each flammable liquid / solvent storage cabinet with an externally mounted grounding conductor screw terminal for up to #8 AWG conductor, mounted at the top of the cabinet.
   2). Connection from the equipment grounding bus at the lab branch circuit panel to the storage cabinet terminal shall be by Division 26.
k. Seismic Anchor: Provide seismic anchor for freestanding cabinets and cabinets located below fume hoods designated to be removable for access for persons with disabilities. Seismic anchors may be floor or wall attachments, but shall not attach to adjacent casework or work surfaces. Seismic anchors shall be accessible without removal of
laboratory casework, furnishings, or equipment. Anchor attachment shall not void UL listing.

7. Metal Casework Construction Performance: Base cabinets shall be constructed to support a uniformly distributed load of 200 lbs. minimum per square foot (1000 kg/m²) of cabinet top area (total maximum of 2000 lbs. (900 kg)), including working surface without objectionable distortion or interference with door and drawer operation.
   a. Base cabinet corner gussets with leveling bolts shall support 500 lbs. (225 kg) per corner, at 1½ inch (38 mm) projection of the leveling bolt below the gusset.
   b. Each adjustable and fixed shelf 4 feet (1219 mm) or shorter in length shall support an evenly distributed load of 40 lbs. per square foot (200 kgf/m²) up to a maximum of 200 lbs. (90 kg), with nominal temporary deflection, but no permanent set.
   c. Drawer assemblies shall automatically maintain alignment in cabinet opening and shall not bind during opening or closing of the drawer so as to minimize glass breakage and damage to fragile parts.
   d. Swinging doors mounted on base units shall support a 250 lb. (113 kg) load located at a test point 14 inches (356 mm) measured horizontally from hinge along the top edge of door through a swing of 180 degrees. Weight test shall allow nominal temporary deflection, but no permanent distortion. Door assembly shall be twist- resistant and rigid, and shall close in a flat plane against the cabinet to permit the door catch at top of door to function properly.

C. Hardware: As specified elsewhere in this Section.

D. Metal Casework Color: As selected by the Architect from manufacturer’s full color line and complying with finish requirements described below.

E. Metal Casework Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.
   a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
   b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
   c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).
   d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color or in a uniform neutral color.

5. Concealed interior parts shall receive corrosion-resistant treatment.

6. Finish must be UV stable.

F. Metal Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.

2. Chemical resistance:
   a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73± 3°F (23± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73± 3°F (23± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM
      1). Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.
      2). Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.
   b. Rating System: Evaluations shall use the following rating system:
      Level 0 No detectable change.
      Level 1 Slight change in color or gloss.
      Level 2 Slight surface etching or severe staining.
      Level 3 Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.
   c. Acceptance Level:
      1). Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
      2). There shall be no more than four (4) Level 3 conditions.
   d. Table of reagents:

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>2.</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-2</td>
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<tr>
<td>3.</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
<td>0-3</td>
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<td>4.</td>
<td>Acetone</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>5.</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
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<tr>
<td>6.</td>
<td>Alcohol, Butyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>7.</td>
<td>Alcohol, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>8.</td>
<td>Alcohol, Methyl</td>
<td>A</td>
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</tr>
<tr>
<td>9.</td>
<td>Ammonium Hydroxide, 28%</td>
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<tr>
<td>10.</td>
<td>Benzene</td>
<td>A</td>
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</tr>
<tr>
<td>11.</td>
<td>Carbon Tetrachloride</td>
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<tr>
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<td>Chloroform</td>
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<td>0-2</td>
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<td>13.</td>
<td>Chromic Acid, 60%</td>
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<td>Cresol</td>
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<tr>
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<td>Dichloroacetic Acid</td>
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<tr>
<td>16.</td>
<td>Dimethylformamide</td>
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</tr>
<tr>
<td>17.</td>
<td>Dioxane</td>
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<td>0-2</td>
</tr>
<tr>
<td>18.</td>
<td>Ethyl Ether</td>
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<td>Test No.</td>
<td>Chemical Reagent</td>
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<tr>
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<td>Formaldehyde, 37%</td>
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<td>Formic Acid, 90%</td>
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<td>Furfural</td>
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<td>22.</td>
<td>Gasoline</td>
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<tr>
<td>23.</td>
<td>Hydrofluoric Acid, 37%</td>
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<tr>
<td>24.</td>
<td>Hydrofluoric Acid, 48%</td>
<td>B</td>
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<tr>
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<td>Hydrogen Peroxide, 30%</td>
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</tr>
<tr>
<td>26.</td>
<td>Iodine, Tincture of</td>
<td>B</td>
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</tr>
<tr>
<td>27.</td>
<td>Methyl Ethyl Ketone</td>
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<td>Methylene Chloride</td>
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</tr>
<tr>
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<td>Monochlorobenzene</td>
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</tr>
<tr>
<td>30.</td>
<td>Naphthalene</td>
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<tr>
<td>31.</td>
<td>Nitric Acid, 20%</td>
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<td>Nitric Acid, 70%</td>
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<td>34.</td>
<td>Phenol, 90%</td>
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<td>Phosphoric Acid, 85%</td>
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<td>0-1</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid 70% equal parts</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>49.</td>
<td>Zinc Chloride, Saturated</td>
<td>B</td>
<td>0</td>
</tr>
</tbody>
</table>

3. **Hot Water Test**
   a. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.
   b. Acceptance Level: After cooling and wiping dry, the finish shall show no visible effect from the hot water.

4. **Paint Adhesion on Steel Test**
   a. Test Procedure: Test shall be based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating.” Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.
   b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. **Impact Test**
   a. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter) from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.
   b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. **Paint Hardness on Steel Test**
a. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.
b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

2.3 MOBILE WORKSTATION

A. Heavy Duty – (MWS)

1. Manufacturers: All products specified in this section shall be the furnished by a single manufacturer.
   a. Bedcolab Ltd, 2305 Francis Hughes Avenue, Laval, Quebec, Canada H7S 1H5 Tel 514 384-2820.
   b. CiF Lab Solutions, 53 Courtland Avenue, Vaughan, Ontario, Canada L4K 3T2 Tel: 905 738-5821.
   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
   d. Mott Manufacturing Ltd., 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
   e. Approved substitution.

2. Components

   a. General requirements:

   b. Vertical structural support: 11-gauge cold rolled vertical shall integrate five cable management grommets, in each vertical, for ease running cabling. Capable of vertical adjustment between 82”-88” A.F.F. in two-inch increments.

   c. Equipment rack base: 7-gauge cold rolled horizontal base shall incorporate four bi-directional casters and four levelers that enable the end-user to extended the leveler support foot to prevent any movement from equipment or personnel.

   d. Table/shelf support frame: 11-gauge cold rolled steel tubing. Cabinet support channels: 14 gauge cold rolled steel. Weld members using the inert gas process.

   e. Support arms:

   f. Cantilever support arms: 11 gauge cold rolled steel.

   g. Lower shelf support: 11 gauge rolled steel.

   h. Cable Management Grommets: Flame resistant ABS plastic, color is black.

   i. Finish: Chemical resistant powder paint color to be Fisher Hamilton 1388, SA Sand or equal.

3. Cantilever Table/Shelf Frame:

   a. Capable of vertical adjustment between 30”-38” A.F.F. in one-inch increments.

   b. Support arm bracket: Support frame of 11 gauge cold rolled steel that incorporates four mechanically fastened machine bolts that interlock into a machine trended welded lock nut.
c. Weight capacity: Total equipment rack plus 2600 pounds. Work surface plus 925 pounds. Shelf unit plus 550 pounds.

4. Support Structures
   a. General requirements for mobile workstation:
   b. Riser uprights: 11 gauge rolled steel supplied with two parallel rows of machine threaded welded nuts that accept bolts that positively engage the table and shelf frames.
   d. Bottom shelf rails: 11 gauge cold rolled steel.
   e. Base cover: 18 gauge cold rolled steel.
   f. Slotted adjustment machined into riser upright: punched for one-inch adjustment of components supported off riser upright.
   g. Stainless steel retaining rods at upper shelves.

5. Electrical raceway: Workstations shall be provided with an adjustable height prewired single channel stainless steel raceway as specified under div 26, with the number of duplex receptacles as shown on the LF drawings, an 8’ black cord, and 90-degree NEMA 5-20P plug.
   a. The first electrical device wired from the main cord shall be a 20-amp GFCI outlet with downstream protection capability.
   b. Ensure wiring to downstream receptacles is connected to the downstream outlets such that GFCI protection is provided to downstream outlets.
   c. Cover plates of downstream outlets to be engraved to note that GFCI protection is provided via upstream receptacle.

6. Finishes
   a. Metal Finish:
      1). Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
      2). Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: Liquid dripped, solvent based finishes are not acceptable.
         a). Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
   b. Surface Finish Tests:
   c. All casework construction and performance characteristics shall be in full compliance with SEFA 8 – 1998 standards.

7. Hardware: As specified elsewhere in this Section.
8. Bench top Material:
   a. Epoxy Resin: as specified elsewhere under Laboratory Work Surfaces
   b. Wood: as specified elsewhere under Laboratory Work Surfaces

9. Adjustable Shelving Material:
   a. Chemical Resistant High Pressure Decorative Plastic Laminate Shelving – At mobile workstations with epoxy resin bench tops. Refer to shelving assemblies specifications section.
   b. Wood – At mobile workstations with wood bench tops. Refer to shelving assemblies specifications section.

2.4 CABINET HARDWARE

A. General: Special cabinets, such as corrosives storage, flammable liquid and solvent storage, rock storage, map storage, museum storage, radioisotope storage, and narcotics lockers, may be provided with the manufacturer’s standard hardware.

1. All door and drawer pulls shall match, regardless of type of casework, except for:
   a. Polypropylene casework. Refer to the pull requirements as specified above.
   b. Flammable liquid/solvent storage cabinets, which should use manufacturer’s standard latch handles as required to satisfy requirements of regulatory approvals.

2. All hardware shall be compliant with the ADA Standards for Accessible Design (28 CFR Part 36).

B. Drawer and Hinged Door Pulls:

1. Drawer and door pulls shall attach to door or drawer with machine screws. Two (2) pulls shall be furnished on drawers wider than 28 inches (711 mm). Plastic pulls or other types subject to breakage are not acceptable.

2. Type: Pulls shall be round “wire.”
   a. Material:
      1). Stainless steel
   b. Finish:
      1). BHMA 630 Satin (Previously US32D).
   c. Size:
      1). Length: 4 inches (100 mm) center to center of screw holes.
      2). Diameter: ¼ inch (6 mm).

C. Hinges:

1. General: Hinges shall be attached to both door and case with three screws through each leaf. Provide two hinges for doors up to 48 inches (1219 mm) high; three hinges for doors over 48 inches (1219 mm) high.

2. Type: Institutional with a five-knuckle bullet-type barrel. Characteristics:
   a. Height: 2½ inches (63 mm), nominal.
   b. Material: Stainless steel with stainless steel screws.
      1). Finish:
      2). Manufacturers:
         b). Approved substitution.
D. Shelf Hardware:

1. Shelf Supports:
   a. Adjustable shelf supports: Adjustable plastic shelf support with lockdown clips.

2. Manufacturers:
   a. Bainbridge Manufacturing, Inc., P. O. Box 487, 237 W 3rd, Waterville, WA 98858 Tel: 800 255-4702.
   b. The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
   c. Knape & Vogt Manufacturing CO., 2700 Oak Industrial Dr. NE, Grand Rapids, MI 49505 Tel: 616 459-7620.
   d. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
   e. Approved substitution.

E. Catches:

1. Roller Catches:
   a. Types and Materials: Roller catches shall be one of the following types. All-plastic or knuckle-type catches are not acceptable, except at corrosive storage cabinets.
      1). Tension ball catches consisting of a case with an adjustable-tension ball catch and a matching strike. Components shall be either stainless steel, chrome plated zinc alloy, or chrome-plated brass.
      2). Nylon roller housed in a steel case, which catches on a steel strike plate. Steel components shall be zinc finished.
      3). At metal casework base cupboard, catches may consist of a two-piece heavy-duty cam action positive catch positioned near the pivoting edge of door which provides a clean unobstructed opening. Main body of the catch shall be confined within an integral cabinet divider rail, while latching post shall be mounted on the hinge side of door.
      4). At corrosive storage cabinets, catches shall be non-metallic.
   b. Application: Provide roller catches at top of all non-locked cabinet doors.
   c. Manufacturers:
      1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
      2). Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
      3). Approved substitution.

2. Elbow catches: Heavy-duty, adjustable, spring-type elbow catch and strike plate.
   a. Material: Brass or steel with bright chromium plated finish.
   b. Application: Elbow catches shall be used on left hand doors of locked double door cabinets, including tall cabinets.
      1). At tall cabinets, elbow catch shall latch to fixed center shelf. Latching devices using chains or strings are not acceptable.
   c. Manufacturers:
      1). The Engineered Products Company (Epco), P. O. Box 108, Flint, MI 48501 Tel: 313 767-2050.
      2). Approved substitution.

F. Drawer slides:

1. Typical: Stainless steel ball bearing slides:
   a. Typical drawers shall be equipped with full extension, 100 lb/pr. (45 kg/pr.) capacity: Sugatsune ESR-7, or equal.
   b. File drawers shall be equipped with rail mounted with overtravel, 150 lb/pr. (68 kg/pr.) minimum capacity: Sugatsune ESR-10, or equal.
c. Provide matching slides at pull-out writing boards, pull-out keyboard trays, pull-out shelves, and other similar conditions.

d. Manufacturers:
   1. Sugatsune America, Inc. 221 East Selandia Lane, Carson, CA 90746 Tel: 310 329-6373.
   3. Approved substitution.

G. Special Hardware Requirements for Mobile Cabinets:

1. Mobile cabinets shall be engineered by the manufacturer to avoid overturning (tipping) when drawers are loaded to their design load, and opened to the specified glide opening.
2. The top drawer of mobile cabinets shall have an opening restricted to ¾ full open.
3. Mobile cabinets shall be provided with a rod-based drawer interlock glide system to prevent multiple drawers from being opened simultaneously. Accuride 3641 with companion slides Accuride 3642, Fulterer FR5218 with companion slides FR5019, or similar.
4. Mobile cabinets may additionally be provided with a counter weight system, consisting of galvanized steel plates securely attached to the cabinet bottom or inside the cabinet back. The weights shall not be visible when the cabinet is in the normal, upright position.

H. Drawer Stops: All regular drawers shall be equipped with integral stops to prevent drawer head impact with cabinet body.

I. Door Stops: Provide door stops for any cabinet door, which will strike an obstruction when opened between 90° and 135°.

1. Stop to be either:
   a. Sash chain, #30 zinc-plated steel.
      1. Terminations: Zinc chromate wire screw eyes. Open eye as required to attach stop with screws. Through-bolting not allowed.
   b. Coated cable.
      1. Seven-strand, 7-wire-per-strand, stainless steel cable with clear nylon coating.
      2. Wire diameter: 0.047 inches.
      3. Composite diameter with coating: 0.063 inches.
      4. Terminations: Number 10 stake eye on both ends. Attach to door/cabinet with screws. Through-bolting not allowed.
      5. McMaster Carr part number 30345T3 or equivalent.
   2. Engineer stop to length to allow door to open 1 ½ inch (40 mm) from obstruction.

J. Locks:

1. General: Provide locks on all file cabinet drawers. Provide locks at other locations as indicated on the drawings.
2. Lock type: Deadbolt-type lock.
   a. Disc-tumbler-type locks and/or cam-type locks will not be accepted.
   b. Framed sliding door locks shall be plunger type.
   c. Refer to Elbow Catches section, above, for requirements at two-swinging-door cabinets.
3. Testing requirements:
   a. Locks shall comply with ANSI/BHMA standard E07121.
   b. Lock shall be cycle tested per ANSI/BHMA A156.11 Grade 1.
4. Include spacers, adapters, fasteners, and strikes.
   a. All locks shall strike into metal material. Striking directly into wood is not acceptable.
5. Barrel length shall be coordinated with specific conditions.
6. Finish: Locks shall have satin nickel or satin chrome finish.
7. Keying:
   a. Key quantities: Provide two keys per lock. Provide four copies of any master/grand master keys.
   b. Key system:
      1). Key system shall support a minimum of 2000 different keys.
      2). Key system shall support up to three levels of master keys (grand-master keys, master keys, and sub-master keys) in addition to individual keys.
   c. Key cylinder type:
      1). Coordinate key type with owner.
   d. Key schedule: Coordinate key schedule with Owner.

8. Key engraving:
   a. Keys to be engraved with an identification number corresponding to the layout of unique keys on the project. All identical keys shall be engraved with the same number.
   b. At laboratories with multiple, individually-locked drawers where number plates are indicated, engrave each key with number to match the number plate on each drawer.

9. Manufacturers:
   a. Swinging Doors and Drawers:
      1). Illinois Lock Company, 301 West Hintz Rd., Wheeling, IL 60090 Tel: 847 537-1800.
      2). National Cabinet Lock, 200 Old Mill Rd., P. O. Box 200, Mauldin, South Carolina 29662 Tel: 864 297-6655.
      4). Approved substitution.

K. Glides: Non-marring material, 1 inch (25 mm) diameter, minimum, with at least 5/8 (16 mm) vertical adjustment. Provide on movable tables, unless otherwise indicated.

L. Leveling devices: Provide each table leg with 3/8 inch (10 mm) minimum diameter leveling bolt and floor clip.

M. Leg shoes: Leg shoes shall be provided on all legs and table legs to conceal leveling devices, except for tables with casters. Shoes shall be 2 ½ (63 mm) inch high and of black rubber or pliable black vinyl material. Use of a leg shoe which does not conceal leveling device is not acceptable.

N. Casters: Where indicated on Laboratory Furnishing drawings, provide sets of 3 ½ inch (89 mm) diameter wheels with self-lubricating bearing, rated to carry 250 pounds (113 kg) minimum each. Each caster must swivel and have a locking brake. Wheel shall be of molded polyurethane tread mechanically locked to a polyolefin core.

   1. Material: Caster shall be heavy gauge stainless steel.
   2. Manufacturers:
      a. Acorn Industrial Products Co., 7 Union Hill Dr., W. Conshohocken, PA 19428 Tel: 800 523-5474.
      b. Caster Technology Corporation, 3265 Whipple Rd., Union City, CA 94587, Tel: 510 429-6727.
      d. Approved substitution.

O. Support Struts and Service Ledging: Refer to specifications for slotted channel framing in this Section.

2.5 LABORATORY WORK SURFACES

A. Epoxy Resin:
1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   a. Durcon Laboratory Tops, Inc., 206 Allison Drive, Taylor, TX 76574 Tel: 512 595-8000.
   b. Epoxyn Products, 500 E. 16th Street, Mountain Home, AR 72653 Tel: 870 425-4321.
   c. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
   d. Prime Industries, Inc., 2600 Warrenville Road, Suite 205, Downers Grove, IL 60515 Tel 630 725-9200
   e. Approved substitution.

2. Thickness:
   a. Typical work surface: 1 inch (25 mm).
   b. Fume hood work surfaces: Tops shall be 1¼ (32 mm) inches thick at outer edge, indented minimum ¼ inch (6 mm) to provide a raised rim around all exposed edges 1 inch (25 mm) wide, minimum, or as to allow for the fume hood sash. The front top edge of the raised rim and exposed vertical corners of the top shall be rounded or chamfered to a 1/8 inch (3 mm) radius. The juncture between the raised rim and the top surface shall be coved or chamfered to a ¼ inch (6 mm) radius.
   c. Curbs and Splashes: ¾ inch (19 mm).

3. Color:
   a. Black.
   b. Color sample to be approved by Architect before work is put in hand.

4. Description:
   a. Monolithic filled epoxy resin work surface consisting of a polymerized cast resin material oven-cured in molds.
   b. Drip Grooves: Provide under all work surface exposed edges, unless noted otherwise on the Laboratory Furnishing Drawings. Drip grooves shall be ½ inch (13 mm) from the front edge where the top overhangs 1 inch (25 mm) and ¼ inch (6 mm) from the edge where the edge overhangs ½ inch (13 mm).
   c. Edge profile: For all exposed upper edges and corners:
      1). Radius eased: ¼ inch (6 mm) machined radius with blended radius corners.
   d. Marine edges: Where indicated on the Laboratory Furnishing Drawings, shall be 1 inch (25 mm) wide and ¼ inch (6 mm) high with chamfered or radiused transition to and be an integral part of the work surface.
   e. Indented areas: Where indicated on the Laboratory Furnishing Drawings, shall be ¼ inch (6 mm) deep with chamfered or radiused sides. Internal and external corners shall have ¼ inch to ½ inch (6 to 13 mm) radius. Marine edges formed around indented areas shall not be less than 1 inch (25 mm) wide.
   f. Sink Mounting:
      1). Drop-in Sink Cutouts: Cutouts shall be profiled to provide support for the sink, and to ensure that the rim of the installed sink is 1/8 inch (3 mm) below the surrounding work surface level or bottom of drain grooves, if present. The top edge of the cutout shall have 1/8 inch (3 mm) bevel. Ensure that there shall be no gaps between the installed sink rim and work surface.
   g. Curbs and Splashes:
      1). Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
      2). Bonded to the surface of the top to form a square joint.
   h. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges. Seal exposed edges after cutting with a waterproofing material recommended by the manufacturer.
   i. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

5. Physical Properties:
   a. Chemical resistance:
1). Organic solvents: A cotton ball, saturated with the test chemical, is placed in a one ounce bottle with a reservoir of liquid above the ball. The container is inverted on the test material surface for a period of 24 hours. Test temperature: 23°C ±2°C.

2). Other test chemicals: Five drops (1/4 cc) of the test chemical are placed on the test material surface. The chemical is covered with a 1 inch diameter watch glass for a period of 24 hours. Test temperature: 23°C ±2°C.

3). Evaluation: After 24 hours exposure, exposed areas are washed with water, then a detergent solution, finally with naphtha, then rinsed with distilled water, dried with a cloth, and rated as follows:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect (No detectable change in the material surface.)</td>
</tr>
<tr>
<td>1</td>
<td>Excellent (Slight detectable change in color or gloss but no change in function or life of the surface.)</td>
</tr>
<tr>
<td>2</td>
<td>Good (A clearly discernable change in color or gloss but no significant impairment of surface life or function.)</td>
</tr>
<tr>
<td>3</td>
<td>Fair (Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.)</td>
</tr>
<tr>
<td>4</td>
<td>Failure (Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.)</td>
</tr>
</tbody>
</table>

4). Test results:

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<tr>
<th>Test chemical</th>
<th>Concentration</th>
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<th>Light gray</th>
<th>Beige</th>
</tr>
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<tr>
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Test chemical

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<th>Beige</th>
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<td>Ethylene dichloride</td>
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<td>Heptane</td>
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<td>Isooctane</td>
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<td>Kerosene</td>
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<tr>
<td>Methyl alcohol</td>
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<tr>
<td>Toluene</td>
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<td>0</td>
</tr>
<tr>
<td>Aniline</td>
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<td>0</td>
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<tr>
<td>Mineral oil</td>
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<td>0</td>
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<tr>
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<tr>
<td>Soap solution</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Transformer oil</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Turpentine</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

b. Heat resistance:
1. High temperature test: A porcelain crucible is heated to a dull red color, placed on the test material, and allowed to cool to ambient temperature. Result: No observable surface deformation.
2. Flame test: A 3/8 inch (10 mm) Bunsen burner is adjusted to a quiet flame with a 1½ inch (38 mm) inner cone, overturned on the test material, and allowed to stay for 5 minutes. Result: no observable surface deformation.

c. Physical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength</td>
<td>ASTM D695</td>
<td>31,400 psi (216 MPa)</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>ASTM D638</td>
<td>8,000 psi (55 MPa)</td>
</tr>
<tr>
<td>Flexural strength</td>
<td>ASTM D790</td>
<td>11,700 psi (81 MPa)</td>
</tr>
<tr>
<td>Rockwell hardness &quot;M&quot;</td>
<td>ASTM D785</td>
<td>105-110</td>
</tr>
<tr>
<td>Specific density</td>
<td>ASTM D792</td>
<td>122.4 lb/ft³ (1960 kg/m³)</td>
</tr>
<tr>
<td>Water absorption</td>
<td>ASTM D570</td>
<td>0.01%</td>
</tr>
<tr>
<td>Fire Resistance</td>
<td>ASTM D635</td>
<td>ATB (sec)=0</td>
</tr>
<tr>
<td>Heat deflection @ 264 psi</td>
<td>ASTM D648</td>
<td>205°F (172°C)</td>
</tr>
<tr>
<td>(1.82 MPa)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Static Dissipative High-Pressure Plastic Laminate Tops:

1. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   a. Nevamar Decorative Surfaces, 8339 Telegraph Road, Odenton MD 21113 Tel: 410 551-5000.
   b. Pionite Decorative Surfaces, One Pionite Road, Auburn, ME 04211 Tel: 800 746-6483.
   c. Approved substitution.

2. Type: Static dissipative laminate work surface and electrical grounding system installed to minimize the risk of static electricity damage to sensitive devices.

3. Substrate Thickness:
   a. Typical work surface: 1 inch (25 mm).
   b. Curbs and Splashes: ¾ inch (19 mm).

4. Color: To be selected by Architect.
5. Description:
a. High-pressure decorative laminate consisting of a resin formulation applied over the decorative surface paper. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Horizontal post-forming grade static dissipative plastic laminate sheet to NEMA LD 3-1995.

b. Finish: Fine beaded "crystal" texture to minimize smudges and finger marks, and to provide optimum scratch resistance.

c. Core material: Hardwood veneer-core plywood.
   1. Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.
   2. Thickness/Plies:
      a). ¾ inch (19 mm): minimum 7-ply.
      b). 1 inch (25 mm): minimum 9-ply.
   3. Physical Properties:
      a). Average modulus of rupture: 7346 psi (50.65 N/mm2).

d. Backing sheets: High-pressure phenolic meeting or exceeding NEMA Standard LD3-2005 Grade BKL.

e. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermosetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18°C) at a pressure no less than 15 pounds per square inch (103 kPa). Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.

f. Edging: Tops shall be edged with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65°C). Apply primer to substrate when recommended by adhesive manufacturer.

g. Flush mount insert grounding system: The work surface installation shall be provided with effective electrical grounding to ensure the safe dissipation of static electricity to ground. Coordinate with Division 26. Connection to the work surface laminate shall be of the flush surface. Projecting connectors and exposed terminals will not be accepted. Components shall include flat socket cap screw to secure brass insert, knurled brass insert to provide electrical connection, flat washer to provide flat surface for securing ring terminals, ring terminal to connect wire to flush mount insert, and nut to fasten flush mount insert together.

h. Personnel grounding system: Provide dual banana jack terminals, 10 feet (3 m) of 22 gauge wire, and 2 banana plug connections in front of work surface grounded to the flush mount insert system.


j. Electrical performance:
   1). Point to point resistance (per EOS/ESD–S4.1):
      2). 60% to 40% RH: 10^6 to 1 x 10^7 ohms.
      3). 40% to 20% RH: 10^7 to 1 x 10^8 ohms.
      4). 20% to 10% RH: 10^8 to 10^9 ohms.
   5). Point to ground resistance (per EOS/ESD–S4.1):
      6). 60% to 40% RH: 10^6 to 1 x 10^7 ohms.
      7). 40% to 20% RH: 10^7 to 1 x 10^8 ohms.
      8). 20% to 10% RH: 10^8 to 10^9 ohms.
   9). Volume resistance (measured face to back at 72°F (22.2°C), 100V with a LCD Megohmmeter, item No. 19770, NFPA Electrodes (2.5 inch (63 mm) diameter, 5 lb. (2.27 kg)):
      10). 60% to 30% RH: 10^6 to 1 x 10^8 ohms.
      11). 30% to 10% RH: 10^8 to 10^9 ohms.
   12). Static Decay (FTMS 101C, Method 4046 test):
      13). 50% RH: 0.01 sec.
      14). 10% RH: 0.02 sec.
k. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges.

l. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.

m. Curbs and Splashes:
   1. Height: 4 inches (100 mm), unless noted otherwise on Laboratory Furnishing Drawings.
   2. Fabricate similar to top with PVC edge band along exposed ends.
   3. Splash shall be set in a thin bead of silicone sealant to prevent moisture migration through the joint.

n. Physical Properties:
   2. Minimum Thickness: 0.036 inches ± 0.005 inches (0.9 mm ± 0.08 mm).
   3. Cleanability: 5 cycles (NEMA LD3 test method 3.4).
   6. Ball Impact Resistance: 35 inches (889 mm) (NEMA LD3 test method 3.8).
   8. Dimensional change:
   9. Machine direction: 0.40% (NEMA LD3 test method 3.11).
   10. Cross direction: 0.80% (NEMA LD3 test method 3.11).
   12. Appearance: No ABC defects.
   15. Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

<table>
<thead>
<tr>
<th>Stain</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water</td>
<td>1</td>
</tr>
<tr>
<td>50%/50% Ethyl alcohol</td>
<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>1</td>
</tr>
<tr>
<td>Household ammonia</td>
<td>1</td>
</tr>
<tr>
<td>10% Citric acid</td>
<td>1</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>1</td>
</tr>
<tr>
<td>Stain</td>
<td>Rating</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Fresh coffee</td>
<td>1</td>
</tr>
<tr>
<td>Fresh tea</td>
<td>1</td>
</tr>
<tr>
<td>Catsup</td>
<td>1</td>
</tr>
<tr>
<td>Yellow mustard</td>
<td>1</td>
</tr>
<tr>
<td>10% Povidone iodine</td>
<td>1</td>
</tr>
<tr>
<td>Black permanent marker</td>
<td>1</td>
</tr>
<tr>
<td>#2 pencil</td>
<td>1</td>
</tr>
<tr>
<td>Wax crayon</td>
<td>1</td>
</tr>
<tr>
<td>Black paste shoe polish</td>
<td>1</td>
</tr>
</tbody>
</table>

C. Stainless Steel: Refer to Stainless Steel Fabrications section of this specification.

D. Solid Laminated Wood Tops:

1. Edge grain maple laminations with edge grain exposed.
2. Thickness:
   a. 1¾ inch (44 mm)
3. Composed of solid hard maple strips 1¾ inches (44 mm) wide, glued with water-resistant resin under heavy pressure side to side and end to end.
4. Curbs and splashes to be ¾ inch (18mm) thick matching material, 4 inches (100mm) high.
5. Round top edges and corners. Plane and sand smooth all surfaces.
6. Provide full-length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
7. Finish:
   a. Finish with two coats of boiled linseed oil, well rubbed into all surfaces.
8. Manufacturers:
   a. Bally Block Co., P.O. Box 188, Bally, Pennsylvania 19503.
   b. Michigan Maple Block Co., P.O. Box 245, Petoskey, Michigan 49770.
   c. Approved equal.

E. Galvanized Steel: 24 gauge (0.6 mm thick) hot galvanized steel bonded to a solid core of suitable material. Completely cover top, sides and edges. All edges shall be flanged down the same dimension as adjacent non-metal tops with 1 inch (25 mm) being the minimum dimension and return a minimum of 1 inch (25 mm) on underside of top. Solder all corners, clean and remove all burrs and sharp edges for a smooth surface. Provide integral 4 inches (100 mm) high coved side and back splashes as required at all walls and vertical adjacent surfaces.

2.6 SHELVING ASSEMBLIES

A. High-Pressure Decorative (Plastic) Laminate Shelving:

1. Manufacturers/Facing material: Products complying with this specification may be provided by the following manufacturers.
   a. Nevamar Decorative Surfaces, One Nevamar Place, Hampton, SC 29924 Tel: 800 638-4380.
   b. Pionite Decorative Surfaces, One Pionite Road, P.O. Box 1014, Auburn, ME 04211 Tel: 800 746-6483.
   c. Wilsonart International, 2400 Wilson Place, P. O. Box 6110, Temple, TX 76503 Tel: 800 433-3222.
   d. Approved substitution (no known equal).
2. Approved Products:
   b. Pionite ChemGuard.
c. Wilsonart ChemSurf

3. Color: To be selected by Architect.

4. Description:
   a. High-pressure decorative laminate, meeting or exceeding NEMA Standard LD3 2005 Grade HGP, HGL, or HGS requirements, consisting of a resin formulation applied over the decorative surface paper to achieve chemical resistance. The decorative paper shall be treated with melamine resin, and the core shall consist of kraft papers impregnated with phenolic resin. Sheets shall be bonded under high temperature and pressure. Product shall be developed for casework, work surface, and shelving surfaces in laboratories.
   b. Laminate shall be applied to top and bottom surfaces.
   c. Finish: Fine pebble-grained “crystal” texture or matte texture with slight sheen to minimize smudges and finger marks, and to provide optimum scratch resistance.
      1). Gloss: 15-16 +/- 3 gloss units.
   d. Physical Properties:
      2). Minimum Thickness: 0.038 inches ± 0.005 inches (0.97 mm ± 0.13 mm).
      3). Cleanability: 10 cycles (NEMA LD3 test method 3.4).
      4). Boiling Water Resistance: No effect (NEMA LD3 test method 3.5).
      7). Ball Impact Resistance: 60 inches (1524 mm) (NEMA LD3 test method 3.8).
      9). Dimensional change:
         10). Machine direction: 0.50% (NEMA LD3 test method 3.11).
         11). Cross direction: 0.80% (NEMA LD3 test method 3.11).
         12). Wear resistance: 1,500 cycles, min. (black); 700 cycles, min. (other colors) (NEMA LD3 test method 3.13).
         14). Stain Resistance Performance Test Results: The surface shall show essentially no effect on Black (Lab grade) plastic laminate when left in contact for 16 hours either when reagents were kept covered or allowed to evaporate.

<table>
<thead>
<tr>
<th></th>
<th>No effect</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No detectable change in the material surface.</td>
<td>Slight detectable change in color or gloss but no change in function or life of the surface.</td>
<td>A clearly discernable change in color or gloss but no significant impairment of surface life or function.</td>
<td>Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.</td>
<td>Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.</td>
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## Acids

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<tr>
<td>Aqua regia</td>
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<tr>
<td>Chromic trioxide (Chromic acid cleaning solution)</td>
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<tr>
<td>Glacial acetic acid</td>
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<tr>
<td>Hydrochloric acid</td>
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<td>Hydrofluoric acid</td>
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<tr>
<td>Formic acid</td>
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<tr>
<td>Nitric acid</td>
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<tr>
<td>Sulfuric acid</td>
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<tr>
<td>Perchloric acid (concentrated)</td>
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<tr>
<td>Phosphoric acid</td>
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<td>Picric acid</td>
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<td>Tannic acid (saturated)</td>
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<td>Uric acid (saturated)</td>
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## Alkalis

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<td>Sodium hydroxide</td>
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<tr>
<td>Sodium sulfide</td>
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## Solvents

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</thead>
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</tr>
<tr>
<td>Amyl alcohol</td>
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</tr>
<tr>
<td>Butyl alcohol</td>
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</tr>
<tr>
<td>Carbon disulfide</td>
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</tr>
<tr>
<td>Carbon tetrachloride</td>
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<tr>
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<td>Dioxane</td>
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<td>EDTA</td>
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<td>Category</td>
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<tr>
<td><strong>Solvents</strong></td>
<td>Xylene</td>
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<tr>
<td><strong>General Reagents</strong></td>
<td>Alconox (lab detergent)</td>
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<tr>
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<tr>
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<td>Ammonium phosphate</td>
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<tr>
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<td>Aromatic ammonia</td>
</tr>
<tr>
<td></td>
<td>Benedicts solution</td>
</tr>
<tr>
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<td>Calcium hypochlorite (concentrated)</td>
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<tr>
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<td>Camphorated parachlorophenol</td>
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<tr>
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<td>Cellosolve</td>
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<td>Copper sulfate</td>
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<td>Ethylene glycol</td>
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<td>Eucalyptol</td>
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<td>Hydrogen peroxide</td>
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<td>Iodine</td>
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<tr>
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<td>Karl Fisher Reagent</td>
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<tr>
<td></td>
<td>Kerosene</td>
</tr>
<tr>
<td></td>
<td>Lactated ringers</td>
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<tr>
<td></td>
<td>Lysol</td>
</tr>
<tr>
<td></td>
<td>Methyl methacrylate</td>
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<td></td>
<td>Mineral Oil</td>
</tr>
<tr>
<td></td>
<td>Monsel's solution (Ferric subsulfate)</td>
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<tr>
<td></td>
<td>Naphtha</td>
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<tr>
<td></td>
<td>Petroleum jelly</td>
</tr>
<tr>
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<td>Phosphate buffered saline (PBS)</td>
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<tr>
<td></td>
<td>Pine oil</td>
</tr>
<tr>
<td></td>
<td>Potassium permanganate</td>
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<tr>
<td></td>
<td>Povidone iodine</td>
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<tr>
<td></td>
<td>Procaine</td>
</tr>
<tr>
<td></td>
<td>Quaternary ammonia compounds</td>
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<tr>
<td></td>
<td>Silver nitrate</td>
</tr>
<tr>
<td></td>
<td>Sodium azide</td>
</tr>
<tr>
<td></td>
<td>Sodium chromate</td>
</tr>
<tr>
<td></td>
<td>Sodium hypochlorite</td>
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<tr>
<td></td>
<td>Sodium thiocyanate</td>
</tr>
<tr>
<td></td>
<td>Sucrose</td>
</tr>
<tr>
<td></td>
<td>Thymol &amp; Alcohol</td>
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<td>Tincture of Iodine</td>
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<td></td>
<td>Tincture of Mercurochrome</td>
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<td>Tincture of Merthiolate</td>
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<td>Trisodium phosphate</td>
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<td></td>
<td>Urea</td>
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<td>Vegetable oils</td>
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<td>Water</td>
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<td></td>
<td>Zinc chloride</td>
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<tr>
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<td>Zinc oxide ointment</td>
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<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stains and Indicators</strong></td>
<td>Ag Eosin Bluish 5% in Alcohol</td>
<td>0</td>
</tr>
</tbody>
</table>
Stains and Indicators

Bromothymol Blue 0
Cresol Red 0
Crystal Violet 0
Gentian Violet 1%
Gram Stains 0
Malachite Green 0
Methyl Orange 0
Methyl Red 0
Methylene Blue 0
Nigrosine 0
Safranin O 0
Sudan III 0
Thymol Blue 0
Wright's Blood Stain 0

5. Plastic laminate adhesive: High-pressure decorative laminate shall be bonded to core with thermostsetting resorcinol or phenol-resorcinol adhesive, or as recommended by the manufacturer for the application, at temperature above 65°F (18.3°C) at a pressure no less than 15 pounds per square inch. Laminate core is not to exceed 10% moisture content and is to be laminated and cured in a controlled environment between 45% and 60% RH.

6. Core material: Hardwood Veneer Plywood.
   a. Description: A one step calibrated core +/- .5mm (to avoid voids) with type 1 waterproof nauf glue. Grade 2 face, and back of mill choice plywood veneer.
   b. Thickness/Plies:
      1. 1 inch (25 mm): minimum 9-ply.
   c. Physical Properties:
      1. Average modulus of rupture: 7346 psi (50.65 N/mm²).
      2. Face Screw Holding Strength: 355 lbf (1579 N).

7. Edging:
   a. Unless otherwise indicated, all edges shall be edgebanded with 3 mm PVC edge banding set in hot melt adhesive. Adhesive shall have a minimum softening point of 150°F (65.6°C). Apply primer to substrate when recommended by adhesive manufacturer. Contact cement is not acceptable. Color of edgebanding to be selected by the Architect.
   b. Safety Edges:
      1. Types:
         a). Retainer Rail: ¼ inch (6 mm) diameter stainless steel retainer rail, as indicated on the drawings.
         2). Refer to the description of each system below for locations of each type.

B. Adjustable Wall Shelves:

1. Shelving: High-Pressure Decorative Laminate shelving as specified above.
2. Double Slot Shelf Standards:
   a. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
      1). Knape & Vogt Manufacturing Company, 2700 Oak Industrial Drive NE, Grand Rapids, MI 49505 Tel: 616 459-3311.
      2). Approved substitution.
   b. Basis of Design: Knape & Vogt 85 ANO series uprights, or equal. Length as indicated on the drawings.
3. Shelf Brackets: 16 gauge (1.6 mm) bookend type, as detailed on drawings.
4. Safety edging:
   a. Retainer rail.
5. Load capacity: System shall support a minimum of 35 pounds per square foot applied at all shelves simultaneously. Maximum deflection shall be 0.35 inches (9mm) under load.
6. Finish: Factory finish standards and brackets with epoxy powder coating. Color to be selected by the Architect.

2.7 OVERHEAD SERVICE CARRIERS

A. Materials:
   1. Support Framing: Slotted channel framing as specified elsewhere on this Section.
   2. Brake-formed metal: 16 gauge (1.6 mm) galvanized steel with epoxy powder-coated finish.

B. Fabrication: Fabricate and assemble components as detailed on the drawings.

C. Coordination: Carefully coordinate location of supports with the work of other Sections.

D. Finish: As specified for slotted channel framing. Color shall be selected by the Architect.

2.8 CABLE TRAY SYSTEM

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
   1. Chalfant Cable Trays, 11525 Madison Avenue, Cleveland, OH 44102 Tel: 216 521-7922.
   2. Approved substitution. No known equal

B. Provide a Cable Tray system, complete with straight and curved sections, fittings, connectors, hardware and miscellaneous devices required for a complete installation.

C. Cable Tray shall be suspended from Overhead Service Carrier specified above and located in laboratories as shown on the Laboratory Furnishings Drawings.

D. Construction shall be Trough Type extruded aluminum 6063-T6 alloy. Maximum spacing between transverse members shall be 4 inches (102 mm) measured parallel to side members. Cable bearing members shall be a minimum of 1 inch (25 mm) and shall be welded to side rail to insure integrity of the ground fault path.

E. Material shall be extruded Anodized Aluminum Alloy Type 6063-T6, NEMA VE-1 Class 12B.

F. Cable Tray shall be 12 inches (305 mm) wide except as otherwise noted. Side rails shall be 4 inches (102 mm) high. Curved section radius shall be 12 inches (305 mm).

G. Connectors: High pressure, rigid type connectors attached by ribbed neck hardened steel screws and locking type nut which does not require a washer. Hardware shall be cadmium plated. Ribbed neck portion of screw shall prevent screw from rotating during tightening of nut.

H. Grounding Continuity: Cable tray systems and all components shall be provided and installed per their listings and per manufacturer's instructions so that the completed system is electrically continuous and provides an approved equipment grounding path in accordance with NEC Article 392. Where cable tray components are not mechanically and electrically continuous, the system shall be provided with approved bonding jumpers and connections in accordance with NEC Article # 392 and Article # 250.96. Where bonding jumpers are utilized they shall be a minimum of #2 AWG copper with suitable, listed fittings. All system testing shall be in accordance with NEMA requirements.
I. Install all cable tray and support systems components in accordance with NEMA VE-1, applicable code requirements and with manufacturer's written instructions.

J. Vertically support at each end of run, at all turns, branches and connection point, and at intervals not to exceed ten feet maximum.

K. Use expansion fittings and connectors at all locations requiring movement.

L. Install warning signs at nominal intervals at 20 feet (6 m), visible from below.

M. Warning Signs: Provide engraved nameplates, using 1/2 inch (12.7 mm) high black letters on yellow background with the following warning label:

   WARNING --- MECHANICAL SUPPORT FOR CABLES & RACEWAY ONLY. DO NOT USE AS A WALKWAY, LADDER OR SUPPORT.

N. Listings:
   1. National Electrical Code, currently enforced edition, including all State and local amendments applicable to this project.
   2. ASTM A123 and ASTM A525.
   3. NEMA VE-1: Metallic Cable Tray Systems.
   4. Underwriters Laboratories: All tray systems shall be UL listed as an assembly.

O. Refer to Laboratory Furnishings Drawings for locations and details.

2.9 PIPE DROP ENCLOSURE / SHROUD

A. Fabricate pipe drop enclosures from minimum 18 gauge (1.3 mm thick) galvanized steel, per details shown on the Laboratory Furnishing drawings, except as noted.

1. Pipe drop enclosures at the following locations shall be fabricated of 18 gauge, Type 304 stainless steel with a #4 finish:
   a. At scullery sinks.
   b. At stainless steel counters.

B. Seal all joints between dissimilar metals and at all panel seams with clear silicone sealant.

C. Materials and finish shall be as specified under Metals Fabrications in this Section.

2.10 WELDING SCREEN

A. Curtain Material and Fabrication:

   1. Fire retardant, capable of withstanding heat to 900°F.
   2. Hemmed with grommets at 12 inches on center all four sides.
   3. Color: Yellow

B. Curtain Frame:

   1. 1 inch tube steel with flange anchors both ends.
   2. Provide snap locks, curtain ties, and steel rings as required.
2.11 **FINISH FOR MISCELLANEOUS WOOD ITEMS**

A. **Applicability:** This section applies to wood fabrications, including, but not limited to, wood laboratory tables, wood-framed balance tables, wood-framed pegboards, and wood filler panels.

B. **Finish:**

1. Manufacturer may use either of the following finish systems:
   a. Customized, high-solids, cross-linked, ultraviolet light (UV)-cured coating developed for durability, including abrasion, chemical, impact, and scratch resistance, for flat-line applications. Coatings shall have little or no VOCs. Chemical-resistant modified acrylic urethane finish with built-in UV blocker, or equal, applied over permanent wood stain.

2. **Stain Color:**
   a. To be selected by Architect from manufacturer's full published color range.

3. **Application:**
   a. Finish application and sequence shall be as recommended and designed by the manufacturer for a high quality, laboratory-grade wood casework finish.
   b. Preparation: Sand exposed surfaces smooth, free from dirt and defects.
   c. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.
   d. Finish application: Apply top finish to all stained surfaces. Finished surfaces shall be even, water-clear and bright. Cloudy or muddy finishes carrying tinting pigments will not be acceptable.
   e. Stain Color:
      1). To be selected by Architect from manufacturer’s full published color range.

C. **Wood Finish Chemical Resistance Performance Requirements:**

1. Manufacturer shall submit wood finish chemical resistance performance test results. Testing to be performed by independent testing agency.
2. **Procedure:** Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity or the currently accepted guideline set by ASTM. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the panel for a period of one hour. Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73º +/- 3ºF (23º +/- 2ºC) and 50 +/- 5% relative humidity, or the currently accepted guideline set by ASTM.
   a. Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the panel.
   b. Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, concave side down.
3. **Rating System:** Evaluations shall use the following rating system:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No detectable change.</td>
</tr>
<tr>
<td>1</td>
<td>Slight change in color or gloss.</td>
</tr>
<tr>
<td>2</td>
<td>Slight surface etching or severe staining.</td>
</tr>
<tr>
<td>3</td>
<td>Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.</td>
</tr>
</tbody>
</table>

4. **Acceptance Level:**
   a. Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.
   b. There shall be no more than four (4) Level 3 conditions.
5. **Table of reagents:**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>Test No.</td>
<td>Chemical Reagent</td>
<td>Test Method</td>
<td>Range</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>2.</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>3.</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>4.</td>
<td>Acetone</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>6.</td>
<td>Alcohol, Butyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>7.</td>
<td>Alcohol, Ethyl</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>Alcohol, Methyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>9.</td>
<td>Ammonium Hydroxide, 28%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>10.</td>
<td>Benzene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>11.</td>
<td>Carbon Tetrachloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>12.</td>
<td>Chloroform</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>13.</td>
<td>Chromic Acid, 60%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>14.</td>
<td>Cresol</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>15.</td>
<td>Dichloroacetic Acid</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>16.</td>
<td>Dimethylformamide</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>17.</td>
<td>Dioxane</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>18.</td>
<td>Ethyl Ether</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>19.</td>
<td>Formaldehyde, 37%</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>20.</td>
<td>Formic Acid, 90%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>21.</td>
<td>Furfural</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>22.</td>
<td>Gasoline</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>23.</td>
<td>Hydrofluoric Acid, 37%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>24.</td>
<td>Hydrofluoric Acid, 48%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>25.</td>
<td>Hydrogen Peroxide, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>26.</td>
<td>Iodine, Tincture of</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>27.</td>
<td>Methyl Ethyl Ketone</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>28.</td>
<td>Methylene Chloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>29.</td>
<td>Monochlorobenzene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>30.</td>
<td>Naphthalene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>31.</td>
<td>Nitric Acid, 20%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>32.</td>
<td>Nitric Acid, 30%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>33.</td>
<td>Nitric Acid, 70%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>34.</td>
<td>Phenol, 90%</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>35.</td>
<td>Phosphoric Acid, 85%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>36.</td>
<td>Silver Nitrate Saturated</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>37.</td>
<td>Sodium Hydroxide 10%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>38.</td>
<td>Sodium Hydroxide 20%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>39.</td>
<td>Sodium Hydroxide 40%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td></td>
<td>70% equal parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>49.</td>
<td>Zinc Chloride, Saturated</td>
<td>B</td>
<td>0</td>
</tr>
</tbody>
</table>
2.12 METAL FABRICATIONS

A. Applicability: This section applies to metal fabrications, including, but not limited to, pipe drop enclosures, shelving support systems, metal-framed laboratory tables, cylinder racks, and other miscellaneous brake-formed and shop fabricated components and trim, such as required for overhead service carriers.

B. Materials:

1. Steel: Cold-rolled furniture stock sheet steel, prime grade, roller leveled.
   a. Steel shall be treated at the mill to be free of scale, ragged edges, deep scratches, or other injurious effects.
   b. All gauges indicated are to be U.S. standard.

C. Finish Requirements:

1. Paint finish for steel laboratory products shall utilize a dry coating process with minimal waste generation. Liquid-applied coatings shall not be acceptable. Manufacturer shall supply documentation that waste generated during the painting process, is a solid, non-hazardous material.
   a. Pretreatment: Finish process shall incorporate a phosphate conversion coating during the pretreatment/cleaning operation.
   b. Operator Protection: The painting process shall be cleanly contained, have no solvent odor and be performed in an air-conditioned room.
   c. VOC (Volatile Organic Compounds) emissions shall not exceed 0.29 lbs per gallon (35 g/L).
   d. Offgasing: No further emissions or “Offgasing/Decomposition” vapors shall occur at room temperature from installed finished parts.

2. Preparation: After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be clean and properly prepared to provide optimum adhesion of finish and resistance to corrosion.

3. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.

4. All drawer bodies to be finished in matching color.
5. Concealed interior parts shall receive corrosion-resistant treatment.
6. Finish must be UV stable.
7. Color: As selected by the Architect.

D. Finish Performance Requirements:

1. Manufacturer shall submit metal finish performance testing results. Testing to be performed by independent testing agency.
2. Chemical Resistance:
a. Test procedure: Place samples on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73± 3°F (23°C± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM. Test the samples for chemical resistance using forty-nine different chemical reagents by one of the following methods. For both methods, leave the reagents on the sample for a period of one hour. Wash off the sample with water, clean with detergent and naptha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73± 3°F (23°C± 2°C) and 50± 5% relative humidity, or the currently accepted guideline set by ASTM

1). Method A: Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a 1-oz. (29.574cc) bottle and inverting the bottle on the surface of the sample. The cotton ball shall remain in contact with the sample for the duration of the test.

2). Method B: Test non-volatile chemicals by placing five drops of the reagent on the surface of the sample and covering with a 24mm watch glass, convex side down.

b. Rating System: Evaluations shall use the following rating system:

- Level 0: No detectable change.
- Level 1: Slight change in color or gloss.
- Level 2: Slight surface etching or severe staining.
- Level 3: Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

c. Acceptance Level:

1). Individual test results for the specified 49 reagents shall be within the Range for that reagent as specified on the table below.

2). There shall be no more than four (4) Level 3 conditions.

d. Table of reagents:

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<tr>
<th>Test No.</th>
<th>Chemical Reagent</th>
<th>Test Method</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetate, Amyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>2</td>
<td>Acetate, Ethyl</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>3</td>
<td>Acetic Acid, 98%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>4</td>
<td>Acetone</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>5</td>
<td>Acid Dichromate, 5%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>6</td>
<td>Alcohol, Butyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>7</td>
<td>Alcohol, Ethyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>8</td>
<td>Alcohol, Methyl</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>9</td>
<td>Ammonium Hydroxide, 28%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>Benzene</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>11</td>
<td>Carbon Tetrachloride</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>12</td>
<td>Chloroform</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>13</td>
<td>Chromic Acid, 60%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>14</td>
<td>Cresol</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>15</td>
<td>Dichloroacetic Acid</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>16</td>
<td>Dimethylformamide</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>17</td>
<td>Dioxane</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>18</td>
<td>Ethyl Ether</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>19</td>
<td>Formaldehyde, 37%</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>20</td>
<td>Fomric Acid, 90%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>21</td>
<td>Furfural</td>
<td>A</td>
<td>0-3</td>
</tr>
<tr>
<td>22</td>
<td>Gasoline</td>
<td>A</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>Hydrofluoric Acid, 37%</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>24</td>
<td>Hydrofluoric Acid, 48%</td>
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<td>0-3</td>
</tr>
<tr>
<td>25</td>
<td>Hydrogen Peroxide, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>26</td>
<td>Iodine, Tincture of</td>
<td>B</td>
<td>0-2</td>
</tr>
<tr>
<td>27</td>
<td>Methyl Ethyl Ketone</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>28</td>
<td>Methylene Chloride</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>Test No.</td>
<td>Chemical Reagent</td>
<td>Test Method</td>
<td>Range</td>
</tr>
<tr>
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<td>-----------------------------------------------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>29.</td>
<td>Monochlorobenzene</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>30.</td>
<td>Naphthalene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>31.</td>
<td>Nitric Acid, 20%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>32.</td>
<td>Nitric Acid, 30%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>33.</td>
<td>Nitric Acid, 70%</td>
<td>B</td>
<td>0-3</td>
</tr>
<tr>
<td>34.</td>
<td>Phenol, 90%</td>
<td>A</td>
<td>0-2</td>
</tr>
<tr>
<td>35.</td>
<td>Phosphoric Acid, 85%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>36.</td>
<td>Silver Nitrate Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>37.</td>
<td>Sodium Hydroxide 10%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>38.</td>
<td>Sodium Hydroxide 20%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>39.</td>
<td>Sodium Hydroxide 40%</td>
<td>B</td>
<td>0-1</td>
</tr>
<tr>
<td>40.</td>
<td>Sodium Hydroxide Flake</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>41.</td>
<td>Sodium Sulfide Saturated</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>42.</td>
<td>Sulfuric Acid, 33%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>43.</td>
<td>Sulfuric Acid, 77%</td>
<td>B</td>
<td>0</td>
</tr>
<tr>
<td>44.</td>
<td>Sulfuric Acid, 96%</td>
<td>B</td>
<td>2-3</td>
</tr>
<tr>
<td>45.</td>
<td>Sulfuric Acid 77% &amp; Nitric Acid, 70% equal parts</td>
<td>B</td>
<td>1-3</td>
</tr>
<tr>
<td>46.</td>
<td>Toluene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>47.</td>
<td>Trichloroethylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>48.</td>
<td>Xylene</td>
<td>A</td>
<td>0-1</td>
</tr>
<tr>
<td>49.</td>
<td>Zinc Chloride, Saturated</td>
<td>B</td>
<td>0</td>
</tr>
</tbody>
</table>

3. **Hot Water Test**
   a. Test Procedure: 190°F to 205°F (88°C to 96°C) hot water shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.5 cc) per minute) on the finished surface, which shall be set at an angle of 45°, for a period of 5 minutes.
   b. Acceptance Level: After cooling and wiping dry, the finish shall show no visible effect from the hot water.

4. **Paint Adhesion on Steel Test**
   a. Test Procedure: Test shall be based on ASTM D2197-86 "Standard Method of Test for Adhesion of Organic Coating." Two sets of eleven parallel lines 1/16 inch (1.587 mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid to 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. Brush surface lightly with a soft brush for one minute. Examine under 100 fc (1076 lux) of illumination.
   b. Acceptance Level: Ninety or more of the squares shall show finish intact.

5. **Impact Test**
   a. Test Procedure: Drop a 1 lb (0.4536 kg) ball (approximately 2 inch (50.8 mm) diameter from a distance of 12 inches (305 mm) onto a flat horizontal surface, coated to manufacturer's standard manufacturing method.
   b. Acceptance Level: No visual evidence to the naked eye of cracks in the finish due to impact.

6. **Paint Hardness on Steel Test**
   a. Test Procedure: Paint film shall be tested with pencils of various hardnesses. Pencils shall have a wide, sharp edge. Pencils shall be pushed across surface in a chisel-like manner.
   b. Acceptance Level: Finish film shall not rupture from a sharpened 4H pencil.

2.13 **STAINLESS STEEL FABRICATIONS**

A. Applicability: This section applies to stainless steel fabrications, including, but not limited to, work surfaces, sinks, and other miscellaneous brake-formed and shop fabricated stainless steel components and trim as shown on the drawings.
B. Manufacturers:
   1. Inter Dyne Systems, Inc., 676 Ellis Road, Norton Shores, MI 49441 Tel: 231 799-8760.
   3. Approved substitution.

C. Materials and Finishes:
   1. Unless otherwise noted stainless steel shall be Type 304 and shall be of gauge indicated on Laboratory Furnishing drawings or this specification.
   2. All fabrications shall have exposed surfaces ground and polished to a Number 4 satin finish.
   3. All stainless steel nuts, screws, bolts, and rivets, etc., shall be of the same type stainless as in the sheet material and shall have a tumbled finish closely resembling that of a Number 4 finish.
   4. All stainless steel welding material shall be of type similar to the sheet material or a richer quality. All welds shall be made without discoloration and shall be ground, polished, and passivated to blend harmoniously with a Number 4 satin finish. All joints in stainless steel tops and work surfaces shall be welded.

D. Work Surfaces:
   1. Thickness: 16 gauge (1.6 mm).
   2. Fabrication:
      a. Edges: Flanged down the same dimension as the adjacent non-stainless top, with 1 inch (25 mm) being a minimum and returned over a perimeter metal frame to simplify securing top material to cabinet or structural frame.
      b. Reinforcement: Under-surface shall be reinforced with full length 16 gauge (1.6 mm) structural metal channels as required to insure rigidity and prevent buckling, warping, or oil canning. Where bench-mounted fittings are indicated on the drawings, provide top reinforcement to allow for rigid, secure mounting of fittings.
      c. Undercoating: Underside of top shall have a heavy mastic agent coating providing sound deadening.
      d. Stainless steel sides and back-splashes, where indicated, shall be integrally welded to top and finish as indicated above. The back side of exposed backsplashes shall be finished to match front and sides.
      e. Provide all holes and cutouts as required for built-in equipment and mechanical and electrical service fixtures. Verify size of opening with actual size of equipment to be used prior to making openings. Form inside corners to a radius of not less than 1/8 inch (3 mm). After sawing, rout and file cutouts to ensure smooth, crack-free edges with no burrs.
   3. Tops with Sinks: Tops and sinks shall be integral, fabricated with a marine edge and shall be pitched to sink bowl for proper drainage. Marine edges shall be seamless die-formed.
   4. Flat Stainless Steel Work Surfaces: (Without marine edge or sink) shall have an integrally coved back splash and bull-nose at front of work surface.
   5. Wall-Supported Benchtop
      a. Benchtops shall be fabricated as per construction section of this specification with stainless steel wall support and bracket angles all as per Laboratory Furnishings Drawings.
      b. Unit shall be designed to support 200 pounds per square foot, completely wall supported with no legs or support members extending to the floor.
   6. Joints: Fabricate work surfaces in the largest sections practical for delivery to the job site. All joints shall be field-welded, ground smooth, and polished on-site to create a continuous work surface.

E. Laboratory Sink: Integral one piece construction with stainless steel work surface.
   1. Thickness: 18 gauge (1.3 mm thick), unless otherwise noted.
2. Construction: Sink units shall be designed and fabricated with sufficient reinforcement to prevent oil canning. All sink joints shall be butt-welded, ground smooth by the heliarc welding process. Inside radii shall be 1 inch (25 mm). Bottoms shall be pitched to the drain indent. No soldering will be permitted in connection with sink construction. Sink bowl dimensions given are inside dimensions. Underside shall have a heavy mastic agent coating providing sound deadening.

2.14 SLOTTED CHANNEL FRAMING

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Unistrut, 35660 Clinton Street, Wayne, MI 48184 Tel: 800 521-7730.
3. Kumar Industries (Nu-Strut), 4881 Chino Ave., Chino, CA 91710 Tel: 909 591-0722.
4. Cooper B-Line Inc. (B-Line), 509 West Monroe St., Highland, IL 62249 Tel: 618 654-2184.
5. Approved substitution.

B. Materials: Channel and framing members shall be fabricated from steel conforming to the following requirements:

1. Framing Members:
   b. Exposed Framing Members and Fittings: ASTM A446 GR A with zinc coating conforming to ASTM A525.
   c. Stainless Steel Framing Members and Fittings: ASTM A240 (Type 304), where indicated.

2. Fittings:
   a. Concealed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307.
   b. Exposed Fittings: Fabricate from steel satisfying the requirements of ASTM A570 GR 33, and conform to the following ASTM specifications: A575, A576, A36, or A635. Nuts shall conform to ASTM A576 GR 1015 and screws shall conform to SAE J429 GR 2 and ASTM A307. Exposed fittings shall receive zinc coating conforming to ASTM A525.
   c. Stainless Steel Fittings and Hardware: Sintered Nuts shall be of ASTM B783 (Type 316N2-33) stainless steel and fittings shall be of ASTM A240 (Type 304) stainless steel. Stainless steel fittings and hardware shall be used with stainless steel framing members, or where indicated.

3. Thickness: 12 gauge, unless noted otherwise.
4. Size: 1 5/8 inch x 1 5/8 inch cross-section, unless noted otherwise.

C. Components:

1. The following components shall be provided, unless otherwise noted:
   b. Suspended Framing Channel, 3 ¼ inch x 1 5/8 inch x 12 gauge: Unistrut P5000, Powerstrut PS 100, Kumar Industries N-150, B-Line Systems, Inc. B11, or equal.
   c. 90° Angle Fitting: 4 1/8 inch x 3½ inch x ¼ inch with two holes, each leg: Unistrut P1325, Powerstrut PS 607, Kumar Industries N-1123, B-Line Systems, Inc. B104, or equal.
   d. 135° Angle Fitting: 3 inch x 2 5/16 inch x ¼ inch with one hole, each leg: Unistrut P1546, Powerstrut PS 633-45°, Kumar Industries N-1425, B-Line Systems, Inc. B154, or equal.
e. T-Shaped Flat Plate Fitting: 5 3/8 inch x 3 ½ inch x ¼ inch plate, T-shaped, with four holes: Unistrut P1031, Powerstrut PS 714, Kumar Industries N-1022, B-Line Systems, Inc. B133, or equal.

f. Wing Shape Fitting, 9 5/32 inch x 3 7/8 inch ten holes, two holes in each wing section and two holes in each of three channel section sides: Unistrut P2347, Powerstrut PS 913, B-Line Systems, Inc. B273.

g. Vertical Posts: 3 ¼ inch x 1 5/8 inch x 12 gauge, double channel section: Unistrut P1001, Powerstrut PS 200 2T3, Kumar Industries N-200-A, B-Line Systems, Inc. B22A, or equal.


i. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge framing channel with 13/32 inch x 3 inch slotted holes, 4 inches on center: Unistrut P1000 SL, Powerstrut P 200 S, Kumar Industries N-200-SL, B-Line Systems, Inc. B22S.

j. Slotted Framing Channel for installation in Chemical Fume Hoods, 1 5/8 inch x 13/16 inch x 16 gauge Type 316 stainless steel framing channel: Unistrut P4000 SS, Powerstrut PS 560 SS, Kumar Industries, B-Line Systems, Inc.

k. Attach channel to side of fume hood with 2 5/8 inch x 1 7/8 inch x 1/8 inch, 4 hole, stainless steel 90° fitting: Unistrut P6325 SS, Powerstrut, Kumar Industries, B-Line Systems, Inc.

l. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

m. Slotted Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

n. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

o. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

p. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

q. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

r. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

s. Slotted Hole Framing Channel, 1 5/8 inch x 1 5/8 inch x 12 gauge: Unistrut P100, Powerstrut PS 200, Kumar Industries N-200, B-Line Systems, Inc. B22, or equal.

2. Service Struts and Ledging:

a. 16 gauge, 13/16 inch x 1 5/8 inch cold-formed framing uprights: Unistrut P4000, Powerstrut PS 560, Kumar Industries N-400, B-Line Systems, Inc. B56, or equal. Uprights shall be provided at 48 inches, maximum, and fastened top and bottom by two adjustable U-shaped spreaders.

b. U-shaped spreaders: 12 gauge by 1½ inch (45 mm) wide by length required, galvanized steel.

c. Locations:

1). Provide to support tops at pipe service chase space, support drain troughs, under fume hood superstructures, and other abnormal loads.

2). Support struts with U-shaped spreaders shall be provided at 48 inches (1220 mm) on center below island and peninsula benches, as indicated on drawings. Support struts shall be provided along wall 48 inches (1220 mm) on center below island and peninsula benches. Struts will be used to support piped and electrical services installed under Divisions 22, 26, and 27. Provide all bolts, expansion sleeves, and fastening devices for a complete assembly. Pipe and conduit hangers shall be provided by Division 22, 26, and 27 installers.

3. Cylinder and Dewar Restraint:

a. Swivel Hanger: 1 ¾ inch long by 3/8 inch diameter link welded to threaded stud; provide two per cylinder: Unistrut P5000

4. Overhead Support Carrier
a. Exposed horizontal support members for user attachment, 3¼ inch x 1 5/8 inch x ¼ inch framing channel: Unistrut P5000, Powerstrut P 100, Kumar Industries N-150, B-Line Systems, Inc. B11.

5. Finish:
   a. Provide finish coating for all cold-formed framing components, except for stainless steel components.
   b. Concealed Framing Members and Fittings: Rust inhibiting acrylic enamel paint applied by electrostatic deposition, after cleaning and phosphating, and thoroughly baked. Finish shall withstand a minimum of 400 hours salt spray when tested in accordance with ASTM B117. Color: Green.
   c. Exposed Framing Members and Fittings: Factory applied epoxy powder coat. Color: To be selected by the Architect.

2.15 SEALANT

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers.
   1. Dow Corning Corporation, P.O. Box 994, Midland, MI 48686 Tel: 989 496-7881.
   3. Approved substitution.

B. Basis of Design: Dow Corning 732 Multi-Purpose Sealant, GE Silicones RTV 100 Series, or equal.

C. Characteristics:
   1. Type: One-part silicone rubber, MIL-A-46106.
   3. Cure: Cures at room temperature on exposure to water vapor in the air.
   4. Authorizations:
      a. FDA Regulation No. 21 CFR 177.2600.
      b. USDA Rating P1.
      c. NSF Rating C2.
      d. UL 150 C Rating, File No. E40195(N).

5. Properties:
   a. Tack Free Time: 45 minutes, maximum.
   c. Tensile Strength: 220 pounds per square inch, minimum.
   d. Elongation: 350 percent, minimum.
   e. Extrusion Rate: 220 to 525 grams per minute.

PART 3 EXECUTION

3.1 SITE CONDITIONS

A. Inspection:
   1. Prior to installation of the work of this Section, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.
   2. Verify that all work may be installed in complete accordance with the original design, reviewed submittals, and the manufacturer’s recommendations.
B. Discrepancy: In the event of discrepancy, immediately notify the Architect.

C. Flooring: Casework will typically be installed on top of finished flooring. Coordinate sequencing, protection, and installation requirements with the contractor to prevent damage of flooring.

3.2 INSTALLATION

A. Coordinate work with any Owner furnished and/or installed components indicated on drawings.

B. General: Assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining units to a tolerance of 1/16 inch (1.5 mm).

C. Cabinets:

1. Install cabinets to create a plumb, level, true and straight installation.
2. Installation of metal and stainless-steel casework fixed cabinets shall utilize the internal leveling devices. Do not use shims.
3. Installation of wood casework shall be performed using shims. Shimming shall be minimized as much as possible, yet be sufficient to achieve a level and plumb condition.
4. Installation shall maintain the required height of countertops. ADA-height countertops shall not vary more than ¼ inch from the heights off the finish floor as indicated.
5. Where floor conditions require shimming or leveling of more than ¾ inch at any point, do not install casework in those locations. Notify the contractor and design team that remedial measures will be required to bring the floors closer to a level situation.
6. Securely fasten wall units to solid supporting material, not plaster, lath, or wallboard. Anchor, adjust, and align wall cabinets as specified for base cabinets. Verify that all required backing and reinforcement necessary to support wall-mounted units is in place, secure, and accurately located.

D. Installation materials:

1. Installation of wood, plastic laminate, and solid phenolic casework may involve the use of shims, spacers, cleats, straps and other such items of either metal or wood composition.
2. Installation of metal casework shall use spacers, cleats, and straps of galvanized steel, epoxy-coated steel, or stainless steel. No wood materials of any sort shall be part of the permanent installation of metal casework.
3. Installation of stainless-steel casework, counters, and scullery sinks shall use spacers, cleats, and straps of stainless steel of the stainless steel type specified for the casework construction. No wood or carbon steel materials of any sort shall be part of the permanent installation of stainless steel casework.
4. Installation of polypropylene casework shall use shims, spacers, cleats, straps, and other such items of polypropylene construction only. No wood or metal materials shall be part of the permanent installation of polypropylene casework.

E. Laboratory Tops:

1. Scribe tops as necessary for close and accurate fit.
2. Field Joints: Factory-prepared and identical to factory joints, locate only where indicated on approved Shop Drawings. Field processing of top and edge surfaces is not acceptable, except as described by manufacturer in approved Submittal Data. Provide full length, one-piece tops and backsplashes wherever possible, and keep field joints to an absolute minimum.
3. Abut top and edge surface in one true plane, with internal supports placed to prevent any deflection. Joints in top units shall be flush and the narrowest for the respective materials of construction. Cement joint in accordance with the manufacturers’ specifications.
4. All joints in stainless steel work surfaces shall be field-welded, ground smooth, and polished on-site to create a continuous work surface.

F. Sealant:
1. Caulk edges of tops, backsplashes and side splashes to adjacent wall surface with silicone sealant.

3.3 DESTRUCTIVE TESTING

A. The Owner, Architect, and/or Contractor may, at their own cost, elect to perform destructive testing on casework cabinet components (such as fronts, sides, etc.) to confirm compliance with the requirements of this specification. The casework manufacturer/installer should account for the de-installation, repair, and reinstallation, or replacement of one cabinet that may be selected for destructive testing.

3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect at no additional cost to the Owner.
B. Clean finished units, touch up as required, and remove and refinish damaged or soiled areas.
C. Cover tops with kraft paper or polyethylene sheeting after installation for protection against scratching, soiling, and deterioration during remainder of construction period. Remove protection prior to final cleaning.
D. Clean counter tops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

END OF SECTION 11 53 10
SECTION 11 53 13 - FUME HOODS AND OTHER AIR CONTAINMENT UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Chemical Fume Hoods - Floor-Mounted Hoods
B. Welding Snorkels

1.2 RELATED SECTIONS
A. Section 11 53 10: Laboratory Casework and Other Furnishings
B. Section 11 53 43: Laboratory Service Fittings and Fixtures
C. Division 22: Plumbing
D. Division 23: HVAC
E. Division 26: Electrical

1.3 REFERENCES
A. Chemical fume hoods:
   2. Conform to the recommended practices for laboratory fume hoods published by the Scientific Equipment and Furniture Association (SEFA) 1-2010.

1.4 DESCRIPTION
A. Provide equipment complete with accessories as described herein and shown on Laboratory Furnishings drawings.
B. Chemical fume hoods:
   1. Fume hoods with accessories shall be pre-piped and pre-wired. Pre-pipe service fittings to single point connection at 6 inches (150 mm) above top of hood or as otherwise shown.
      a. Refer to Section 11 53 43 and details on Laboratory Furnishings drawings for service fittings.
      b. P-trap, waste piping and tailpiece extensions for cupsinks shall be furnished and installed by Division 22. Comply with Division 22 requirements for piping and installation requirements for respective pre-piped services.
      c. Pre-wire all electrical devices to junction box at top of hood. Comply with Division 26 requirements for electrical work.
1.5 SUBMITTALS

A. Refer to the General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.
2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.
3. Submittals shall be organized by specification sequence with section and paragraph number identified.
4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project. All non-applicable options, items and components shall be deleted or struck.

C. Materials List/Product Data: Submit complete materials list, including catalog data of all materials, equipment, and products for Work specified in this Section. Include chemical resistance finish performance test results for any products specified in this section.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches x 17 inches (A3) in size. Blueline prints are not acceptable.

E. Submit detailed anchorage and attachment detail drawings for seismic restraint.

F. Samples: Submit two (2) samples of each type of specified finish and color range available.

G. Test Reports: Submit the following performance test reports.

1. “As Manufactured” (AM) Fume Hood Testing in Manufacturing Facility: Provide certification that each type and size of fume hood has passed Flow Visualization and Face Velocity tests, and achieved an AM performance rating equal or better than 0.05 ppm with 4.0 Lpm tracer gas release rate when tested in accordance with ASHRAE 110-2016.
2. Fume Hood Sound Level Certification: Provide certification of fume hood compliance with design criteria for maximum allowable noise within laboratories.
   a. At project design operating conditions for sash height and face velocity, test data of octave band analysis verifying hood is capable of a 50 NC or lower value when connected to a 50 NC (minimum) HVAC source. Measurements shall be taken 36 inches (915 mm) in front of open sash.
3. Fume Hood Certification: Submit “As Installed” (AI) test report as described elsewhere in this section.

H. Operations/Maintenance Manuals: Submit for Owner’s use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, component parts list, and closest factory representative for components and service.

1.6 QUALIFICATIONS

A. Work in this Section shall be performed by a firm having a minimum eight years documented experience, and an established organization and production facilities including all tools, equipment and
special machinery necessary for specializing in the fabrication and installation of the type of equipment required with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.7 COORDINATION

A. Work of this Section requires close coordination with Work of Divisions 22, 23 and 26 as well as Work specified in other Sections. Sequence all Work to ensure an orderly progress in the project without removal of previously installed Work and so as to prevent damage to finishes and products.

B. Coordinate, furnish, and install chemical fume hoods designed for variable air volume (VAV) or constant air volume (CAV) operation as indicated in the mechanical drawings. The designed exhaust airflow control method (VAV or CAV) shall be confirmed and coordinated prior to submission and shall be clearly indicated in the submittal product documentation.

1.8 SUBSTITUTIONS

A. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

B. Substitution shall not affect dimensions shown on Drawings.

C. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.

D. Substitutions shall have no adverse effect on other trades, the construction schedule, or specified warranty requirements.

E. Maintenance and service parts shall be locally available for the proposed substitution.

1.9 WARRANTY

A. Refer to the General Conditions and Division 1 “Product Requirements” for warranty requirements. In addition to these requirements, all products will be warranted to be free from defects in materials and workmanship for a minimum period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved.

PART 2 PRODUCTS

2.1 ACCESSIBILITY FOR PERSONS WITH DISABILITIES

A. Where indicated on Laboratory Furnishings drawings, fume hoods shall be furnished and installed in a manner to make them accessible to persons with disabilities in accordance with the Americans with
Disabilities Act and any state or local building code or regulation having jurisdiction. The height of the highest point of access to the work surface above finished floor shall not exceed 34 inches. Fittings for piped services and electrical receptacles and controls shall be of a design and in a location in order to be considered accessible.

2.2 CHEMICAL FUME HOODS

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

1. Air Master Systems Corporation, 6480 Norton Center Drive, Muskegon, MI 49441 Tel: 231 798-1111.
2. CIF Lab Solutions L.P., 53 Courtland Avenue, Vaughan, ON Canada L4K 3T2 Tel: 905 738-5821.
4. Kewaunee Scientific Corporation, P O Box 1842, Statesville, NC 28687 Tel: 704 873-7202.
5. Labconco Corporation, 8811 Prospect Avenue, Kansas City, MO 64132 Tel: 800 821-5525.
6. Mott Manufacturing Limited, 452 Hardy Road, P. O. Box 1120, Brantford, ON, Canada N3T 5T3 Tel: 519 752-7825.
7. Approved substitution.

B. Underwriters Laboratory Listing: Fume hoods shall be UL subject 1805 classified. Label shall be attached to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods.

C. Materials: The following materials shall be provided, unless superseded by the requirements listed below for specific fume hood types.

1. Steel:
   a. ASTM A366 mild steel, furniture stock, cold-rolled, pickled, double annealed, and free from rust, scale, scratches, buckles, ragged edges, and other defects.
   b. Minimum Thickness: 18 gauge (1.2 mm).

2. Stainless Steel:
   a. Type 316, ASTM 240, with exposed surfaces ground and polished to a No. 4 finish.
   b. Minimum Thickness: 16 gauge (1.6 mm).
   c. Welding: All stainless steel welding material shall be of similar type to sheet material. Welds shall be made without discoloration, ground, polished, and passivated to blend with a No. 4 finish.

3. Liner and Baffle:
   a. Typical: Glass-reinforced polyester panel, flame-retardant and self-extinguishing with smooth finish and white color. Flexural strength: 14,000 psi. Flame spread index of 0-25 when tested per UL 723 and ASTM E 84. Baffle shall be same material as liner. Liner thickness: 3/16 inch (4.76 mm); baffle thickness: ¼ inch (6.35 mm), minimum. Liner performance characteristics shall be as specified below.

4. Glass: 7/32 inch (5.56 mm) laminated safety glass. Glass shall not be etched with manufacturer's name, logo, or any other permanent markings, other than to identify the glass as safety glass. Light fixture lens may be tempered safety glass.

5. Sash guides: Extruded PVC.

   a. Pulley assembly for sash chain: Finish bored steel drive sprockets and keyed drive, 1/2-inch (12.7 mm) diameter front connector shaft. Rear idler sprockets; double sealed ball bearings type, lubricated. All sprockets steel with zinc dichromate finish.
7. Sash belt: Two 1/2 inch wide stainless steel-reinforced polyurethane notched belts. Minimum tension cord strength of 840 N.
   a. Pulley assembly for sash belt: Cast aluminum sprocket mated to a steel shaft.

8. Sash pull
   a. Material:
      1). Steel with chemical resistant powder coating.
      2). Type 304 stainless steel.
   b. Length: Full width of sash.

9. Gaskets: Provide PVC gasket at interior access panels to eliminate air leakage and retain liquids inside hood.

10. Fasteners:
    a. Exterior structural member attachments: Sheet metal screws, zinc plated.
    b. Interior fastening devices shall be concealed; exposed screws are not acceptable. (Screw head “caps” not acceptable).
    c. Exposed exterior fastening devices shall be corrosion-resistant, non-metallic material; exposed screws are not acceptable.

D. Construction:

1. Design: Fume hoods shall be designed for consistent and safe air flow through the hood face opening. Variations of face velocity shall not exceed ±20% of the average face velocity at any designated measuring point.
   a. Refer to the Laboratory Equipment Exhaust Schedule on the Laboratory Furnishings drawings for the design face velocity requirements for each type of fume hood.

2. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4 7/8 inch (124 mm) thick. Wall shall consist of a sheet steel outer shell and a corrosion resistant inner liner, and shall house and conceal steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels shall be attached to a full frame construction, minimum 14 gauge (2.0 mm) galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.

3. Access Panel: Access to fixture valves and piping concealed in wall shall be through flush access panels on the inside liner walls, or through removable front posts. Panels shall be secured with PVC extruded gasket or tamperproof, epoxy coated, countersunk, flat head screws providing a tight fit. Hook and loop type attachments and panels held by gravity are not acceptable.

4. Downdraft bypass: Low resistant type, 18 gauge (1.27 mm) steel chamber; directional louvers are not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

5. Baffles: Baffles shall be fixed and non-adjustable.

6. Ceiling Closure Panels: Panel shall include simple-to-operate means of access to the hood lighting fixture without the use of tools. Finish shall match superstructure exterior. Closure panel shall conceal view of the sash when the sash is in the open position. Provide sash pocket if required to allow correct operation of the bypass.

7. Bypass Grille: Low-resistant type 18 gauge steel with upward directional louvers.

8. Trim and Side Panels: Provide matching steel trim and side panels, as required, to finish any openings around and between hoods. Finish shall match superstructure exterior.

9. Finished Back: Provide for any fume hood where back of hood is exposed to view. 18 gauge steel sheet. Finish shall match superstructure exterior.

10. Exhaust Duct Collar:
    a. Construction: Provide Type 316L stainless steel, minimum 18-gauge, duct collar with 1-¼-inch (38 mm) to 2-inch (50 mm) extension above top of fume hood with butt joint termination suitable for welding. Duct collar design shall be bell-mouthed for round or contoured design for rectangular to provide lower static pressure drop and improved noise performance. Duct collar shall be integral to fume hood construction, factory-installed, and welded or permanently sealed airtight to hood.
b. Configuration: For collar size and quantity, refer to Laboratory Equipment Exhaust Schedule on the Laboratory Furnishing drawings.

11. Exhaust Duct Transition Piece: Furnished by the fume hood manufacturer for installation by the mechanical contractor. Provide contoured Type 316L stainless steel, minimum 18-gauge, exhaust duct transition piece to connect to the fume hood exhaust duct collar and Laboratory exhaust duct system as shown on the Mechanical Drawings. Provide butt joint terminations suitable for welding. Note: Transition Piece is not required where hood exhaust duct collar has been provided per the Laboratory Equipment Exhaust Schedule.

12. Piping shall be as specified in Division 22 for respective system.

13. Service Fittings: As shown on Laboratory Furnishings Drawings and specified in Section 115343, factory-installed and complete with all gaskets, grommets and sleeves. No additional holes in fume hood side posts shall be provided for services beyond those required by the construction documents.

14. Alarm (for CAV hoods): Continuously operating, field calibratable and programmable, airflow monitoring device mounted at front of fume hood shall provide audible and visual alarm and FPM readout with digital display. Provide for remote alarm connections. TEL model AFA1000, or equal. Provide receptacle for alarm.

15. Electrical:
   a. Pre-Wiring: All fume hood electrical devices shall be factory-installed and wired to a junction box located on top of the hood. Comply with Division 26 requirements for electrical work.
      1). Fume hood receptacles shall be wired such that no more than two duplex outlets and the hood lighting are wired through a single circuit.
   b. Receptacles: Flush mounted, 125V / 20A / 60Hz duplex type, single gang, NEMA 5-20R, 3-wire, grounding type receptacle, one or two per side, or as indicated on the Laboratory Furnishings Drawings, with brushed stainless steel cover plate.

16. Interior Hood Lighting:
   a. Lighting within the hood shall be provided by a UL approved, protected, vapor-proof, fluorescent light fixture with two lamps (32W T8, electronic ballast, rapid start) operated by an exterior switch with a stainless steel cover plate.
      1). Lamp size shall not exceed 48 inches; provide multiple light fixtures for hoods wider than 72 inches.
   b. Provide safety glass panel cemented and sealed to the hood roof.
   c. Light level: Average light level on the work surface shall be 80 foot-candles, minimum.

17. Safety label: Provide self-adhesive polyester label, as described on the Laboratory Furnishing drawings. Labels shall indicate safe operating conditions with respect to fume hood sash position. Labels solely indicating 100 fpm face velocity sash position are not acceptable.
   a. Manufacturer: Lab Safety Supply Inc., P.O. Box 1368, Janesville, WI 53547 Tel: 800 356-0783, or approved substitution.
      1). Model No. 156.

18. Hood Finish: As specified elsewhere in this Section.

19. Exterior Color: As selected by Architect from manufacturer's full color line and complying with finish requirements.

E. Floor-Mounted (Walk-In) Chemical Fume Hoods:

1. Style: Floor-mounted.
   a. Subject to compliance with the requirements listed below, acceptable models include:
      2). APEX-Air GP Series Floor Mounted Fume Hood by CIF Lab Solutions L.P.
      3). Isolator Bypass Walk-in Fume Hood by Jamestown Metal Products, Inc.
      5). Protector XL Floor-Mounted Laboratory Hood by Labconco Corporation.
   b. Exterior Depth: up to 39 inches, nominal.
3. Design:
   a. Restricted bypass fume hoods for variable air volume or constant volume exhaust systems with airfoil. Bypass shall be sufficient in size to allow 25% flow with sash closed. Bypass must be achieved through low resistance opening at top of front lintel panel. Bypass shall be designed to provide a smooth down flow effect.
   b. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.
      1). Fume hoods shall be designed to operate safely at face velocities of 100 feet per minute (0.51 m/s) to 125 feet per minute (0.64 m/s).
4. Fume hood sash (Vertical): Full-view, double-hung, frameless type with clear, unobstructed, side-to-side view of fume hood interior and service fixture connections.
   a. Sash Opening: Refer to the Laboratory Equipment Exhaust Schedule on the Laboratory Furnishings drawings for vertical access height clearance.
   b. Counter balance system: Single weight, counter balance system to prevent sash tilting and permit ease of operation at any point along full width pull. Maximum 7 pounds (3 kg) pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position without creep and to prevent sash drop in the event of suspension system failure.
   c. Upper Sash Stop: To allow manual override with automatic reset for a 28 ½ inch (724 mm) upper sash opening.
5. Work Surface: Removable Type 304 stainless steel vertically adjustable work surface for use at 18 inch (457 mm) or 36 inch (915 mm) height.

F. Finish Requirements
1. Preparation:
   a. After the units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a heated cleaner/phosphate solution and pretreated with iron phosphate spray followed by a neutral final seal prior to application of final finish. The strength of each solution shall be monitored by filtration to insure consistent quality.
   b. All treated parts shall be immediately dried in heated ovens and gradually cooled before application of the finish. Treated metal parts shall be properly prepared to provide optimum adhesion of finish and resistance to corrosion.
2. Application: Electrostatically apply powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thicknesses:
   a. All surfaces, exterior or interior, exposed to view, shall receive sufficient powder coat to achieve an average 1.5 mil (38 µm) film thickness with a minimum 1.2 mil (30 µm) film thickness and shall have smooth satin luster.
   b. Backs of cabinets and other surfaces not exposed to view shall have sufficient powder coat to achieve an average 1.0 mil (25 µm) film thickness.
   c. Concealed interior parts shall receive corrosion-resistant treatment.
   d. Stainless steel parts and surfaces shall not be powder coated.
3. Chemical Resistance Finish Performance Requirements:
   a. Test Procedure: Apply 10 drops (approximately 0.5 cubic centimeters) of each reagent identified to the surface of the finished test panels laid flat and level on a horizontal surface. Ambient temperature: 68°F to 72°F (20°C to 22°C). After one hour flush away chemicals with cold water and wash surface with detergent and warm water at 150°F (65.5°C) and with alcohol to remove surface stains. Examine surface under 100 foot-candles (1076 lux) of illumination.
b. Evaluation Ratings: Change in surface finish and function shall be described by the following ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
<tr>
<td>4</td>
<td>Failure</td>
</tr>
</tbody>
</table>

0. No detectable change in the material surface.

1. Slight detectable change in color or gloss but no change in function or life of the surface.

2. A clearly discernable change in color or gloss but no significant impairment of surface life or function.

3. Objectionable change in appearance due to discoloration or etch, possibly resulting in deterioration of function over an extended period of time.

4. Obvious and significant deterioration.

4. Performance requirements: Test results for powder coat finish shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by weight</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Acetic acid, glacial</td>
<td>98%</td>
<td>1</td>
</tr>
<tr>
<td>Acetone</td>
<td>50%</td>
<td>2</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Cresol</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Furfural</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Gasoline</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Glycerin</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>20%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>37%</td>
<td>1</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>48%</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Monochlorobenzene</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Naphthalene (dissolved in Toulene)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>10%</td>
<td>1</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>30%</td>
<td>1</td>
</tr>
<tr>
<td>Phenol</td>
<td>85%</td>
<td>2</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>25%</td>
<td>1</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>75%</td>
<td>1</td>
</tr>
<tr>
<td>Potassium hydroxide</td>
<td>45%</td>
<td>1</td>
</tr>
<tr>
<td>Silver nitrate (10% aqueous solution)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sodium carbonate, saturated</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sodium chloride, saturated</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>40%</td>
<td>1</td>
</tr>
</tbody>
</table>
Reagent % by weight Rating
Sodium hydroxide 50% 1
Sodium hypochlorite 5.25% 1
Sodium sulfide, saturated 1
Sulfuric acid 50% 1
Sulfuric acid 70% 1
Tincture of Iodine 2
Toulene 1
Trichloroethylene 2
Xylene 1
Zinc chloride, saturated 1

Note: Maximum concentration is to be understood unless a lower concentration is shown in the table.

a. Physical Tests:
   1). Abrasion: Finish shall have high abrasion resistance with maximum weight loss of 5.5 mg per 100 cycles as tested on a Taber Abrasion Tester No. E40101 with 1000 gm wheel pressure and Calibrase No. CS10 wheel.
   2). Hardness: Finish shall have surface hardness equivalent to 4H or 5H pencil lead.
   3). Humidity: Finish shall withstand 1000 hours exposure in saturated atmosphere at 100°F (38°C).
   4). Moisture: Finish shall withstand the following procedures with no visible effect:
      a). Boiling water flowing over 45 degree inclined surface for 5 minutes.
      b). 100 hours continuous contact with water-soaked cellulose sponge, maintained in a wet condition throughout test.
   5). Adhesion: Finish shall withstand the following test procedure with at least 95 squares maintaining their finish. Using a razor blade, score the finish surface of the test panel through to the substrate with a pattern of 100 squares, each 1/16 inch x 1/16 inch. Brush away loose particles with a soft brush.
   6). Salt spray: Finish shall withstand 200 hours exposure to salt spray test.

G. Fume Hood Liner Test: Polyresin

1. Test No. 1: Spills and Splashes:
   a. Suspend a 42 inches (1067 mm) x 12 inches (305 mm) panel (42 inch (1067 mm) dimension horizontal) in a position to expose the surface to be tested in a vertical plane. Divide the panel vertically into 3/4 inch (19 mm) spaces.
   b. Using an eyedropper, apply five drops of each reagent as listed.
   c. Liquid reagents shall be applied at the top of the panel and permitted to flow down full panel height. (CAUTION! Flush away any reagent drops.)

2. Test No. 2: Fumes and Gases:
   a. Prepare a panel 24 inches (610 mm) x 12 inches (305 mm) by dividing panel into 2 inch (51 mm) squares. Using 100 ml beakers, place 25 ml (approximately 1/2 inch (13 mm) of reagent) into each beaker. Place beakers in position so that test panel may be placed over beaker tops in the proper sequence. Place panel over beakers. Note: Beaker pouring lip permits atmospheric oxygen to enter and participate in the reaction of the reagent fumes.
   b. After a 24 hour time period has elapsed, remove panel, flush off with water, clean with naphtha and detergent, rinse and wipe dry. Evaluate.

3. Evaluating Ratings:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Excellent</td>
</tr>
<tr>
<td>2</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Fair</td>
</tr>
</tbody>
</table>
etch, possibly resulting in deterioration of function over an extended period of time.

4 Failure

Pitting, cratering, or erosion of the surface. Obvious and significant deterioration.

4. Performance: Test results shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Reagent</th>
<th>% by wt.</th>
<th>Spills</th>
<th>Fumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid, glacial</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acetone</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Acid dichromate</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>28%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Amyl acetate</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Benzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Butyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Carbon tetrachloride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chloroform</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Chromic acid, saturated</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cresol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dichloro acetic acid</td>
<td>93%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dioxane</td>
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<td>0</td>
</tr>
<tr>
<td>Ethyl acetate</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>88%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Furfural</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Gasoline</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>48%</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hydrofluoric acid</td>
<td>37%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>30%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl alcohol</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Methylene chloride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Monochlorobenzene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid</td>
<td>20%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid 30%</td>
<td>30%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nitric acid 70%</td>
<td>70%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phenol</td>
<td>85%</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>85%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Silver Nitrate</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>10%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide 20%</td>
<td>20%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide 40%</td>
<td>40%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Hydroxide Flake</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sodium Sulfide, saturated</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid 33%</td>
<td>33%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid 77%</td>
<td>77%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid 93%</td>
<td>93%</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sulfuric acid/Nitric acid, equal parts 77%/70%</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tincture of Iodine</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Trichloroethylene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Toluene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Xylene</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Reagent  | % by wt. | Spills | Fumes
---|---|---|---
Zinc Chloride | 0 | 0 | 0

Note: Maximum concentration is to be understood unless a lower concentration is shown in the table.

2.3 WELDING SNORKEL

A. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

2. Plymovent Corporation, 375 Raritan Center Parkway, Edison, NJ 08837 Tel: 1-800-644-0911.
3. Approved substitution.

B. Models: Subject to compliance with the requirements listed below, acceptable models include:

1. RX Local Extractor by Movex Inc.
2. MultiSmart Arm by Plymovent Corporation.

C. Type: Ceiling mounted, self-supporting fume extractor arm.

D. Characteristics:

1. Extractor Arm Diameter:
   a. 5 inch diameter tubes.
2. Extractor Arm Material:
   a. Tube: Anodized aluminum.
   b. Hose: Double skin flexible hose of PVC-coated woven polyamide with internal steel spiral.
3. Arm Length: Arms shall be of sufficient length to cover a 24 inch radius area at 48 inches above the finished floor.
   a. Assembly shall be positioned so that no component is lower than 84 inches above the finished floor.
4. Swivel Assembly: Hi-grade cast aluminum with 360 degree rotation.
   a. Provide external, corrosion-resistant adjustment knobs.
7. Ceiling mounted stanchion/bracket for attachment to structure above.
8. Escutcheon suitable to trim any ceiling penetrations.
9. Final connection to the fume exhaust duct system under Division 23. Provide airflow per Equipment Exhaust Schedule.
10. Dampers are not acceptable and shall not be provided.

PART 3 EXECUTION

3.1 SITE CONDITIONS

A. Prior to installation of the Work of this Section, carefully inspect the installed Work specified in other sections and verify that all such Work is complete to the point where this installation may properly commence.

B. Verify that all Work has been installed in complete accordance with the original design, received submittals, and the manufacturer's recommendations.
C. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION

A. Work in this Section requires close coordination with Work specified in Division 22, Division 23 and Division 26, as well as installation by Owner of Owner furnished components. Coordinate all Work to ensure an orderly process in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

B. Coordinate location and alignment of fume hoods and cabinets for proper connection of all piping and duct work.

C. Install all equipment in accordance with applicable codes and regulations, accepted Shop Drawings, and as necessary for a complete operating system.

3.3 FIELD TESTING

A. Chemical Fume Hoods:

1. Fume hood field tests shall be performed by a qualified independent testing company on each hood.

2. All laboratory supply, general exhaust, and fume exhaust HVAC systems shall be operational during testing.

3. Test and certify each fume hood in accordance with ASHRAE Standard 110-2016 for Section 6.1 Flow Visualization, Section 6.2 Face Velocity Measurements, Section 6.3 Test Method for VAV Fume Hoods, Section 6.4 VAV Response Test, and Section 7 Tracer Gas Test Procedure testing requirements.

4. Flow Visualization: Fume hood shall provide complete containment of the smoke generated within the hood.

5. Face Velocity Measurements: Fume hoods shall be tested at the design operating condition sash opening height indicated in the Chemical Fume Hood Schedule.
   a. Fume hoods shall achieve the scheduled design operating condition average face velocity within ±5 fpm.
   b. Individual face velocity readings shall not vary by more than 20% of the mean between measurement grid locations.

6. Test Method for VAV Fume Hoods (Not Applicable to CAV Hoods): Perform this test to confirm VAV controls are properly calibrated. Average and individual face velocity reading should meet the performance criteria indicated for Section 6.2 Face Velocity Measurements above.

7. VAV Response Test (Not Applicable to CAV Hoods): Perform this test to verify VAV controls are responding accurately to the opening of the fume hood sash. The time it takes from the start of the sash movement until the face velocity stabilizes shall be less than 5 seconds.

8. Tracer Gas Test Procedure: Fume hoods shall achieve an As-Installed (AI) performance rating equal or better than 0.10 ppm with 4.0 Lpm tracer gas release rate.

9. Cross Drafts: Fume hood testing shall also include measuring and documenting the vertical and horizontal cross-drafts at the face of the hood. Cross-drafts shall not exceed half of the fume hood face velocity.

10. Balancing of the HVAC systems is in the scope of work of Division 23.
3.4 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as approved by the Architect upon completion of installation.

B. Adjust all moving or operating part to function within their design parameters.

C. Clean equipment, touch up as required.

D. Protect all units before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

END OF SECTION 11 53 13
SECTION 11 53 43 - LABORATORY SERVICE FITTINGS AND FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Laboratory service fittings, valves, and related components.

B. Laboratory emergency plumbing fixtures.

C. Laboratory sink units.

1.2 RELATED SECTIONS

A. Division 22: Plumbing

B. Division 23: Heating, Ventilated, and Air-Conditioning

C. Section 22 2000: Laboratory Plumbing

D. Division 26: Electrical

1.3 REFERENCES


1.4 DESCRIPTION

A. Work includes but is not necessarily limited to furnishing to the project site for installation by Division 22, all laboratory fixtures, fittings, and emergency plumbing fixtures described herein and shown on the Laboratory Furnishings Drawings.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.
4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project.

C. Materials List/Product Data: Submit complete materials list, including catalogue data, of all materials, equipment, and products for Work in this Section.

D. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11inches x 17 inches (A3) in size. Blueline prints are not acceptable.

E. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

1. Substitution shall not affect dimensions shown on Drawings.
2. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.
3. Substitutions shall have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts shall be locally available for the proposed substitution.

F. Samples: Submit two (2) samples of each type of specified finish and color specified.

G. Certifications: As a condition of acceptance, submit certification stating that equipment is complete and ready for intended function.

H. Operations/Maintenance Manuals: Accompanying certification, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damaged work shall be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.7 QUALIFICATIONS

A. Work in this section shall be performed by a company having a minimum of eight years documented experience, and an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment required, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.
B. Work in this Section requires close coordination with Work in electrical and mechanical Sections. Coordinate all Work to assure an orderly progress in the Project, without removal of previously installed Work, and so as to prevent damage to finishes and products.

C. Review conditions of installation, procedures and coordination with related Work.

D. Carefully inspect the installed Work specified in other Sections and verify that all such Work is complete and ready for the installation of this Work to properly commence.

E. Verify that all Work may be installed in complete accordance with the original design, reviewed submittals and manufacturer's recommendations.

1.8 WARRANTY

A. All products will be warranted to be free from defects in materials and workmanship for a period of one year following substantial completion. The manufacturer/dealer/subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved. Warranty replacement work must be scheduled in coordination with the College’s academic schedule and may therefore require evening and/or weekend hours.

PART 2 PRODUCTS

2.1 GENERAL

A. All service fittings and emergency plumbing fixtures shall be specifically designed for laboratory use.

B. Service fittings, emergency fixtures, sinks, etc. specified in this Section shall be furnished and delivered to point of use for installation as specified in Division 22.

C. All service fittings shall be factory pre-assembled including the assembly of valves to turrets, mounting shanks to turrets, etc., and individually factory tested.

D. All laboratory service fittings shall be the product of one service fitting manufacturer to assure ease of replacement and maintenance.

E. All service valves, fittings, turrets, flange and accessories shall be forged brass with a minimum copper content of 85%.

F. Provide fittings as shown in laboratory fitting details for all laboratory equipment at locations shown on the Laboratory Furnishings drawings. See Service Fitting Schedule.

G. Assembly components and operating parts such as valve stems, renewable units, packing nuts, outlet nozzles and straight serrated hose ends shall be made from solid brass stock.

H. Replaceable seats, needle cones, valve disc screws and other accessories shall be Monel or stainless steel alloys especially selected for use intended.

I. Fittings shall be factory tested and shall be supplied with nipples, lock nuts, shanks, etc.

J. Serrated tip fittings shall be threaded with the hose end being tapered.
K. Turrets shall be brass drop forging of design indicated in details shown elsewhere in the Section and shall be one or two-way, as required, with 3/8 inch (9.525 mm) IPS female inlet thread for connections. Units shall be furnished with brass shanks, brass locknuts, and washers.

L. Fittings located on the same plane shall have their handles project the same distance from the plane of reference to present a uniform related appearance, regardless of valve type construction.

M. Flanges shall be brass forging of approved design with 3/8 inch (9.525 mm) IPS female inlet and outlet.

N. All goosenecks shall provide full thread for attachment of aerator or serrated hose ends.

O. Hot water/cold water gooseneck mixers and wall-mounted cold water goosenecks shall swivel. Swivel point shall be above valve body or at valve level if wall mounted. Swing joints shall have heavy Teflon type packings; "O" rings will not be permitted. Cold water goosenecks at cup sinks shall be rigid.

P. All fittings shall have plastic colored service index buttons as specified in this Section.

Q. Flow stop shut-off valve with lever handle on compressed air (AIR60-100) fittings are not acceptable and shall not be required at wall/panel mounted conditions.

R. Provide approved backflow preventers at hand held drench hoses. See details on Laboratory Furnishings drawings.

S. Provide durable 1 inch x 3 inch (25 x 75 mm) sign “NONPOTABLE WATER, DO NOT DRINK” at each bench mounted industrial water fitting, see details on Laboratory Furnishings drawings.

T. Provide plug and socket (2-piece) quick connect service fittings for all compressed air (AIR60-100) fittings and processed chilled water supply and return fittings.

U. Fittings and fixtures designated to be accessible to persons with disabilities (ADA) with operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N), maximum.

2.2 LABORATORY SERVICE FITTINGS

A. Manufacturers:

1. Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be provided by a single manufacturer.

   a. Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: (312) 666-5500.
   b. T&S Brass and Bronze Works, Inc., 2 Saddleback Cove, P. O. Box 1088, Travelers Rest, SC 29690 Tel: (800) 476-4103.
   c. Broen, Inc., 2820 Commerce Blvd., Birmingham, AL 35210 Tel: (800) 446-7326.
   d. Approved substitution.

B. Cylindrical Pattern:

1. All service fittings shall have WaterSaver Standard turret style (not Colortech) as the basis of design.

C. Handles:
1. Faucets designated to be accessible to persons with disabilities (ADA): provide 4 inch “wrist-blade” handles with color coded screw-on index (identification) discs. Wrist-blade handles to be installed in the vertical position (off).

2. Laboratory gas, air and vacuum valves at workstations indicated to be accessible to persons with disabilities (ADA): Provide ball valves fitted with lever-type handles and color coded screw-on index (identification) discs.

3. Other fittings shall be fitted with black hooded type handles and color coded screw-on index discs.

D. Finish: As described elsewhere in this section.

E. Water Valves:

1. Water valves shall include a renewable unit containing all the working parts which are subject to wear, including stainless steel or monel seat, monel screw and heavy duty seat disk and Teflon packing.

2. Volume control at deck mounted water faucets:
   a. Compression unit with integral adjustable volume control to regulate size of inlet port of valve.

3. Volume control at fume hood water outlets: Serrated hose end shall have a 0.5 GPM removable flow restrictor insert to allow a perfect flow out of the outlet and eliminate any splashing or wide pattern spray.

4. Goosenecks: Unit shall be capable of being readily converted from compression to self-closing, and vice versa, without disturbing faucet body and shall also be capable of being readily converted from water construction to needle valve or steam valve construction having outside packing gland without disturbing faucet body.

5. Unit shall be sealed in valve body with special composition gasket. Metal-to-metal or ground joint type of sealing is not acceptable.

6. Water fixtures shall be fully assembled and factory tested at 80 psi (0.55 MPa) water pressure.

F. Needle Valves: Fully assembled and factory tested at 225 psi (1.55 MPa) air pressure. Gas, air, vacuum and steam needle valve fittings shall have stainless steel replaceable floating cone that is precision ground and self-centering which shall seat against a stainless steel or monel renewable valve seat. Action of valve shall be slow compression for fine control under pressure up to 150 psi (1.03 MPa) and shall have subject-to-wear parts easily replaceable. Provide pressure regulators designed for use with the appropriate service at locations indicated on the Laboratory Furnishing drawings. Needle valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-2009/CGA 9.1-2009. Needle valves in fume hoods shall be mounted on the front panel of the fume hood, with all components subject to wear accessible from the exterior face of the hood.

G. Laboratory Ball Valves: Suitable for laboratory gas, air and vacuum and be supplied fully assembled and factory tested at 125 psi (0.86 MPa) air pressure. Ball valves shall be of quarter-turn (closed to fully open) design, be fitted with lever handle requiring less than 5 lbf (22 N) force to operate, and shall have subject-to-wear parts easily replaceable. Ball valves for natural (laboratory) gas service shall be certified for use with natural gas by the Canadian Standards Association under ANSI Z21.15-2009/CGA 9.1-2009.

H. Service Fitting Color Index:

<table>
<thead>
<tr>
<th>Service Name</th>
<th>Disc Color</th>
<th>Letters</th>
<th>Letter Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Air</td>
<td>Orange</td>
<td>AIR</td>
<td>Black</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Orange</td>
<td>AIR60,90,100</td>
<td>White</td>
</tr>
<tr>
<td>Cold Water (Potable)</td>
<td>Dark Green</td>
<td>CW</td>
<td>White</td>
</tr>
</tbody>
</table>
2.3 LABORATORY EMERGENCY PLUMBING FIXTURES

A. Manufacturers:

1. Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
   a. Water Saver Faucet Co., 701 West Erie Street, Chicago, IL 60610 Tel: 312 666-5500.
   b. Guardian Equipment, 1104N North Branch St., Chicago, IL 60642 Tel: 312 447-8100.
   c. Haws Corporation, 1455 Kleppe Lane, Sparks, NV 89431 Tel: 775 359-4712.
   d. Approved substitution.


C. All emergency plumbing fixtures shall be accessible to persons with disabilities in compliance with the requirements of the federal Americans with Disabilities Act (ADA), ADA Accessibility Guidelines (ADAAG), and state accessibility regulations.

D. For locations where finished ceilings are 10’0”A.F.F. or lower:

1. Barrier-free safety station with swing-down eye/face wash, drain pan and emergency shower actuation valve in stainless steel cabinet for recessed mounting: Water Saver Model No. SSBF2150, or equal, with the following characteristics or modifications.
   a. Ceiling-mounted exposed showerhead. Nipple length shall be as required for a complete installation; verify finished ceiling height.
   b. Exposed piping, showerhead, nipple, and escutcheon shall be chrome-plated brass with clear epoxy coating.
   c. Safety shower actuating arm shall be stainless steel.
   d. Showerhead shall have perforated stainless steel spreader.
   e. Eyewash heads shall be ABS plastic.
   f. Eyewash flow shall be activated by swing-down actuation valve connected to eyewash piping.
   g. Eyewash components and safety shower actuating arm shall be mounted in a flanged, recessed-mounted 18 gauge (1.3 mm) stainless steel cabinet with No. 4 finish. A stainless steel drain pan shall be integral with eyewash components and shall direct eyewash water to drain outlet in bottom of recessed mounting cabinet.
   h. Stay-open brass ball valves concealed behind stainless steel/access panel housing.
   i. Fixture shall be furnished with green plastic sign with graphic symbol for safety shower/eyewash.

E. For locations where there are no finished ceilings or finished ceilings are higher than 10’0”A.F.F.

1. Barrier-free safety station with swing-down eye/face wash and emergency shower activation valve in stainless steel cabinet for recessed mounting: Water Saver Model No. SSBF2170, or equal, with the following characteristics or modifications.
   a. Wall-mounted, exposed showerhead.
   b. Exposed piping, showerhead, nipple, and escutcheon shall be stainless steel.
c. Safety shower actuating arm shall be stainless steel.

d. Showerhead shall have perforated stainless steel spreader.

e. Eyewash heads shall be ABS plastic.

f. Eyewash flow shall be activated by swing-down actuation valve connected to eyewash piping.

g. Eyewash components and safety shower actuating arm shall be mounted in a flanged, recessed-mounted 18 gauge (1.3 mm) stainless steel cabinet with No. 4 finish.

h. Stay-open brass ball valves concealed behind stainless steel/access panel housing.

i. Fixture shall be furnished with green plastic sign with graphic symbol for safety shower/eyewash.

F. Barrier-free safety station with swing-down eye/face wash and emergency shower activation valve in stainless steel cabinet for recessed mounting: Water Saver Model No. SSBF2170, or equal, with the following characteristics or modifications.

1. Wall-mounted, exposed showerhead.

2. Exposed piping, showerhead, nipple, and escutcheon shall be chrome-plated brass with clear epoxy coating.

3. Safety shower actuating arm shall be stainless steel.

4. Showerhead shall have perforated stainless steel spreader.

5. Eyewash heads shall be ABS plastic.

6. Eyewash flow shall be activated by swing-down actuation valve connected to eyewash piping.

7. Eyewash components and safety shower actuating arm shall be mounted in a flanged, recessed-mounted 18 gauge (1.3 mm) stainless steel cabinet with No. 4 finish.

8. Stay-open brass ball valves concealed behind stainless steel/access panel housing.

9. Fixture shall be furnished with green plastic sign with graphic symbol for safety shower/eyewash.

2.4 FINISHES

A. Service Fittings:

1. Satin (AISI No. 6 brushed finish) chrome with clear, acid-resistant coating:
   a. Chrome finish: All exposed surfaces shall be polished and buffed, then electroplated with one layer of nickel and one layer of chrome. Each layer of plating shall completely cover all visible areas. Total plating thickness shall be not less than 0.4 mil (10 µm).
   b. Clear epoxy coating: Following plating, clear epoxy coating shall be applied to all exposed surfaces and then baked to permit curing. Surfaces shall have a minimum coating thickness of 2 mils (50 µm).

B. Performance requirements for coated finishes:

1. Chemical resistance:
   a. Fume Test: Suspend coated samples in a container of at least 6 cu. foot (170 L) capacity, approximately 12 inches (300 mm) above open beakers, each containing 100 mL of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid, respectively. After exposure to these fumes for 150 hours, the finish on the samples shall show no discoloration, disintegration or other effects.
   b. Direct Application Test: Subject coated samples to the direct action of the following reagents and solvents at a temperature of 25°C dropping from a burette at the rate of 60 drops per minute for ten minutes. Finish on samples shall not rupture, though slight discoloration or temporary softening is permissible.

<table>
<thead>
<tr>
<th>Reagent</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>98%</td>
</tr>
<tr>
<td>Acetone</td>
<td></td>
</tr>
<tr>
<td>Reagent</td>
<td>Concentration</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Ammonium Hydroxide</td>
<td>28%</td>
</tr>
<tr>
<td>Amyl Acetate</td>
<td></td>
</tr>
<tr>
<td>Amyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
</tr>
<tr>
<td>Butyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Calcium Hypochlorite</td>
<td></td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td></td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td></td>
</tr>
<tr>
<td>Chloroform</td>
<td></td>
</tr>
<tr>
<td>Chromic Trioxide Acid</td>
<td></td>
</tr>
<tr>
<td>Cresol</td>
<td></td>
</tr>
<tr>
<td>Crude Oil</td>
<td></td>
</tr>
<tr>
<td>Dioxane</td>
<td></td>
</tr>
<tr>
<td>Distilled Water</td>
<td></td>
</tr>
<tr>
<td>Ether</td>
<td></td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td></td>
</tr>
<tr>
<td>Ethyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Ethyl Ether</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>37%</td>
</tr>
<tr>
<td>Formic Acid</td>
<td>90%</td>
</tr>
<tr>
<td>Glacial Acetic Acid</td>
<td>99.5%</td>
</tr>
<tr>
<td>Glycerine</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>38%</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
<td>48%</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>5%</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Lactic Acid</td>
<td>10%</td>
</tr>
<tr>
<td>Kerosene</td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
</tr>
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<td>Methyl Alcohol</td>
<td></td>
</tr>
<tr>
<td>Methyl Ethyl Ketone</td>
<td></td>
</tr>
<tr>
<td>Methylene Chloride</td>
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</tr>
<tr>
<td>Mineral Oil</td>
<td></td>
</tr>
<tr>
<td>Monochlor Benzene</td>
<td></td>
</tr>
<tr>
<td>N-Hexane</td>
<td></td>
</tr>
<tr>
<td>Naphthalene</td>
<td></td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>70%</td>
</tr>
<tr>
<td>Perchloric Acid</td>
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</tr>
<tr>
<td>Phenol</td>
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</tr>
<tr>
<td>Phosphoric Acid</td>
<td>75%</td>
</tr>
<tr>
<td>Sea Water</td>
<td></td>
</tr>
<tr>
<td>Silver Nitrate</td>
<td>30%</td>
</tr>
<tr>
<td>Sodium Bichromate</td>
<td>Saturated</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>10%</td>
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<tr>
<td>Sodium Chloride</td>
<td>20%</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>50%</td>
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<tr>
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<tr>
<td>Sodium Sulfide</td>
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<tr>
<td>Toluene</td>
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</tr>
<tr>
<td>Trichlorethylene</td>
<td></td>
</tr>
<tr>
<td>Turpentine</td>
<td></td>
</tr>
<tr>
<td>Urea</td>
<td>Saturated</td>
</tr>
</tbody>
</table>
Reagent | Concentration
--- | ---
Xylene | Saturated
Zinc Chloride | Saturated

2. Mar and abrasion resistance: Coating material shall have a pencil hardness of 2H – 4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch-pounds (18 Nm). Coating shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

3. Repairability: Scratches and other localized surface damage shall be field-repairable.

2.5 LABORATORY SINKS

A. Epoxy Resin:

1. Manufacturer: Manufacturer shall be the manufacturer of epoxy resin work surfaces specified in Section 11 5310.

2. Laboratory Sinks:
   a. Drop-in Type: Drop-in installation by Division 11 in epoxy resin work surface, sizes as indicated on drawings. Color to match work surface.
   b. Comply with the requirements of Section 11 5310 for epoxy resin.
   c. All exposed edges shall be radiused not less than 1/4 inch (6 mm).
   d. Sink shall be set 1/8 inch (3 mm) below the level of the adjacent surface.
   e. Provide epoxy resin sink outlet in color to match sink with strainer, stopper and open-end overflow, and install in sink with continuous bead of silicone sealant.
      1). At black epoxy resin sinks, outlet shall be black polypropylene.
      2). Where Garbage Disposers occur, provide outlet opening to match disposer's sink flange mounting assembly.
   f. Provide tailpiece compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

B. Epoxy resin

1. Fume Hood Locations: Provide cup sinks at fume hoods as described in Section 11 5313.

2. Laboratory Work Surface Installations:
   a. Raised rim, color to match work surface, sizes as indicated on drawings, with integral threaded tailpiece.
   b. Flush with work surface, color to match work surface, sizes as indicated on drawings, with integral outlet and threaded tailpiece. Tailpiece shall be compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.

3. Provide strainer for all cup sinks.

4. Provide mounting bracket for wall-mounted cup sinks.

C. Stainless steel:

1. Laboratory Sinks:
   a. Refer to Section 11 5310, Stainless Steel Fabrications.
   b. Provide stainless steel strainer, outlet, standpipe overflow and stopper for all sinks unless otherwise specified.
   c. Provide tailpieces compatible with waste piping system for all sinks unless otherwise specified. Refer to Division 22 for piping requirements.
PART 3 EXECUTION

3.1 SITE CONDITIONS

A. Inspection:
   1. Prior to installation of fittings specified in Section 11 5343, carefully inspect the installed Work specified in other Sections and verify that all such Work is complete to the point where this installation may properly commence.
   2. Verify that all Work has been installed in complete accordance with the original design, approved submittals, and the manufacturer’s recommendations.

B. Discrepancy:
   1. In the event of discrepancy, immediately notify the Architect.

3.2 PACKING AND DELIVERY

A. Deliver all fittings and fixtures to job site in recommended packaging, with each fitting individually packaged, marked, and scheduled for point of use.

B. Inventory fittings, at job site, verify that type and quantity are correct, and re-package until installed.

C. Store in clean, dry location.

3.3 INSTALLATION

A. Set internal volume control on all cup sink water fittings so water does not splash out of sink.

END OF SECTION 11 53 43
SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.
2. Manually operated roller shades for skylights.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.
2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

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

1. Draper Inc.
3. Lutron Electronics Co., Inc.
4. MechoShade Systems, Inc.

B. 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.

1. Chain-Retainer Type: Clip, jamb mount.
2. Spring Lift-Assist Mechanisms: Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As indicated on Drawings.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

   a. Type: Exposed with endcaps (light filtering) and exposed with endcaps and integral light seal at bottom where it meets the sill (light blocking).
   b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
3. Endcap Covers: To cover exposed endcaps.
4. 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.
5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MOTOR-OPERATED, SINGLE AND DOUBLE-ROLLER SHADES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Draper Inc.
   3. Lutron Electronics Co., Inc.
   4. MechoShade Systems, Inc.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated. 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. Electrical Characteristics: As indicated on drawings.
      b. Maximum Total Shade Width: As required to operate roller shades indicated.
      c. Maximum Shade Drop: As required to operate roller shades indicated.
      d. Maximum Weight Capacity: As required to operate roller shades indicated.
   3. Remote Control: See drawings for location and type of control station.
   4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
   5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: As indicated on Drawings.
   2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.

F. Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Exposed with endcaps (light filtering) and exposed with endcaps and integral light seal at bottom where it meets the sill (light blocking).
b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
3. Endcap Covers: To cover exposed endcaps.
4. 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.
5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 SHADEBAND MATERIALS – See Drawings and Finish Materials.

2.5 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroading 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 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 to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

E. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 24 13
SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid surface material countertops.
   2. Solid surface material backsplashes.
   3. Solid surface material end splashes.

1.2 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Sustainable Design Submittals:
   2. Product Data: For adhesives, indicating VOC content.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS – See Drawings and Finish Materials.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Grade: Premium.

B. Configuration:
   1. Front: Straight, slightly eased at top.
2. Backsplash: Straight, slightly eased at corner.

C. Countertops: 1/2-inch- and 3/4-inch- thick, solid surface material.

D. Backsplashes: 1/2-inch- and 3/4-inch- thick, solid surface material.

E. Joints: Fabricate countertops without joints.

F. Joints: Fabricate countertops in sections for joining in field.

G. Cutouts and Holes:
   1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.
   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."

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.

B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.

D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.

F. 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.

G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."
END OF SECTION 12 36 61.16
PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Roll-up rail mats for recessed slab (3/4") application.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings:
   1. Items penetrating floor mats and frames, including door control devices.
   2. Divisions between mat sections.
   3. Perimeter floor moldings and frames.
C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance data.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL
A. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design".

2.2 ROLL-UP RAIL MATS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amaro Products.
   2. American Floor Mats.
   3. Babcock-Davis.
   4. Balco, Inc.
   5. C/S Group.
B. Basis-of-Design: Amaro Al-Track 250 BF (Bristle Filament Insert)
1. Tread Inserts: 1/4-inch-high, 28-oz./sq. yd. weight, level-cut, nylon-pile, fusion-bonded carpet.
3. Colors, Textures, and Patterns of Inserts: As selected by Architect from full range of industry colors.
4. Rail Color: As selected by Architect from full range of industry colors and color densities.
5. Hinges: Aluminum.
6. Mat Size: As indicated.

2.3 FRAMES

A. Recessed Frames: Manufacturer's standard extrusion.
   1. Extruded Aluminum: ASTM B 221.
      a. Color: As selected by Architect from full range of industry colors and color densities.

2.4 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

B. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.

B. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.

3.2 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13
SECTION 12 61 00 - FIXED AUDIENCE SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Fixed Audience Seating shown in the Large Classroom Amphitheater 0165 will be provided as part of the future Furniture Package through a separate bidding process. The installation portion of that package will be provided by the GC/CM for this project. At the time the Furniture Package bids, the GC/CM will provide pricing direct to the Owner for the installation portion of the Fixed Audience Seating package (attaching the seating units to the concrete floor slab).

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION – Not Applicable

END OF SECTION 12 61 00
SECTION 12 66 00 - TELESCOPING STANDS WITH INTEGRAL FIXED SEATING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electrically operated recessed telescoping stands in Inspiration Hall
   2. Fixed Seating for Inspiration Hall
      a. Mounted on Telescoping Stands

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
   3. Chain-of-Custody Qualification Data: For manufacturer and vendor.
   4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For telescoping stands in both stacked and extended positions.
   1. Include plans, elevations, sections, and attachment details.
   2. Include diagrams for power, signal, and control wiring.

D. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Field quality-control reports.
1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Telescoping stands shall withstand the effects of gravity loads, operational loads, and other loads and stresses according to ICC 300.


2.2 TELESCOPING STANDS

A. System Description: Operable system of multiple-tiered seating on interconnected folding platforms that close for storage, without being dismantled, into a nested stack. Telescoping-stand units permit opening and closing of adjacent, individual and multiple rows, and close with vertical faces of platforms in the same vertical plane.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Recessed Telescoping Stands: Forward-folding system, in which the bleachers open in the forward direction by moving the front row away from the stack to the fully extended position and the rear of bleacher understructure permanently attaches to building construction so that closed stands are recessed in opening.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
b. Interkal LLC.
c. Irwin Telescopic Seating Company; Irwin Seating Company.
d. Royal Stewart Ltd.
e. Substitutions: See Section 01 25 00 Substitution Procedures.

2. Layout: Two side aisles. See drawings.

3. Operation: Electrically operated, with friction-type, integral power unit.

4. Electrical Characteristics for Each Seating Section: As required. See electrical drawings.

5. Electrical Controls:
   a. Control Devices: Wall-attached control system.
   b. Limit Switches: Automatically stop power system when telescoping stands reach fully opened or closed positions.
   c. Motion Monitor: Flashing light with self-contained warning horn, rated at 85 dB at 10 feet, mounted under telescoping seating for audio and visual warning during integral power operation.
   d. Transformer: As required to coordinate current characteristics of motor and control station with building electrical system.

2.3 COMPONENTS

A. Seating Types: For telescoping platforms.
   1. Basis-of-Design: Hussey Gallery 2 PC – SS150'.
      a. Chair Width (center to center): 20 \( \frac{1}{4} \)" (515 mm)
      b. Upholstered seat cushion and back
      c. Armrests: Molded plastic

B. Deck: Manufacturer's standard 3/4" laminated panel.
   1. Finish: Manufacturer's standard carpet bonded to substrate.
      a. Color: As selected by Architect from manufacturer's standard colors.

C. Risers: Steel sheet with manufacturer's standard, rust-inhibiting coating or hot-dip galvanized finish.

D. Safety Rails: Steel, finished with manufacturer's standard powder coat system.
   1. End rails (guards) that are removable.
   2. Color: As selected by Architect from manufacturer's full range of colors.

E. Understructure: Structural steel.
   1. Finish: Manufacturer's standard rust-inhibiting finish.
   2. Color: Manufacturer's standard.
F. Support Column Wheels: Nonmarring, soft, rubber-face wheel assembly under each support column.

1. Include wheels of size, number, and design required to support stands and operate smoothly without damaging the flooring surface, but no fewer than four per column or less than 4 inches in diameter and 1-1/2 inch wide.

G. Control Devices:

1. Wall Attached: Keyed-switch control station, located within full view of each stand and its movement area. Provide two keys per station.

H. Aisle and Seat Numbering: To be provided.

2.4 ACCESSORIES

A. Steps:

1. Slip-resistant, abrasive tread surfaces at aisles.
2. Intermediate aisle steps, fully enclosed, at each aisle.
3. Transitional top step, fully enclosed, at each aisle where last row of telescoping stands is adjacent to a cross aisle.
4. Removable front steps, fully enclosed, at each aisle, that engage with front row to prevent accidental separation or movement and are equipped with a minimum of four skid-resistant feet.

B. Closure Panels and Void Fillers:

1. Aisle closures at foot level that produce flush vertical face at aisles when system is stored.
2. End panels covering exposed ends of stands in the stored position.
3. Rear fillers including supports for closing openings between top row and rear wall of adjoining construction.
4. Gap fillers for closing openings between stand units or between stand units and adjoining construction.

2.5 MATERIALS

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

B. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

D. Composite Wood Products: Products 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."

E. Lumber: Kiln dried, surfaced four sides; southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B & B finish (B and better) grade-of-finish requirements.

F. Plywood: PS 1 as standard with manufacturer.
2.6 FABRICATION

A. Fabricate telescoping stands to operate easily without special tools or separate fasteners unless otherwise indicated.

B. Round corners and edges of components and exposed fasteners to reduce snagging and pinching hazards.

C. Form exposed work with flat, flush surfaces, level and true in line.

D. Supports: Fabricate supports to withstand, without damage to components, the forces imposed by use of stands without failure or other conditions that might impair their usefulness.

1. Cantilever bench seat supports to produce toe space uninterrupted by vertical bracing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install telescoping stands according to ICC 300 and manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. ICC 300 Inspection: Inspect installed telescoping stands to verify that construction, installation, and operation are according to ICC 300 requirements.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Telescoping stands will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust backrests so that they are at proper angles and aligned with each other in uniform rows.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to inspect, adjust, operate, and maintain telescoping stands.

END OF SECTION 12 66 00
SECTION 14 24 00 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hydraulic passenger and service elevators.

1.2 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.

B. Shop Drawings:
   1. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
   2. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.

C. Samples: For finishes involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

B. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard two-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
1.5 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. KONE Inc.
2. Otis Elevator Co.
3. ThyssenKrupp Elevator.
4. Schindler Group

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.


C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. Project Seismic Design Category: See structural drawings.
2. Elevator Component Importance Factor: 1.25. See structural drawings.
3. Design earthquake spectral response acceleration short period (Sds) for Project: See structural drawings.
4. Provide earthquake equipment required by ASME A17.1/CSA B44.
5. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description: Passenger Elevator 1.

1. Type: Under-the-car single cylinder.
2. Rated Load: 5000 lb.
3. Rated Speed: 150 fpm.
5. Auxiliary Operations:
   a. Battery-powered lowering.
b. Nuisance call cancel.
c. Automatic operation of lights and ventilation fans.


7. Car Enclosures:
   a. Inside Width: Not less than 68 inches from side wall to side wall.
   b. Inside Depth: Not less than 101 inches from back wall to front wall (return panels).
   c. Inside Height: Not less than 108 inches to underside of ceiling.
   e. Car Fixtures: Satin stainless steel, No. 4 finish.
   g. Door Faces (Interior): Enamed or powder-coated steel. Color: TBD.
   h. Ceiling: Enamed or powder-coated steel. Color: TBD.
   i. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.

8. Hoistway Entrances:
   a. Width: 54 inches.
   b. Height: 96 inches.
   c. Type: Two-speed side sliding.
   d. Frames: Enamed or powder-coated steel.
   e. Doors at First Floor: Enamed or powder-coated steel.
   f. Doors at Other Floors: Enamed or powder-coated steel.


10. Additional Requirements:
    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.
    b. Provide hooks for protective pads in service car and two complete set(s) of full-height protective pads.

C. Elevator Description: Service Elevator 2.
   1. Type: Under-the-car single cylinder.
   2. Rated Load: 7500 lb.
   3. Freight Loading Class for Service Elevators: Class A.
   4. Rated Speed: 150 fpm.
   6. Auxiliary Operations:
      a. Battery-powered lowering.
      b. Nuisance call cancel.
      c. Automatic operation of lights and ventilation fans.
   
   7. Security Features: Keyswitch operation.
   8. Dual Car-Control Stations: Provide two car-control stations; equip only one with required keyswitches if any.
   9. Car Enclosures:
      a. Inside Width: Not less than 81 inches from side wall to side wall.
      b. Inside Depth: 101 inches from back wall to front wall (return panels).
c. Inside Height: Not less than 108-inches to underside of ceiling.


e. Car Fixtures: Satin stainless steel, No. 4 finish.

f. Side and Rear Wall Panels: Enameled or powder-coated steel. Color: TBD.

g. Door Faces (Interior): Enameled or powder-coated steel. Color: TBD.

h. Ceiling: Enameled or powder-coated steel. Color: TBD.

i. Handrails: 1-1/2 inches round satin stainless steel, No. 4 finish, at sides and rear of car.


k.

10. Hoistway Entrances:

a. Width: 66 inches

b. Height: 96 inches.

c. Type: Two-speed center opening.

a. Frames: Enameled or powder-coated steel. Color: TBD

b. Doors: Enameled or powder-coated steel. Color: TBD

11. Hall Fixtures: Satin stainless steel, No. 4 finish.

12. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

b. Provide hooks for protective pads in service car and two complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

1. Pump shall be submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts.

2. Motor shall have wye-delta or solid-state starting.

3. Motor shall have variable-voltage, variable-frequency control.

B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.

C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

1. Cylinder units shall be connected with dielectric couplings.


D. Hydraulic Fluid: Nontoxic, biodegradable, fire-resistant fluid, made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives, that is approved by elevator manufacturer for use with elevator equipment.

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:
E. Protective Cylinder Casing: PVC or HDPE pipe casing complying with ASME A17.1/CSA B44, of sufficient size to provide not less than 1-inch clearance from cylinder and extending above pit floor. Casing shall have means of monitoring effectiveness to comply with ASME A17.1/CSA B44.

F. Guides: Roller guides, Polymer-coated, nonlubricated sliding guides, or sliding guides with guide-rail lubricators. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.

B. Auxiliary Operations:
   1. Single-Car Battery-Powered Lowering: When power fails, car is lowered to the main level, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
   2. Priority Service: Service is initiated by a keyswitch at designated floors. One elevator is removed from group operation and directed to the floor where service was initiated. Car is placed in operation by selecting a floor and pressing door close button or by operating keyswitch to put car in independent service. After responding to floor selected or being removed from independent service, car returns to group operation.
   3. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.

C. Security Features: Security features shall not affect emergency firefighters' service.
   1. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations.

2.6 DOOR-REOPENING DEVICES

A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door-reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. General: Provide enameled- or powder-coated-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.
   1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Enameled- or Powder-Coated-Steel Wall Panels: Flush, formed-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.

2. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard honeycomb core 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.

3. Enameled- or Powder-Coated-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.


5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

6. Metal Ceiling: Flush panels, with four LED downlights in each panel. Align ceiling panel joints with joints between wall panels.

7. Light Fixture Efficiency: Not less than 35 lumens/W.

8. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

A. 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.

1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1 ½ hours.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Enameled- or Powder-Coated-Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.

2. Enameled- or Powder-Coated-Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.


4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

2.9 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.
B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
   
   1. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide flush-mounted cabinet in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Section 28 31 11 "Digital, Addressable Fire-Alarm System."

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide hall push-button station at each landing as indicated.

G. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide the following:
   
   1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Stainless-Steel Bars: ASTM A 276, Type 304.

E. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

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

G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS or Type HGL.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Excavation for Cylinder: Drill well hole in each elevator pit to accommodate installation of cylinder; comply with applicable requirements in Section 312000 "Earth Moving."

B. Provide waterproof well casing to retain well-hole walls.

C. Install cylinder in protective casing within well hole. Before installing protective casing, remove water and debris from well hole and provide permanent waterproof seal at bottom of well casing.
   1. Align cylinder and fill space around protective casing with fine sand.

D. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

E. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

F. Lubricate operating parts of systems as recommended by manufacturers.

G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.

H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

I. Locate hall signal equipment for elevators as follows unless otherwise indicated:
   1. Place hall lanterns either above each hoistway entrance.

3.2 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

3.3 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to Freight Elevator #2. Comply with the following requirements for elevator used for construction purposes:
   1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
   2. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
   3. Engage elevator Installer to provide full maintenance service.
   4. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.
3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

3.5 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 24 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 14 24 00