PROJECT MANUAL

FOR:

RENAISSANCE HIGH SCHOOL
BID SET
1305 E CENTRAL DRIVE
MERIDIAN, IDAHO 83642

January 12, 2018

Owner:

WEST ADA SCHOOL DISTRICT
1303 E CENTRAL DRIVE
MERIDIAN, IDAHO 83642

Architect:

HUMMEL ARCHITECTS PLLC

HA Project No. 17015
Table of Contents

Volume 1:

BIDDING REQUIREMENTS
Advertisement for Bids
Invitation to Bid and Bid Form
AIA A701 - 1997 - Instructions to Bidders
Supplemental Instructions to Bidders
General Requirements – All Bid Packages
Bid Package Descriptions and Requirements (BP-1 to BP-10)
Bidders Checklist
Project Schedule
AIA A101 2017 - Standard Form of Agreement Between Owner and Contractor
AIA A201 - 2017 – General Conditions of the Contract for Construction
WH-5 Form – State Tax Commission Public Works Contract Report

DIVISION 01 - GENERAL REQUIREMENTS
011000 SUMMARY
012300 ALTERNATES
012600 CONTRACT MODIFICATION PROCEDURES
012900 PAYMENT PROCEDURES
013100 PROJECT MANAGEMENT AND COORDINATION
013300 SUBMITTAL PROCEDURES
014000 QUALITY REQUIREMENTS
014200 REFERENCES
015000 TEMPORARY FACILITIES AND CONTROLS
016000 PRODUCT REQUIREMENTS
017300 EXECUTION REQUIREMENTS
017329 CUTTING AND PATCHING
017700 CLOSEOUT PROCEDURES

Volume 2:

DIVISION 02 – EXISTING CONDITIONS
024119 SELECTIVE STRUCTURE DEMOLITION

DIVISION 03 - CONCRETE
033000 CAST-IN-PLACE CONCRETE
035313 POLISHED CONCRETE FINISHING

DIVISION 05 - METALS
051200 STRUCTURAL STEEL FRAMING
053100 STEEL DECKING
054000 COLD-FORMED METAL FRAMING
055000 METAL FABRICATIONS
055213 PIPE AND TUBE RAILINGS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
061053 MISCELLANEOUS ROUGH CARPENTRY
064023 INTERIOR ARCHITECTURAL WOODWORK

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>072100</td>
<td>BUILDING INSULATION</td>
</tr>
<tr>
<td>075423</td>
<td>THERMOPLASTIC POLYOLEFIN (TPO) ROOFING</td>
</tr>
<tr>
<td>079200</td>
<td>JOINT SEALANTS</td>
</tr>
<tr>
<td></td>
<td><strong>DIVISION 08 - OPENINGS</strong></td>
</tr>
<tr>
<td>081113</td>
<td>HOLLOW METAL DOORS AND FRAMES</td>
</tr>
<tr>
<td>081416</td>
<td>FLUSH WOOD DOORS</td>
</tr>
<tr>
<td>083113</td>
<td>ACCESS DOORS AND FRAMES</td>
</tr>
<tr>
<td>083326</td>
<td>OVERHEAD COILING GRILLES</td>
</tr>
<tr>
<td>083613</td>
<td>SECTIONAL DOORS</td>
</tr>
<tr>
<td>084113</td>
<td>ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS</td>
</tr>
<tr>
<td>087100</td>
<td>DOOR HARDWARE</td>
</tr>
<tr>
<td>088000</td>
<td>GLAZING</td>
</tr>
<tr>
<td></td>
<td><strong>DIVISION 09 - FINISHES</strong></td>
</tr>
<tr>
<td>092213</td>
<td>GYPSUM BOARD SHAFT-WALL ASSEMBLIES</td>
</tr>
<tr>
<td>092216</td>
<td>NON-STRUCTURAL METAL FRAMING</td>
</tr>
<tr>
<td>092900</td>
<td>GYPSUM BOARD</td>
</tr>
<tr>
<td>095113</td>
<td>ACOUSTICAL PANEL CEILINGS</td>
</tr>
<tr>
<td>096513</td>
<td>RESILIENT BASE AND ACCESSORIES</td>
</tr>
<tr>
<td>098319</td>
<td>ACOUSTICAL WALL PANELS</td>
</tr>
<tr>
<td>099123</td>
<td>INTERIOR PAINTING</td>
</tr>
<tr>
<td></td>
<td><strong>DIVISION 10 - SPECIALTIES</strong></td>
</tr>
<tr>
<td>101100</td>
<td>VISUAL DISPLAY SURFACES</td>
</tr>
<tr>
<td>101400</td>
<td>SIGNAGE</td>
</tr>
<tr>
<td>102123</td>
<td>CUBICLE CURTAINS</td>
</tr>
<tr>
<td>102800</td>
<td>TOILET, BATH AND LAUNDRY ACCESSORIES</td>
</tr>
<tr>
<td>104413</td>
<td>FIRE PROTECTION SPECIALTIES</td>
</tr>
<tr>
<td></td>
<td><strong>DIVISION 11 - EQUIPMENT</strong></td>
</tr>
<tr>
<td>113100</td>
<td>RESIDENTIAL APPLIANCES</td>
</tr>
<tr>
<td>115313</td>
<td>LABORATORY FUME HOODS</td>
</tr>
<tr>
<td>117300</td>
<td>CEILING MOUNTED PATIENT LIFT SYSTEM</td>
</tr>
<tr>
<td></td>
<td><strong>DIVISION 12-14 (NO REQUIREMENTS)</strong></td>
</tr>
</tbody>
</table>

**Volume 3:**

**DIVISIONS 15 – 20 (NO REQUIREMENTS)**

**DIVISION 21 - FIRE SUPPRESSION**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210000</td>
<td>FIRE SPRINKLER SYSTEMS</td>
</tr>
</tbody>
</table>

**DIVISION 22 - PLUMBING SYSTEMS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>220000</td>
<td>PLUMBING GENERAL REQUIREMENTS</td>
</tr>
<tr>
<td>220100</td>
<td>PLUMBING</td>
</tr>
</tbody>
</table>

**DIVISION 23 - HVAC SYSTEMS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>230000</td>
<td>HVAC GENERAL REQUIREMENTS</td>
</tr>
<tr>
<td>230100</td>
<td>HEATING, VENTILATING, AND AIR CONDITIONING</td>
</tr>
<tr>
<td>230150</td>
<td>MECHANICAL START-UP</td>
</tr>
</tbody>
</table>
DIVISION 24 – 25 (NO REQUIREMENTS)

DIVISION 26 – ELECTRICAL
260500 ELECTRICAL GENERAL PROVISIONS
260502 SHORT-CIRCUIT/COORDINATION STUDY/ARC FLASH HAZARD ANALYSIS
260519 CONDUCTORS AND CABLES
260626 GROUNDING
260533 RACEWAYS AND BOXES
260536 CABLE TRAYS
260800 LIGHTING SYSTEMS COMMISSIONING
260923 LIGHTING CONTROL DEVICES
262418 MOTOR STARTERS
262726 WIRING DEVICES
262815 DISCONNECT SWITCHES
265100 INTERIOR LIGHTING
266000 ELECTRICAL DEMOLITION AND REPAIR

DIVISION 27 – COMMUNICATIONS
271101 TELECOM RACEWAY SYSTEMS
271300 COMMUNICATIONS CABLING
275116 PUBLIC ADDRESS SYSTEMS
275313 CLOCK SYSTEMS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY
283100 FIRE ALARM SYSTEM

DIVISION 29 – 33 (NO REQUIREMENTS)

END OF TABLE OF CONTENTS
PART I - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner unless indicated otherwise.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

A. Qualification Data: For demolition firm.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and other tenants' on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.

5. Coordination of Owner's continuing occupancy of portions of existing building.

6. Means of protection for items to remain and items in path of waste removal from building.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.
E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:

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

1.5 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner’s operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary."

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

C. Notify Construction Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.
B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Construction Manager.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section “Summary.”

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
   a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

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

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.
D. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

E. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

F. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Construction Manager will arrange to shut off indicated services/systems when requested by Contractor.
   2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

G. Salvaged Items: Comply with the following:
   1. Clean salvaged items of dirt and demolition debris.
   2. Store items in a secure area site. Arrange area with Owner.
   3. Transport items to storage area designated by Owner.
   4. Protect items from damage during storage and transport.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   7. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Existing Tilt-Up Concrete Wall Panels:
   1. Accurately mark areas to be demolished for new openings.
   2. Provide temporary structural support and shoring for new openings in tilt-up wall panels until new steel headers have been completed and accepted by Architect.
3. Carefully saw-cut perimeter of areas to be demolished, then break-up and remove. New openings shall be uniform, flush, plumb and square to accommodate new aluminum storefront frames.

4. Grind corners down to produce uniform, even chamfer as indicated on Drawings.

**B.** Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

**B.C.** Concrete Slabs-on-Deck: Saw-cut perimeter of area to be demolished, then remove. See notes on Structural Drawings for additional requirements at trench drain locations.

**C.** Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCl-WP and its Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

**D.** Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Section “Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing” for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories as required for new construction.
2. Remove existing roofing system down to substrate.

**E.** Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

**A.** General: Except for items or materials indicated to be salvaged, recycled, reused, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

**B.** Burning: Do not burn demolished materials.

**C.** Disposal: Except for materials indicated to be salvaged or recycled, transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

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

END OF SECTION 024119
PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Slabs-on-grade.
2. Concrete slabs on metal decking.

B. Related Sections include the following:

1. Division 05 Section "Structural Steel Framing" for coordinating anchoring for structural columns.
2. Division 05 Section "Structural Steel Framing" for coordinating anchoring for structural supports.
3. Division 05 Sections "Steel Decking" for steel deck supporting concrete fill.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

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

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
E. Samples: For waterstops and vapor barrier.

F. Welding certificates.

G. Qualification Data: For manufacturer.

H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

I. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Waterstops.
   6. Curing compounds.
   8. Vapor barriers.

J. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

K. Field quality-control test and inspection reports.

L. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. 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."

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

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, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade I, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
   2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
   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.
   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, shoring and reshoring procedures, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

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

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II gray. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class F.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.


2.5 ADMIXTURES


B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

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.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products:
   a. Boral Material Technologies, Inc.; Boral BCN.
   b. Euclid Chemical Company (The); Eucon CIA.
   c. Grace Construction Products, W. R. Grace & Co.; DCI.
   d. Master Builders, Inc.; Rheocrete CNI.
   e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products:
   a. Axim Concrete Technologies; Catexol 1000Cl.
   c. Cortec Corporation; MC1 MCI 2000 or 2005NS.
   d. Grace Construction Products, W. R. Grace & Co.; DCI-S.
   e. Master Builders, Inc.; Rheocrete 222+.
   f. Sika Corporation; FerroGard-901.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers:
   a. Greenstreak.
   b. Progress Unlimited, Inc.
   c. Williams Products, Inc.

2. Profile: Ribbed with center bulb.
3. Dimensions: 6 inches by 3/8 inch thick (150 mm by 10 mm thick); nontapered.

2.7 VAPOR BARRIERS

A. Plastic Vapor Barrier: ASTM E 1745, Class A, polyolefin. Include manufacturer’s recommended adhesive or pressure-sensitive tape.

1. Products:
   a. Fortifiber Corporation; Moistop Ultra 15.
   b. Stego Industries, LLC; Stego Wrap, 15 mils.
2.8 CURING MATERIALS

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

   1. Products:

      a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
      b. L&M Construction Chemicals, Inc.; E-Con.
      c. MBT Protection and Repair, Div. of ChemRex; Confilm.
      d. US Mix Products Company; US Spec Monofilm ER.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

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

D. Water: Potable.

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 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

   1. Types I and II for non-load bearing, and types IV and V for load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) 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 (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
5. **Products:**

   a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Conspec Concrete Top.
   b. L&M Construction Chemicals, Inc.; Conflow.
   c. US Mix Products Company; US Spec SLU.

B. **Repair Overlayment:** Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. **Cement Binder:** ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. **Primer:** Product of topping manufacturer recommended for substrate, conditions, and application.
3. **Aggregate:** Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. **Compressive Strength:** Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/109M.
5. **Products:**

   a. Ardex Engineered Cements; Ardex K-500.
   b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Conspec Spec Topping MT.
   c. US Mix Products Company; US Spec Flowtop HD.

### 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:** Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

   1. **Fly Ash:** 20 percent.
   2. **Combined Fly Ash and Pozzolan:** 15 percent.
   3. **Ground Granulated Blast-Furnace Slag:** 50 percent.
   4. **Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag:** 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 15 percent.
   5. **Silica Fume:** 10 percent.
   6. **Combined Fly Ash, Pozzolans, and Silica Fume:** 35 percent with fly ash or pozzolans not exceeding 20 percent and silica fume not exceeding 10 percent.
   7. **Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume:** 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

**C.** **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 and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50, unless indicated otherwise on Drawings.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated on Drawings.
   3. Slump Limit: 3 inches (76.2 mm), plus or minus 1 inch (25 mm).
   4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

B. Concrete Fill (for metal deck and stair pans): Proportion normal-weight concrete mixture as follows:
   1. Minimum Compressive Strength: As indicated on Drawings.
   3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
   4. Air Content: Do not allow air content of troweled finished toppings 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 (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.
3.2 INSTALLING (UNDER-SLAB) VAPOR BARRIERS

A. Plastic Vapor Barriers: Place, protect, and repair vapor retarders according to ASTM E1643 and manufacturer’s written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer’s recommended tape.
2. Seal around all pipe and duct penetrations as recommended by vapor barrier manufacturer.
3. Repair all damage to vapor barrier prior to cover-up, as recommended by manufacturer.
4. Protect installed vapor barrier from damage prior to and during concrete slab-on-grade placement.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI’s "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

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

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

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

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.4 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with powersaws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. 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 (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "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.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.5 WATERSTOPS

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.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

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

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

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

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

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete
embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

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

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 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 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 view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. **Smooth-Rubbed Finish:** Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. **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.

### 3.8 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 surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

#### D. Trowel and Fine-Broom Finish
Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

#### E. Broom Finish
Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.9 MISCELLANEOUS CONCRETE ITEMS

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

#### B. Curbs
Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. 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.

3.10 CONCRETE PROTECTING AND CURING

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

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m 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. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3.11 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 joint clean and dry.
C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

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

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through un-reinforced 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 (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit 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 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. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
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, 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 (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
7. 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.
8. 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.
9. 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 (3.4 MPa).
10. 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.
11. 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.
12. 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.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000
RENAISSANCE HIGH SCHOOL – TENANT IMPROVEMENT
MERIDIAN, IDAHO
HA PROJECT #17015

SECTION 035313 – POLISHED CONCRETE FINISHING

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 polishing of existing concrete floor slabs including:
   3. Grinding and polishing of floor slab to desired finish.

B. Related Sections:
   1. Section 033000 “Cast-In-Place Concrete” for new concrete floor slabs

1.3 REFERENCES

A. American Society of Testing and Materials (ASTM):
   3. ASTM F 710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

A. Preparation and concrete grinding procedures.

B. Installer’s Qualifications.

C. Samples for Verification: For each type of finish indicated, on representative sample of substrate.

D. Copy of manufacturer’s warranty.
1.6 CLOSEOUT SUBMITTALS

A. Maintenance instructions.

B. Overage products applicable to maintenance.

1.7 QUALITY ASSURANCE

A. Installer’s Qualifications:

1. Company specializing in ground and polished concrete flooring systems with a documented successful in-service record of performance for a minimum of five (5) commercial projects similar in type, scope, and quality to the Work of this Project.

2. Company and installers certified by manufacturer, in writing, as qualified to perform the Work of this Section, prior to Bid Date, and acceptable to Architect.

B. Source Limitation: All system chemicals/components shall be manufactured by a single source and approved in writing as compatible parts of a complete system.

C. Mock-Ups:

1. Provide a Mock-up of 16 square feet in location as directed by Architect. Mock-up shall demonstrate surface finish, color variations, and level of workmanship.

2. Maintain mock-up in an undisturbed condition during construction to serve as a standard for judging the Work.

3. Approved mock-up may be retained and incorporated into the finished Work.

D. Pre-Installation Conference: Conduct at the Project Site.

1. Required Attendees: Owner, Installer, System Manufacturer’s Representative, and other parties affected by the Work of this Section.

2. Agenda:


   b. Review requirements for assessment of sound substrate and subsequent remediation in the case of sub-standard conditions.

   c. Review requirements for environmental conditions and storage of materials.

   d. Review system manufacturer’s preparation and application instructions including, but not limited to, the following:

      1) Details of each step of grinding, honing, and polishing operations.

      2) Application of liquid products.

      3) Protection of concrete floor surfaces until polishing is completed.

      4) Sealing and protecting polished concrete floors after polishing is completed.
e. Review conditions and/or techniques that would prevent the satisfactory application of the polishing system.

3. Reports: Provide written meeting minutes, including decisions and agreements reached, and furnish copy of minutes to the Architect and each party in attendance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer’s packaging, in sealed containers with manufacturer’s identifying labels intact.

B. Store according to manufacturer’s recommendations.

1.9 PROJECT CONDITIONS

A. Do not apply product when air, surface, or material temperatures are expected to fall below 40°F (4° C) within four hours prior to or after application of products.

B. Limit and control damage from excessive dust caused by grinding/polishing procedure.

C. Properly dispose of collected dust from polishing.

1.10 WARRANTY

A. Contractor to guarantee work under this Section to be free of defects of material and installation for the duration of the warranty period. Defects occurring during the warranty period shall be repaired, in a manner acceptable to the Architect and Owner, at no additional cost to the Owner.

1. Warranty Period: One (1) year from date of Substantial Completion.

1.11 MAINTENANCE MATERIALS

A. Furnish one (1) gallon of unopened maintenance materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design Product: Subject to compliance with requirements, provide L & M Construction Chemicals, Inc. “Permashine” system, or a comparable product by one of the following:

1. Advanced Floor Products, Inc., “Retro Plate.”

2. PROSOCO Inc. “Consolideck.”

2.2 POLISHED CONCRETE FINISHES

A. System shall consist of the following:

1. Hardener, Sealer, Densifier: Water-based, odorless liquid, VOC-compliant hardening solution leaving no surface film:

   a. Product: L & M Construction Chemicals, Inc.; “FGS Hardener Plus” or a comparable product by one of the manufacturers approved in Article 2.1, above.
2. Joint Filler: Semi-rigid, 2 component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A hardness of 80 or greater:
   a. Product: L & M Construction Chemicals, Inc.; “Joint-Tite 750” or a comparable product by one of the manufacturers approved in Article 2.1, above

3. Oil Repellent Sealer: Water-based, ready to use, silane, siloxane and fluoropolymer blended solution sealer, quick-drying, low odor, oil and water repellent, VOC compliant =, and compatible with chemically-hardened floors:
   a. Product: L & M Construction Chemicals, Inc.; “Petrotex” or a comparable product by one of the manufacturers approved in Article 2.1, above

4. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents, biodegradable, environmentally safe and certified “High Traction” by the National Floor Safety Institute:
   a. Product: L & M Construction Chemicals, Inc.; “FGS Concrete Conditioner” or a comparable product by one of the manufacturers approved in Article 2.1, above.
   b. Finish: Standard Medium Gloss (MG-2), 800 Grit.

EXECUTION

3.1 EXAMINATION
   A. Examine substrates, with Installer present, for conditions affecting the performance of the concrete polishing system. Insure that concrete substrate is acceptable for product installation in accordance with all requirements of the manufacturer.
   B. Proceed with work only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Insure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing process and materials.

3.3 INSTALLATION
   A. Floor Surface Polishing and Treatment:
      1. Provide polished concrete floor treatment in entirety of floor slab areas indicated on Drawings. Provide consistent finish in all contiguous areas.
      2. Apply floor finish prior to installation of fixtures and accessories.
      3. Diamond polish concrete floor surfaces with power disc machine recommended by floor finish manufacturer.
      4. Sequence with course to fine grit using dry method.
         a. Comply with manufacturer’s recommended polishing grits for each sequence to achieve desired finish level.
b. All concrete surfaces shall be as uniform in appearance as possible.

5. Polished Concrete:
   a. Locate demarcation line between dyed surfaces and other finishes.
   b. Polish concrete to final finish level.
   c. Remove residue with dry buffer; reapply as necessary to achieve desired result.

6. Apply FSG Hardener Plus as follows:
   a. First coat at 250 sq. ft./gal.
   b. Second coat at 350 sq. ft./gal.
   c. Follow manufacturer's recommendation for drying time between coats.

7. Remove defects and re-polish defective areas.

8. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

9. Provide 1/8 inch wide x 1 inch deep control joints at all color transitions.

3.4 CLEANING AND PROTECTION

A. Mechanically scrub treated floors for seven days with soft to medium pads with cleaning solution approved by system manufacturer.

B. Protect installed product with EZ Cover by McTech Corp., or comparable equal.

C. Repair any damaged areas at completion of construction activities of other trades.

END OF SECTION 035313
PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes structural steel and grout.

   B. Related Sections:
      1. Division 03 Section “Cast-In-Place Concrete.”
      2. Division 05 Sections “Steel Decking,” “Cold-Formed Metal Framing,” “Metal Fabrications” and “Metal Stairs.”

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

   B. Shop Drawings: Show fabrication of structural-steel components.

   C. Welding certificates.

   D. Mill test reports.

   E. Source quality-control test reports.

1.4 QUALITY ASSURANCE
   A. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd or related project experience.

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

   C. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

   D. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS
   A. W-Shapes: ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50 (345).
B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50 (345).

C. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50 (345).

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing, or Grade C, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

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

1. Finish: Plain.
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.

   a. Finish: Plain.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.

1. Direct-Tension Indicators: ASTM F 959, Type 490 (ASTM F 959M,) Type 10.9, compressible-washer type, plain.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy hex head steel structural bolts with splined ends; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, weldable, straight, or ASTM F 1554, Grade 55, weldable, straight.

1. Finish: Plain.

F. Threaded Rods: ASTM A 193/A 193M, unless ASTM A 36/A 36M is indicated on Drawings.


2.3 PRIMER

A. Primer: Fabricator’s standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION


B. 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 and manufacturer's written instructions.

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, slip critical.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding 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 (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces to be high-strength bolted with slip-critical connections.
   4. Surfaces to receive sprayed fire-resistive materials.
   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" for interior structural steel.
   2. SSPC-SP 3, "Power Tool Cleaning" for exterior structural steel.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of Part 3, Article "Field Quality Control."

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

C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding.

PART 3 - EXECUTION

3.1 ERECTION

A. Examination: Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

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

B. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings."


1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. 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 base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base, or bearing 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.

D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.2 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, slip critical.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

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

END OF SECTION 051200
PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
   2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.

1.3 SUBMITTALS

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

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

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

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

B. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
C. **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."

D. **FMG Listing**: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

### 1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

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

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

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

1. Steel Deck:
   - ASC Profiles, Inc.
   - Canam Steel Corp.; The Canam Manac Group.
   - Consolidated Systems, Inc.
   - DACS, Inc.
   - D-Mac Industries Inc.
   - Epic Metals Corporation.
   - Marlyn Steel Decks, Inc.
   - New Millennium Building Systems, LLC.
   - Nucor Corp.; Vulcraft Division.
   - Roof Deck, Inc.
   - United Steel Deck, Inc.
   - Valley Joist; Division of EBSCO Industries, Inc.
   - Verco Manufacturing Co.
   - Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

#### 2.2 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. **Prime-Painted Steel Sheet**: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 3350 \[330345\] minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray or white baked-on, rust-inhibitive primer.
Select zinc-coating weight from options in subparagraph below.

Select zinc-coating weight and color, if applicable, from options in subparagraph below.

Select one profile depth from subparagraph below or revise to suit Project. Indicate locations on Drawings if various depths are required.

2. Profile Depth: As indicated on drawings.

Select one steel thickness from subparagraph below or revise to suit Project.

3. Design Uncoated-Steel Thickness: As indicated on drawings.

Select span used in design from subparagraph below.

4. Span Condition: As indicated on Drawings.

2.3 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 (4.8-mm) 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 (230 MPa), not less than 0.0359-inch (0.91-mm) 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 (230 MPa), of same material and finish as deck, and of thickness and profile indicated on Drawings.

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 Pans: Single-piece steel sheet, 0.0747-inch (1.90mm) –thick, of same material and finish as deck. For drains, cut holes in field.

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

B. 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.

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

3.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: As indicated on Drawings.

Retain one of two subparagraphs below. First subparagraph is based on SDI specifications. Select second subparagraph if showing requirements on Drawings.

2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.

3. Weld Spacing: Space and locate welds as indicated on Drawings.

Retain subparagraph below if minimum uncoated steel thickness is less than 0.028 inch (0.71 mm). See installation considerations in the Evaluations.

4. Weld Washers: Install weld washers at each weld location.

5. Side-Lap and Perimeter Edge Fastening: Fasten side-laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span and located side-laps and perimeter edge fastenings as indicated on Drawings.

B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped.
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.

3.4 FIELD QUALITY CONTROL

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

B. Field welds will be subject to inspection.

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

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

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces 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.

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

END OF SECTION 053100
SECTION 054000 - 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. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
4. Floor joist framing.

1.3 SUBMITTALS

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

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports.

F. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

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

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

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
PART 2 - PRODUCTS

2.1 MATERIALS

2.2 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 on drawings.
2. Section Properties: As indicated on drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and same minimum base-metal thickness as steel studs.

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

1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Flange Width: As indicated on Drawings.
3. Section Properties: As indicated on Drawings.

2.3 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 on Drawings.
2. Flange Width: As indicated on Drawings.
3. Section Properties: As indicated on Drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

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.

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 and lateral loads.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.4 FRAMING ACCESSORIES

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

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
C. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

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

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

F. 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.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

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

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

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

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

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

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

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of $\frac{1}{8}$ inch in 10 feet ($1:960$) and as follows:
   1. Space individual framing members no more than plus or minus $\frac{1}{8}$ inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 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 on Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of $\frac{1}{8}$ inch (3 mm) 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. 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 as indicated.

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

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 48 inches (1220 mm). Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer’s written instructions.

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

K. 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.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

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

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 deflection tracks and anchor to building structure.
2. Install double deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to infill studs and anchor to primary building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   a. Install solid blocking at centers indicated Drawings.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.
3.5 FIELD QUALITY CONTROL

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

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

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

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

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

3.6 REPAIRS AND PROTECTION

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

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

END OF SECTION 054000
PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes the following:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Miscellaneous steel trim.
   4. Floor transition trim.
B. Products furnished, but not installed, under this Section include the following:
   1. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete.
C. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, inserts and other items indicated to be cast into concrete.
   2. Division 05 Section "Structural Steel."
   3. Division 05 Section "Pipe and Tube Railings."
   4. Division 09 painting sections for coordinating compatibility of shop primers with field-applied finishes.

1.3 SUBMITTALS
A. Product Data: For the following:
   1. Nonslip aggregates and nonslip-aggregate surface finishes.
   2. Paint products.
B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   2. Provide templates for anchors and bolts specified for installation under other Sections.
   3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
C. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
D. Welding certificates.
E. Qualification Data: For professional engineer.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."
   3. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 METALS, GENERAL

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.
2.3 FERROUS METALS

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

B. 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.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

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

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

F. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
   1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm), unless noted otherwise.
   2. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B 0.0677-inch (1.7-mm) minimum thickness; coated with manufacturers standard rust-inhibitive.

G. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

H. Woven-Wire Mesh: Intermediate-crimp, diamond pattern, 2-inch (50mm) –square woven-wire mesh, made from 0.135-inch (3.5mm) nominal diameter wire complying with ASTM A 510 (ASTM A 510M).

2.4 FASTENERS

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

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head, annealed stainless steel bolts, nuts and, where indicated, flat washers.

D. Anchor Bolts: ASTM F 1554, Grade 36.
   1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).


J. Threaded Rod: ASTM 242 High-strength, low alloy structural steel, 5/8-inch (15.8mm) diameter; Thread: UNC Class 2B.


2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that are compatible with finish coats specified in Division 09 painting Sections.


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


F. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.6 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 (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

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

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

E. Weld corners and seams continuously to comply with the following:

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

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

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Prime miscellaneous framing and supports with rust-inhibitive primer compatible with finish coats specified in Division 09 painting Sections.

2.8 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. Prime miscellaneous steel trim with rust-inhibitive primer compatible with finish coats specified in Division 09 painting Sections.

2.9 FINISHES, GENERAL

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

1. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-Dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Provide shop primer that is compatible with intermediate and finish coats specified in Division 09 painting Sections. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.

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

2.11 STAINLESS-STEEL FINISHES

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

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

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

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

PART 3 - EXECUTION

3.1 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 bolts, wood screws, and other connectors.
E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

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.

3.3 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 (0.05-mm) dry film thickness.

END OF SECTION 055000
SECTION 055213 - PIPE AND TUBE RAILINGS

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube guards

B. Related Sections include the following:

1. Division 03 section “Cast-In-Place Concrete” for substrate supporting handrails and railings.
2. Division 05 Sections "Structural Steel and "Cold-Formed Metal Framing" for structure supporting handrails and guards.
3. Division 09 Section “Interior Painting” for applying intermediate and finish coats to pipe and tube railings over compatible primers specified in this section.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Top Rails of Guards:
   a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
   c. Infill load and other loads need not be assumed to act concurrently.

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

A. Product Data: For the following:

1. Manufacturer’s product lines of mechanically connected railings.
2. Grout,anchoring cement, and paint products.

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

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For firms and persons specified in the “Quality Assurance” Article, to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses, names of architects and owners, and other information specified.

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

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Engineer Qualifications: Professional engineer legally authorized to practice in the jurisdiction where the project is located, and experienced in providing engineering services of the kind indicated for railing systems similar to those in this Project in material, design, and scope, with a record of successful service performance.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION AND SCHEDULING

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

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.
PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

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

D. Castings: Either gray or malleable iron, unless otherwise indicated.
   1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
   2. Malleable Iron: ASTM A 47/A 47M.

E. Perforated Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, or hot-rolled steel sheet, ASTM A 1011/A 1011M, commercial steel Type B, 0.060-inch (1.52mm) thick, with 1/8-by-1-inch (3.2-by-25.4-mm) round end slotted holes in side- staggered rows.

2.3 FASTENERS

A. General: Provide the following:

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
   1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
   2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors: Provide cast-in-place, chemical, or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that are compatible with intermediate and finish coats specified in Division 09 "Painting" Sections.

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


E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

   1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Preassemble railings in the 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. Use connections that maintain structural value of joined pieces.

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

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

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

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

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

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

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

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

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

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

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

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

N. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long, unless otherwise indicated, with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.

O. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.

1. Orient wire mesh with diamonds vertical.

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

2.6 FINISHES, GENERAL

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

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

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

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:

1. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
F. 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. Coordinate with Division 09 “Painting” Sections to ensure that shop-applied primer is compatible with field-applied finish coats.

1. Do not apply primer to galvanized surfaces.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of $\frac{1}{16}$ inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed $\frac{1}{4}$ inch in 12 feet (5 mm in 3 m).

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

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

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 “Fabrication” Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (125 mm) deep and $\frac{3}{4}$ inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post
and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer’s written instructions.

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

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

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces by welding.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For steel-framed gypsum board partitions, use hanger or lag bolts set into wood blocking or backing between studs. Coordinate with stud installation to locate backing members.

3.7 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 priming to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.8 PROTECTION

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

B. Restore 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 055213
SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Floor sheathing.
3. Rooftop equipment bases and support curbs.
4. Wood backing, blocking and nailers.
5. Wood furring and grounds.
7. Plywood backing panels.

B. Related Sections include the following:

1. Division 01 Section “Alternates” for alternates that affect the scope of work of this Section.
2. Division 05 Section “Cold-Formed Metal Framing” for exterior metal stud walls requiring blocking and backing for mounting of hardware and fixtures.
3. Division 05 Section “Metal Fabrications” for items mounted to wood blocking in frame walls.
4. Division 05 “Pipe and Tube Railings” for handrails and guards fastened to wood blocking and backing in frame walls.
5. Division 06 Section “Interior Architectural Woodwork” for cabinets supported by blocking and backing in frame walls.
6. Division 07 Roofing Sections for wood blocking installed in roofing assemblies.
7. Division 08 Section “Door Hardware” for items attached to wood blocking in frame walls.
8. Division 09 Section “Non-Load-Bearing Steel Framing” for non-load-bearing steel stud walls requiring blocking and backing for hardware and fixtures.
9. Division 10 Sections for frame wall-mounted specialties requiring blocking and backing for support.
10. Division 11 Sections for frame wall-mounted equipment requiring blocking and backing for support.
11. Divisions 22, 23, 26 and 27 Sections for surface-mounted items requiring blocking and backing for support, and for equipment mounted to plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.
1.4 SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
5. Expansion anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

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

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Floor sheathing for raised platforms.
3. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness.

B. Miscellaneous Framing: Construction or No. 2 grade and any of the following species:

1. Hem-fir (north); NLGA.
2. Douglas fir-larch; WCLIB or WWPA.
3. Spruce-pine-fir; NLGA.
4. Douglas fir-south; WWPA.
5. Hem-fir; WCLIB or WWPA.
6. Douglas fir-larch (north); NLGA.
2.5 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
5. Furring.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

1. Hem-fir (north); NLGA.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB, or WWPA.
4. Spruce-pine-fir (south); WCLIB, or WWPA.
5. Western woods; WCLIB or WWPA.
6. Northern species; NLGA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
2. Northern species, No. 2 Common grade; NLGA.
3. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

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

2.6 PLYWOOD BACKING PANELS & SHEATHING

A. Telephone and Electrical Equipment Backing Panels and sheathing in frame wall in Multi-Media Production: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FLOOR SHEATHING

A. Plywood Sheathing: APA-rated T&G sheathing,

2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).
2.8 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. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Provide backing, blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

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

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.
E. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

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

G. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

3.2 WOOD GROUNDS, SLEEPER, BACKING, BLOCKING, AND NAILER INSTALLATION

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

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

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 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 061053
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
   1. Fixed modular laminate-clad casework, open shelving, and components.
   2. Open laminate-clad shelving.
   3. Casework hardware.
   4. Laminate-clad countertops.
   5. Epoxy resin countertops and sinks.
   6. Miscellaneous laboratory items.
   7. Premanufactured flammables and acids storage safety cabinets.
   8. Fiber-Reinforced Plastic (FRP) panels

   B. Related Sections include the following:
   1. Division 01 Section "Alternates" for alternates that affect the scope of work of this Section.
   2. Division 06 Section "Miscellaneous Rough Carpentry" for blocking within frame walls.
   3. Division 09 Section "Resilient Base and Accessories" for base materials installed against casework.
   4. Division 11 Section "Laboratory Fume Hoods" for fume hoods, fume hood work surfaces, and cupsinks.
   5. Division 22 Sections for sinks, service fixtures and plumbing fixtures to be installed in casework.
   6. Division 26 and 27 Sections for electrical service, lighting fixtures, and data lines to be installed in casework.

1.3 DEFINITIONS
   A. Identification of casework components and related products by surface visibility.
   1. Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass insert doors and/or acrylic doors.
   2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, sliding solid doors.
   3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
   4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
   5. Semi-Exposed Surfaces: Interior surfaces that are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.

1.4 QUALITY ASSURANCE
   A. Manufacturer Qualifications:
1. Manufacturer shall have a minimum of 5 years experience in providing manufactured casework systems for similar types of projects, shall be able to produce evidence of financial stability, shall be able to produce evidence of adequate bonding capacity, and shall maintain adequate facilities and personnel required to perform work on this project in a timely manner.

2. Manufacturer shall comply with the minimum levels of material and detailing indicated on the Drawings or as specified.

B. Installer: The installer shall be the casework manufacturer or shall be approved in writing by the casework manufacturer.

1.5 SUBMITTALS

A. Product Data: Manufacturer’s catalog with specifications and construction details, for the following items:

1. Epoxy resin countertops.
2. Cup sinks and epoxy resin sinks.
3. Plastic laminate and chemical-resistant laminate.
4. Premanufactured flammables and acids storage cabinets.
5. Casework hardware.

B. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Include section drawings of typical and special casework, work surfaces and accessories.
2. Indicates locations of plumbing and electrical service field connection by others.

C. Casework Samples:

1. Base cabinet: Cabinet conforming to specifications, with drawer and door.
2. Wall cabinet: Cabinet conforming to specifications, with door.
3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.
4. Component samples: Two sets of samples for each of the following: Names of individuals making tests and inspections.

   a. Decorative laminate color charts (including chemical-resistant laminates).
   b. PVC edgings.

5. The Owner reserves the right to request casework samples directly from the production line of cabinets specific to this project to assure specifications have been met.

D. Samples for initial selection purposes:

1. Fiber-Reinforced Plastic (FRP) panels: 8-1/2-inches x 11- inches (215.9mm x 279.4 mm), and trim. Provide manufacturers full range of colors.

E. Samples for verification purposes of the following:

1. Each type of plastic laminate required in the Work: 4-inch x 8-inch (101.6 mm) x (203 mm).
2. Epoxy resin countertop: 4-inch (101.6 mm) square sample.
3. Laminate-clad panel products: 8-1/2-inches x 11- inches (215.9mm x 279.4 mm).
4. Fiber-reinforced plastic (FRP) panels: 8-1/2-inches x 11- inches (215.9mm x 279.4 mm).
5. Exposed casework hardware: one of each type and finish.
F. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in “Quality Assurance” article to demonstrate their capabilities and experience. Include list of completed projects of similar scope and size with project names, addresses, names of Architects and Owners, and other information specified.

1.6 PRODUCT HANDLING

A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 20 percent to 50 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.7 JOB CONDITIONS

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.

1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.

2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, plastering and other wet operations are complete.

1.8 WARRANTY

A. All materials and workmanship covered by this section will carry a 5-year warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CASEWORK MANUFACTURERS:

A. Acceptable Manufacturer:

1. A manufacturer who fulfills the requirements of the “Quality Assurance” article in Part 1, above.

2.2 MATERIALS

A. Core Materials:


4. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A 208.2.

B. Hardboard:
1. ASTM A135.4, 3/16-inches (5 mm) thick.

C. Miscellaneous Dimension Lumber:
1. Maximum Moisture Content: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness.
2. Construction or No. 2 grade and any of the following species:
   a. Hem-fir (north); NLGA.
   b. Douglas fir-larch; WCLIB or WWPA.
   c. Spruce-pine-fir; NLGA.
   d. Douglas fir-south; WWPA.
   e. Hem-fir; WCLIB or WWPA.
   f. Douglas fir-larch (north); NLGA.

D. Plywood for Storage Shelving:
1. APA AC-Plugged, Exposure 1, PS1-95 sanded plywood.

E. Decorative Laminates:
3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-1995.
5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995.
8. Laminate Color Schedule:
   a. PL-1: Match Wilsonart International, color # 7935-07 “Shaker Cherry.”
   b. PL-2: Match Wilsonart International, color # 4888-38 “Rustic Slate.”

F. Edging Materials:
1. 1mm (.04-inch) PVC Edge Banding: for low-impact, semi-exposed edges such as drawer body edges.
2. 3mm (1/8-inch) PVC Edge Banding: machine profiled to 1/8-inch (3mm) radius (for exposed edges at countertops, drawer faces, door hinges, exposed adjustable shelf edges, etc.).

G. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class I (clear), Quality-Q3, 1/4-inch (6mm) thick, unless otherwise indicated.
1. Sliding doors shall be mounted in aluminum track.
2. Trim glass inserts: Extruded rigid PVC channel and self-locking insert retainer strip.
2.3 SPECIALTY ITEMS

A. Support Members: Furniture grade, epoxy powder-coated steel.
   1. Adjustable countertop support brackets with integral wire management and leveling pad.
   2. Undercounter support frames.
   3. Legs.

B. Open Laminate-Clad Shelving:
   1. Open plastic laminate clad shelving, (shelving not contained inside cabinet units), in locations indicated on drawings.
   2. All shelving shall have a 1-inch (25.4mm) -thick medium density particleboard substrate.
   3. Shelving shall be plastic laminate-clad, with 3mm PVC edge banding on exposed surfaces.
   4. Shelving shall be 7-feet (2133mm) tall with 5 adjustable shelves spanning 3 feet maximum, unless indicated otherwise on Drawings.

2.4 CABINET HARDWARE

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

   1. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.
   2. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

   3. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

B. Hinges: Five knuckle, institutional grade, 2-3/4-inch (69.9mm) overlay type with hospital tip, 0.095-inch (24.1mm)-thick. ANSI-BHMA standard A156.9, Grade 1.
   1. Doors 48-inches (1219 mm) and over in height have 3 hinges per door.
   2. Magnetic door catch with maximum 5-lb. (2.2kg) pull provided, attached with screws and slotted for adjustment.

C. Piano Hinges: Stainless steel piano hinge #351.10.023, by Hafele America, or equal.

D. Wire Pulls: Back mounted, solid metal, 5-inches (127mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.

E. Drawer Slides:

F. Adjustable Shelf Supports: Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to
interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4-inch (19mm) or 1-inch (25.4mm) -thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

G. Locks:

1. Door Locks: BHMA A156.11, E07121.
2. Drawer Locks: BHMA A156.11, E07041.
4. Provide two keys per lock and key all locks in same room alike.
5. Automatic door bolt: Hafele #530-1604, or equivalent, used to secure inactive door on all locked cabinets.

H. Heavy-Duty Shelf Standards and Brackets for Wall-Mounted Storage Shelving: For loads up to 540 lbs. (245kg) per bracket on 24-inch (610mm) -deep shelving and supports mounted on steel stud and gypsum wallboard walls:

1. Product: Knafe & Vogt #87 ANO Slotted Standards with 2-inch (50.8mm) height increments and #187 Heavy-Duty Brackets, or preapproved equal.
   a. Provide 210, 211, and 212 end, center and front steel shelf rests for anchoring shelves to bracket, or equal, and all other components necessary for complete installation.
   b. Provide length of standard and depth of bracket as indicated on Drawings.

I. Door Bumpers: 3/8-inch (9.5mm) diameter, 1/8-inch (3mm)-thick - clear.

J. Label Holders (at Science Rooms): Provide as indicated, sized to receive standard label cards approximately 1-inch by 2-inch (50.8mm) nominal size, finished to match other exposed hardware.

1. Location: All casework doors and drawers in Rooms 512, 512A, 514, and 514A.

K. Cable Management Tray:

1. Model CWM15-BK, channel-type, by Outwater Plastics, Inc., black molded polymer with adhesive tape. Provide at back of all computer counters.

L. Cable Grommets: Plastic, 2-3/8-inch (60mm)-diameter, with flush plug type cover, black, as manufactured by "Hafele" or "Lamp".

2.5 LABORATORY SPECIALTIES

A. Glassware Pegboard Drying Rack: Fisher Hamilton Model # 52L86500, with model 52L884400 Drip Trough, or equal.

1. Composed of 1-inch (25.4 mm) thick black epoxy resin with replaceable solid white polypropylene peg with glassware protector bases. Each rack shall have a stainless steel drip trough with a drain located on the right end and 36-inch (914.4 mm) long PVC drain tubing.
   a. Size: 30 inches (762 mm) wide x 30 inches (762 mm) high.
B. Upright Rod and Crossbar Assembly: Manufacturer: Fisher Hamilton; Model: # 26L111, complete upright rod assembly # 26L41 receptacles, or equal.

1. Provide at the demonstration tables in the following rooms:
   a. Room 512 – Biology Lab/ Lecture
   b. Room 513 – Chemistry Lecture

2.6 PREMANUFACTURED FLAMMABLES STORAGE CABINETS

A. General: Where indicated on the drawings furnish and install the following:

1. Large Flammables Storage Cabinet:
   a. Manufacturer: Eagle Manufacturing Company; Product: Model No. 4510 Safety Cabinet or equal,
   b. Double wall 18-gauge steel top, bottom, sides and doors, with 1-1/2-inch (12.7 mm) air space between walls.
   c. Paired, Self-closing doors with three-point latch and key lock.
   d. Two adjustable steel shelves supported by four brackets.
   e. Two vent ports, one high and one low, with 2-inch (50.8mm) threaded fittings, fire baffle and cap.
   f. Standard factory yellow finish with red warning graphics, “Flammable - Keep Fire Away.”
   g. OSHA, EPA, U.S. DOT and NFPA Approval.
   h. Size: 24 inches (1092mm)-W x 65 inches (1651mm)-H x 18 inches (457mm)-D.
   i. Locations: Room 514A: Provide one.

2.7 PREMANUFACTURED ACIDS STORAGE CABINETS

A. General: Where indicated on the drawings furnish and install the following:

1. Large Acids Storage Cabinet:
   a. Manufacturer: Eagle Manufacturing Company; Product: Model CRA-P44W Poly Acid-Corrosive Storage Cabinet or equal.
   b. Constructed of 100% polyethylene.
   c. Suitable for storage of sulphuric, hydrochloric and nitric acids.
   d. Independent upper and lower compartments.
   e. Two, 3/8-inch (9.5 mm) threaded inserts on top sides for wall anchors.
   f. Bottom shelves remove for cleaning of sump areas.
   g. Color: White with manufacturer’s standard warning labels on doors.
   h. Size: 24-inches (889mm)-W x 65-inches (1651mm)-H x 22-inches (559 mm)-D.
   i. Locations: Room 514A: Provide one.

2.8 HORIZONTAL SURFACE MOUNTED HEADWALL

A. General: Where indicated on the drawings furnish and install the following:

1. Surface mounted headwall:
   a. Manufacturer: Amico, Sapphire Series, Horizontal Console, HW60-O1T-0-SGEN (1-877-462-6426) - (or approved equal)
   b. Antique White
2.9 CABINET FABRICATION

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction:

1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24-inch deep cabinets and a minimum of 4 dowels each joint for 12-inch (305mm)-deep cabinets. Mechanical fasteners will not be accepted for cabinet body construction.
   a. Tops, bottoms and sides of all cabinets except sink base units shall be particleboard core.
   b. Tops, bottoms and sides of sink base units shall be moisture-resistant particleboard core.

2. Cabinet backs: 1/2-inch (12.7mm) thick prefinished medium density fiberboard. Wall and tall cabinets shall be provided with a 1-inch x 1-3/4 inch (25.4 x 44.5mm) PVC mounting strip used to secure the cabinet to the wall.
   a. Exposed back on fixed or movable cabinets, except sink base units: 3/4-inch (19mm)-thick particleboard with the exterior surface finished in VGS laminate as selected.
   b. Exposed back on fixed or movable sink base cabinets: 3/4-inch (19mm)-thick moisture resistant particleboard with the exterior surface finished in VGS laminate as selected.

3. Fixed base and tall units shall have an individual factory-applied base, constructed of 3/4-inch (19mm)-thick exterior grade plywood. Base is 96mm (nominal 4-inch)-high unless otherwise indicated on the drawings.

4. Base units, except sink base units: Full sub-top. Sink base units shall be provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.

5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm (1-1/4-inch) line boring centers. Mount door hinges, drawer slides and pullout shelves in the line boring for consistent alignment.

6. Exposed and semi exposed edges.
   a. Edging: 1mm (.04-inch) PVC.

7. Adjustable shelf core: 3/4-inch (19mm)-thick particleboard up to 24-inches (610mm)-wide, 1 inch thick particleboard over 24 inches wide.
   a. Front edge: 3mm (1/8-inch) PVC.

8. Interior finish, units with open Interiors:
   a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

9. Interior finish, units with closed Interiors:
   a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

10. Exposed ends:
   a. Faced with VGS high-pressure decorative laminate.
11. Wall unit bottom:
   a. Faced with thermally fused melamine laminate.

12. **Balanced construction of all laminated panels is mandatory.** Unfinished core stock surfaces shall not be permitted, even on concealed surfaces (excluding edges).

C. Drawers:

1. Sides, back and sub front: Minimum 1/2-inch (12.7mm)-thick particleboard, laminated with thermally fused melamine dowelled and glued into sides. Top edge banded with 1mm PVC.
2. Drawer bottom: Minimum 1/2-inch (12.7mm)-thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
3. Paper storage drawers: Minimum 3/4-inch (19mm)-thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2-inch (12.7mm)-thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

D. Door/Drawer Fronts:

1. Core: 3/4-inch (19mm)-thick particleboard, except at sink units, which shall have a ¾-inch thick moisture-resistant particleboard core.
2. Provide double doors for all openings in excess of 24 inches wide
3. Faces:
   a. Exterior: VGS High-pressure decorative laminate.
   b. Interior: High-pressure cabinet liner CLS
4. Door/drawer edges: 3mm (1/8-inch) PVC, external edges and outside corners machine profiled to 1/8-inch radius.
5. Miscellaneous Shelving:
   a. VGS High-pressure decorative laminate.
   b. Core material: 3/4-inch (19mm) or 1-inch (25.4mm)-thick particleboard.
   c. Exterior Edges: 1mm (.04-inch) PVC.

2.10 DECORATIVE LAMINATE COUNTERTOPS:

A. Core:

1. All countertops except at sink elevations: 1-inch (25.4mm)-thick ANSI A 208.1-1993 M-2 particleboard.
2. Countertops at sink elevations: 1-inch (25.4mm)-thick ANSI A 208.1-1993 M-3 MR moisture resistant particleboard.
3. Surface: HGS/HGP high-pressure decorative laminate with balanced backer sheeting.
4. Edges, including applied backsplash: 3mm (1/8-inch) PVC, exposed edges and corners machine profiled to 1/8-inch (3mm) radius. Edges are machine applied with moisture curing polyurethane (PUR) hot melt for fast setting, high strength adhesion.

2.11 EPOXY RESIN COUNTERTOPS

A. Tops, Box Curbs, Splash Rim: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Make exposed edges and corners uniformly rounded.
B. Reagent Shelves: Provide 12-inch (305mm)-wide shelf where indicated.

C. Top Thickness: 1-inch (25.4mm) thickness, unless noted otherwise, with tolerance not exceeding plus or minus 1/32 inch. Provide front and end overhang of 1 inch over base cabinets, formed with continuous drip groove on under surface 1/2 inch from edge.

D. Cast Modified Epoxy Resin: Factory-molded tops of modified epoxy resin formulation, uniform mixture throughout full thickness. Provide in smooth, nonspecular finish of color indicated.

2. Physical Properties: Comply with the following minimum requirements:
   a. Flexural strength: 15,000 psi (103 mPa).
   b. Compressive strength: 35,000 psi (241 mPa).
   c. Hardness (Rockwell M): 100.
   d. Water absorption (24 hours): 0.02 percent (maximum).
   e. Heat distortion point: 350 deg F (176 deg C).
   f. Thermal shock resistance: Highly resistant.

3. Chemical Resistance: Spot test with the following reagents in standard laboratory concentrations, in contact with finished top for 24 hours; top shall be entirely unaffected or show only slight dulling of finish:
   a. Glacial acetic acid, nitric acid, sulfuric acid, ammonium hydroxide, sodium hydroxide, amyl acetate, benzene, ethyl acetate, ethyl ether, hydrogen peroxide, methyl ethyl ketone, phenol, trichloroethylene, zinc chloride, hydrochloric acid, phosphoric acid, chromic acid, calcium hypochlorite, acetone, aqua regia, butyl alcohol, ethyl alcohol, formaldehyde, methyl alcohol, kerosene, silver nitrate, xylene.

4. Workmanship: Cast surfaces very smooth, with factory cutouts for sinks and drip grooves. Fabricate plain butt-type joints assembled with epoxy adhesive and prefitted, concealed metal spline.

5. Curbs and backsplashes shall be 1-inch (25.4mm)-thick or greater and epoxy bonded to the surface of the top to form a square edge.

6. Manufacturer: Subject to compliance with requirements, provide modified epoxy resin tops from one of the following (or approved equal prior to bid):
   a. Durcon:
      1255 S. Mill Street
      Plymouth, Michigan
      313 - 455-4520
   b. EPOXYN Products
      500 E. 16th Street
      Mountain Home, AR
      501-352-4321
   c. Laboratory Tops, Inc.
      206 Allison Drive
      Taylor, Texas
      512-352-5591

2.12 EPOXY RESIN SINKS

A. Sizes: as indicated on the drawings and as herein specified.
B. Outlets: 1.5-inch (38mm)-diameter, 6-inch (152.4mm) minimum length, fabricated of cast epoxy resin of same material as sink wherever possible, or as otherwise acceptable to Architect.

C. Overflows: For each sink, provide overflow of standard beehive or open top design and with separate strainer. Height 2-inches (50.8mm) less than sink depth. Provide in same material as sink.

D. Cast Epoxy Resin Sinks: Nonspecular black, molded in one piece with surfaces smooth, corners coved and bottom sloped to outlet. Minimum physical properties and chemical resistance as specified for cast epoxy resin tops: 1/2-inch (12.7mm) minimum thickness.

1. Size: As indicated on the drawings.
2. Drain Location: Corner.
3. Provide sink supports and brackets as required for complete mounting into casework units.
4. Manufacturers:
   a. Durcon.
   b. EPOXYN Products.
   c. Laboratory Tops, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:
A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:
A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.
B. Coordinate with plumbing, mechanical and electrical contractors for utilities and appurtances installed in millwork.

3.3 INSTALLATION
A. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8-inch in 8-feet (3mm in 2.4m) for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.
B. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit. Refinish cut surfaces or repair damaged finish at cuts.
C. Anchor interior architectural woodwork to blocking built into walls. Secure to blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
D. Cabinets: Install without distortion do that 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 the installation of hardware and accessory items as indicated.
E. Tops: Anchor securely to base units and other support systems as indicated.

F. Complete the finishing work specified in this section to extent not completed at shop before installation of woodwork.

G. Repair minor damage per plastic laminate manufacturer’s recommendations. Replace other damaged cabinets or materials.

3.4 INSTALLATION OF FRP:

A. Install FRP in largest practical panel sizes, with fewest joints, in strict accordance to manufacturer’s written instructions for substrate indicated.

B. Trim out all butt joints and panel edges with manufacturer’s standard trim. Miter all 90-degree corners.

3.5 CLEANING:

A. Leave cabinets broom clean inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

B. Remove and dispose of all packing materials and related construction debris.

END OF SECTION 064023
SECTION 072100 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

2. Insulation fasteners.
3. Sound attenuation blanket insulation.

B. Related Sections include the following:

1. Division 05 Section “Cold-Formed Metal Framing” for installation in metal-framed assemblies of insulation specified by referring this section.
2. Division 07 Sections “Penetration Firestopping” for UL assemblies requiring firesafeing insulation.
3. Division 09 Sections “Non-Load-Bearing Steel Framing” and Gypsum Board” for sound attenuation blanket insulation.
4. Division 22 and 23 “Insulation” Sections.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass or slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.


1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2.2 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION (FIRESAFING)

1. Available Manufacturers:
2. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
3. Density: Minimum 4 lb/ft$^3$ (64 kg/m$^3$).
4. Type: SAF.

2.3 SOUND ATTENUATION BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation:

1. Available Manufacturers

   a. CertainTeed Corporation.
   b. Guardian Fiberglass, Inc.
   c. Johns Manville.
   d. Knauf Fiber Glass.
   e. Owens Corning.

2. Thickness: As required to fill stud cavity.

2.4 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Available Products:

   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
   c. Gemco; Spindle Type.

2. Plate: Perforated galvanized carbon-steel sheet, 0.030-inch (0.762 mm) thick by 2 inches (50 mm) square.
3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Available Products:
a. Gemco; 90-Degree Insulation Hangers.

2. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.

3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Available Products:
   a. AGM Industries, Inc.; RC150.
   b. AGM Industries, Inc.; SC150.
   c. Gemco; Dome-Cap.
   d. Gemco; R-150.
   e. Gemco; S-150.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Ceiling plenums.
   b. Attic spaces.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Available Products:
   a. AGM Industries, Inc.; TACTOO Adhesive.
   b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
   c. Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer’s written instructions applicable to products and application indicated.
B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Install mineral-fiber insulation 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 cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

C. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5-lb/cu. ft. (40 kg/cu. m).

D. Install firesafing insulation per requirements of UL-referenced assembly.

3.6 INSTALLATION OF SOUND ATTENUATION BLANKET INSULATION

A. Install sound attenuation blanket insulation in framed walls and partitions full height, unless noted otherwise.
3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100
SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Mechanically fastened thermoplastic polyolefin (TPO) roofing system.
   2. Roof insulation.

B. Related Sections:
   1. Section 014100 "Air Barrier System" for transitions to other air barrier components.
   2. Section 042200 “Concrete Unit Masonry.”
   4. Section 061600 “Sheathing.”
   5. Section 072100 “Thermal Insulation.”
   6. Section 072800 “Air Sealing.”
   7. Section 074213.13 “Formed Metal Wall Panels.”
   8. Section 074213.23 “Metal Composite Wall Panels.”
   9. Section 074233 “Plastic Wall Panels.”
   10. Section 076200 “Sheet Metal Flashing and Trim” for associated roof flashings.
   11. Section 077200 “Roof Accessories” for roof access hatches and smoke vents.
   12. Division 22, 23, 26, and 27 for fixtures and appurtances installed on roof.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

C. Samples for Verification: For the following products:
1. Sheet roofing, of color required.
2. Walkway pads or rolls, of color required.

1.6 INFORMATIONAL SUBMITTALS
A. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
B. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS
A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 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.

1.9 COORDINATION
A. Coordinate transitions to other air barrier system components per Section 014100 “Air Barrier System.”

1.10 WARRANTY
A. Installer’s Warranty: Submit roofing Installer's warranty, signed by Installer, covering the installation of the Work of this Section, including all components of roofing system such as membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, vapor retarders, and walkway pads, for the following warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.
B. Manufacturer’s 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 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:

D. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

E. Exterior Fire-Test Exposure: Minimum Class B per ASTM E 108 or UL 790; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

A. Basis-of-Design manufacturer, Roof Membrane: Carlisle SynTec Incorporated.

1. Subject to compliance with requirements, comparable systems by one of the following manufacturers may be incorporated into the Work, with written approval of the Architect prior to bidding:
   a. Firestone Building Products.
   b. GAF Materials Corporation.
   c. Genflex Roofing Systems.
   d. Versico Incorporated.
   e. Johns Manville.

B. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer for the above specified warranty.

2.3 ROOFING ASSEMBLIES

A. Mechanically-Attached Roofing Assembly RA-1 on minimum 20 gage steel roof deck:
   1. Minimum UL Class B Assembly.
   3. Membrane: 60-mil white TPO.
   4. Thermal Insulation: (2) layers of Polyisocyanurate Board Insulation: ASTM C 12289, Type II, Class 1, Grade 2:
      a. Provide (1) layer 2.5 inches thick, and a second layer 3 inches thick, for a total thickness of 5.5 inches, not including tapered insulation.
   5. Tapered Insulation: Polyisocyanurate or Expanded Polystyrene; ASTM C578 – Type I; 1.0 lb/cu. ft. density; tapered as required to provide minimum ultimate roof slope of 1/4 inch in 12 inches.

B. Mechanically-Attached Roofing Assembly RA-2 on minimum 20 gage steel roof deck:
   1. Minimum UL Class B Assembly.
   2. System R-Value: Not Required.
   3. Membrane: 60-mil white TPO.
4. Substrate Board: (1) layer 1/2-inch G-P Dens Deck or USG Securock Glass-Mat Roof Sheathing.
5. Provide tapered insulation as required for roof drainage.

C. Mechanically -Attached Roofing Assembly RA-3 on combustible wood deck:

1. Minimum UL Class C Assembly.
3. Membrane: 60-mil white TPO.
4. Thermal Insulation: (2) layers of Polyisocyanurate Board Insulation: ASTM C 12289, Type II. Class 1, Grade 2.
   a. Provide (1) layer 2.5 inches thick and a second layer 3 inches thick, for a total thickness of 5.5 inches, not including tapered insulation.
5. Tapered Insulation: Polyisocyanurate or Expanded Polystyrene; ASTM C578-Type1; 1.0 lb/cu. ft. density, tapered as required to provide minimum ultimate roof slope of 1/4 inch in 12 inches.

D. Mechanically -Attached Roofing Assembly RA-4 on combustible wood deck:

1. Minimum UL Class C Assembly.
2. System R-Value: Not Required.
3. Membrane: 60-mil white TPO.
4. Thermal Insulation: (1) layer of Polyisocyanurate Board Insulation: ASTM C 12289, Type II. Class 1, Grade 2.
   a. Provide (1) layer 2 inches thick on sloped decks.
5. Tapered Insulation: Polyisocyanurate or Expanded Polystyrene; ASTM C578-Type1; 1.0 lb/cu. ft. density, tapered as required to provide minimum ultimate roof slope of 1/4 inch in 12 inches.
   a. Provide (1) layer with minimum 3/4-inch thickness on level decks.

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.
B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
C. Bonding Adhesive: Manufacturer's standard.
D. Coated Sheet Metal: Manufacturer’s standard, heat-weldable, TPO-coated, metallic-coated sheet metal flashing material.
E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.
F. Rooftop Vent: VentSure Metal Square Top Vent model # GVSTWG, as manufactured by Owens-Corning, or comparable product, only with written approval of Architect in an Addendum published prior to Bidding:

1. Fabricated from Galvanized steel with factory finish.
2. Base: 16-1/2 x 17-1/2 inches.
3. Opening: 8 x 8 inches.
4. Net free ventilation area per unit: 51 sq. in.

G. Miscellaneous Accessories: Provide metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 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:

   b. Carlisle SynTec Incorporated.
   c. Firestone Building Products.
   d. GAF.
   e. Hunter Panels.
   f. Johns Manville; a Berkshire Hathaway company.
   g. Rmax, Inc.

2. R-Value: Not less than 31.8.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope 1/2 inch per foot unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.


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

   a. Georgia-Pacific Building Products; Den Deck.
   b. United States Gypsum Company; Securock.

2.6 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer.
C. Deck-to-Wall Air Infiltration Barrier: 725TR Air & Vapor Barrier, as manufactured by Carlisle SynTec, Inc., or equivalent product by manufacturer of roof membrane.

2.7 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16-inch-thick and acceptable to roofing system manufacturer.

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.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.2 SUBSTRATE BOARD INSTALLATION

A. Where substrate board is indicated, install 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 INSULATION INSTALLATION

A. Install Deck-to-Wall Air Infiltration Barrier at roof perimeter and around roof penetrations as recommended by roof membrane manufacturer.

B. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

C. Install tapered insulation between layers of thermal insulation under area of roofing indicated to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Install two layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
3.4 MECHANICALLY FASTENED ROOFING INSTALLATION

A. Mechanically fasten roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Mechanically fasten (or adhere) roofing securely at terminations, penetrations, and perimeter of roofing.

D. Apply roofing with side laps shingled with slope of roof deck where possible.

E. In-Seam Attachment: Secure one edge of TPO sheet using fastening plates centered within seam, and mechanically fasten TPO sheet to roof deck.

F. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
   2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

G. Spread sealant bed over deck-drain flange at roof drains, and securely seal 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 seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.
3.7 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423
1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following applications indicated in the Joint Sealant Schedule at the end of Part 3, including those applications specified by reference to this Section.

B. Related Sections include the following:
   1. Division 07 Sections, “Thermoplastic Membrane Roofing” and “Sheet Metal Flashings and Trim” for related joints sealants.
   2. Division 07 Section “Fire-Resistive Joint Systems” for sealing joints in fire-resistance-rated construction.
   3. Division 08 Section “Glazing” for glazing sealants.
   4. Division 09 Section “Gypsum Board” for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
   5. Division 09 Section “Acoustical Panel Ceilings” for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer’s color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Qualification Data: For Installer.

F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.

2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

D. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

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

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric 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’s standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer’s written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer’s full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant ES-3:

1. Available Products:

   a. Pecora Corporation; 898.
b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (nonsag).
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.

E. Single-Component Nonsag Urethane Sealant ES-4:

1. Available Products:
   a. Bostik Findley; Chem-Calk 900.
   b. Bostik Findley; Chem-Calk 915.
   c. Bostik Findley; Chem-Calk 2639.
   d. Pecora Corporation; Dynatrol I-XL.
   e. Polymeric Systems Inc.; Flexiprene 1000.
   f. Polymeric Systems Inc.; PSI-901.
   g. Schnee-Morehead, Inc.; Permathane SM7100.
   h. Schnee-Morehead, Inc.; Permathane SM7108.
   i. Schnee-Morehead, Inc.; Permathane SM7110.

2. Type and Grade: S (single component) and NS (nonsag).
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
   a. Use O Joint Substrates: Galvanized steel and brick.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant LS-1: Comply with ASTM C 834, Type P, Grade NF.

B. Available Products:
   1. Bostik Findley; Chem-Calk 600.
   4. Sonneborn, Division of ChemRex Inc.; Sonolac.
   5. Tremco; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints AS-1: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
   1. 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.
   2. Available Products:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
2.6 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer’s written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

   a. Concrete.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

   a. Metal.
   b. Glass.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer’s written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application JS-1: Interior perimeter joints of exterior openings.

2. Joint-Sealant Color: As selected by Architect from manufacturer’s full range.

B. Joint-Sealant Application JS-2: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

2. Joint-Sealant Color: As selected by Architect from manufacturer’s full range.

C. Joint-Sealant Application JS-3: Vertical joints on exposed surfaces of interior unit masonry walls and partitions.

2. Joint-Sealant Color: As selected by Architect from manufacturer’s full range.

D. Joint-Sealant Application JS-4: Perimeter joints between interior wall surfaces and frames of interior doors, and windows.

2. Joint-Sealant Color: As selected by Architect from manufacturer’s full range.

E. Joint-Sealant Application JS-5: Perimeter joints between interior wall surfaces and metal deck, and cast in place concrete floors.

2. Joint Sealant Color: As selected by Architect from manufacturer’s full range.
END OF SECTION 079200
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. Standard hollow metal doors and frames of the following types:
         a. Welded, factory-primed unit type.
      2. Assemblies: Provide hollow metal door and frame assemblies for the following:
         a. Labeled, smoke-rated.
         b. Labeled, fire-rated.
      3. Fire-rated steel transparent wall assemblies incorporating fire-resistive-rated glass.
   B. Related Sections include the following:
      1. Division 05 Section "Cold-Formed Metal Framing" for exterior walls receiving hollow metal doors and frames.
      2. Division 07 Section "Joint Sealants" for sealing around the perimeters of hollow metal frames.
      3. Division 08 Section "Flush Wood Doors" for factory-finished solid core wood doors in hollow metal frames.
      4. Division 08 Section "Door Hardware" for door hardware for hollow metal doors and frames.
      5. Division 08 Section "Glazing" for borrowed lights and vision panels in hollow metal doors and frames.
      6. Division 09 Painting Sections for field painting hollow metal doors and frames.
      7. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.
      8. Division 28 Section "Fire Alarm" for connections to automatic-closing fire- and smoke-rated doors.

1.3 DEFINITIONS
   A. Minimum Thickness: Minimum thickness of base metal without coatings.
   B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS
   A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance ratings and finishes.
   B. Shop Drawings: Include the following:
      1. Elevations of each door design.
      2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for openings and details as those on Contract Drawings.
   1. Indicate requirements of glazing frames and stops with glass and glazing requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252, or UL 10C.

C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Mark all doors, frames and miscellaneous parts and cartons with Architect’s opening number.

B. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

C. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

D. Inspect doors and frames upon delivery for damage. Minor damage may be repaired provided repaired item matches new work and is acceptable to Architect. Otherwise, remove and replace damaged item as directed.

E. Store hollow metal work under cover at Project site. Place units on minimum 4-inch- (102-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that can create a humidity chamber. If cardboard wrappers become wet, remove cartons immediately.
   1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.9 WARRANTY

A. All hollow metal doors and frames shall be supplied with a one-year warranty against defects in materials and workmanship.

B. Revolving darkroom doors shall be supplied with a 30-month warranty against defects in materials and workmanship.

C. Warranty shall commence on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.
5. Windsor Republic Doors.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.

D. Supports and Anchors: Fabricated from not less than 0.042-inch (1.0mm) –thick sheet steel where used with steel frames; and 0.053-inch (1.2mm) –thick metallic-coated sheet steel complying with ASTM A 591 A 591M, where used with metallic-coated steel frames.

E. Inserts, Bolts, and Fasteners: Manufacturer’s standard units. Where items are to be built into exterior walls hot-dip galvanize according to ASTM A 153/A 153M, Class C or D as applicable.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
H. Glazing: Comply with requirements in Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Primer: Apply after fabrication.

K. Rust-inhibitive enamel paint, either air-dried or baked, compatible with intermediate and finish coats specified in Division 09 “Painting” Sections, and complying with ANSI/SDI A250.10, “Test Procedure and Acceptable Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

2.3 STANDARD HOLLOW METAL DOORS - GENERAL

A. General: Provide 1-3/4-inch (44mm) –thick doors of materials and ANSI/SDI A250.8 grades and models as indicated on drawings, and as specified below:

1. Interior Doors: ANSI/SDI A250.8, Level 2; Physical Performance Level B (Heavy-Duty), Model 1 (Full flush) or Model 2 (Seamless), fabricated from minimum 0.042-inch (1.0mm) –thick cold-rolled sheet steel faces, factory-primed, and meeting requirements of ANSI A250.4.

2. Exterior Doors ANSI/SDI A250.8, Level 3; Physical Performance Level A (Extra Heavy-Duty), Model 1 (Full flush) or Model 2 (Seamless), fabricated from minimum 0.053-inch (1.6mm) –thick sheet steel faces prior to receiving metallic coating, factory-primed, and meeting requirements of ANSI A250.4.

3. Core Construction: Manufacturer’s standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

   a. Thermal-Rated (Insulated) Doors: At exterior locations and where sound seals are indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 12.3 deg F x h x sq. ft./Btu (2.166 K x sq. m/W) when tested according to ASTM C 1363.

B. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door faces sheets.

C. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES - GENERAL

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Provide hollow metal frames and doors, sidelights, borrowed lights and other openings.

1. Frames for Interior Openings: ANSI/SDI A250.8 frames, with coped and welded corners and seamless face joints, fabricated from 0.053-inch (1.6mm) –thick, cold-rolled sheet steel, factory-primed, and meeting the requirements of ANSI/SDI A250.4.

2. Frames for Exterior Openings: ANSI/SDI A250.8 frames, with coped and welded corners and seamless face joints, fabricated from 0.067-inch (1.7mm) –thick, metallic-coated sheet prior to receiving metallic-coating, factory-primed, and meeting the requirements of ANSI/SDI A250.4.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

D. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of frames and 2 silencers on heads of double-door frames.

E. Grout Guards: Provide minimum 0.0179-inch (0.45mm) –thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation, and to close off interior of openings.
2.5 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
   3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
   4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
   5. Combination Type: With dual anchors, designed to engage stud, welded to back of frame, and with adjustable strap-and-stirrup or T-shaped anchor to fit into horizontal course of masonry; not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick. Use at openings in frame walls with masonry veneer.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, 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 (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- (6.4-mm-thick by 25.4-mm-) wide steel.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick

2.8 FABRICATION – STEEL (HOLLOW METAL) DOORS AND FRAMES

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 thickness of metal. 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.
   1. Clearances: Not more than 1/8-inch (3mm) at jambs and heads, except not more than 1/4-inch (6 mm) between non-fire-rated pairs of doors. Not more than 3/4-inch (19mm) at bottom.
      a. For Fire-Rated Doors, provide clearances according to NFPA 80.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 “Manufacturing tolerances for Standard Steel Doors and Frames.”
C. Hollow Metal Doors:

1. Fabricate exposed faces of doors only from cold-rolled steel sheet.
2. Exterior Doors: At all exterior locations, fabricate doors and frames from metallic-coated steel sheet according to ANSI/SDI A250.8. Close top and bottom edges of doors flush. As an integral part of door construction, or by addition of a minimum 0.042-inch (1 mm) -thick metallic coated steel channel, with channel webs placed even with top and bottom edges. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of door against water penetration.
4. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.
5. Metallic-Coated Steel Doors and Frames: At all exterior locations, fabricate doors and frames from metallic-coated steel sheet according to ANSI/SDI A250.8. Close top and bottom edges of doors flush. As an integral part of door construction, or by addition of a minimum 0.042-inch (1 mm) -thick metallic coated steel channel, with channel webs placed even with top and bottom edges. Seal joints in top edges of door against water penetration.

D. 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and Mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      1) Three anchors per jamb up to 60 inches (1524 mm) high.
      2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
      3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
      5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
   b. Compression Type: Not less than two anchors in each jamb.
   c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware. Drilling and tapping for surface-applied hardware may be done at Project Site.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Divisions 26 and 27 Sections for doors and frames with power-operated hardware, access control and intrusion detection.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or 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 type of glazing and type of installation indicated.

H. Exposed Fasteners: Unless otherwise noted, provide countersunk flat or oval heads for exposed screws and bolts.

2.9 FINISHES

A. General: Comply with NAAMM’s “Metal Finishes Manual” for recommendations relative to applying and designating finishes.

B. Steel (Hollow Metal) Doors and Frames:
1. Apply prime finishes to doors and frames after fabrication.
2. Shop Priming: Clean. Treat and paint exposed surfaces of steel door and frame units, including metallic-coated surfaces, with primer compatible with finish coat specified in Division 9 “Painting” Sections.
   a. Clean steel surfaces of all mill scale, rust, oil. Grease, dirt and other foreign materials before application of paint.
   b. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

C. Transparent Wall Assemblies:
1. Apply manufacturer’s standard powder coating finish system to factory-assembled frames before shipping, complying with manufacturer’s written requirements for surface preparation including pretreatment, application and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. 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. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal door, frames, and accessories according to Shop Drawings, manufacturer’s data, and as specified.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install frames with removable glazing stops located on secure side of opening.
   d. Install door silencers in frames before grouting.
   e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


   a. Attach wall anchors to studs with screws. In metal stud walls and partitions, install at least 3 wall anchors per jamb at hinge and strike levels.

4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

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. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

8. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: \( \frac{1}{8} \) inch \( (3 \, \text{mm}) \) plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \).
   b. Between Edges of Pairs of Doors: \( \frac{1}{8} \) inch \( (3 \, \text{mm}) \) plus or minus \( \frac{1}{16} \) inch \( (1.6 \, \text{mm}) \).
   c. Between Bottom of Door and Top of Threshold: Maximum \( \frac{3}{8} \) inch \( (9.5 \, \text{mm}) \).
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum \( \frac{3}{4} \) inch \( (19 \, \text{mm}) \).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer’s written instructions.

   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches \( (230 \, \text{mm}) \) o.c. and not more than 2 inches \( (50 \, \text{mm}) \) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of air-drying, rust-inhibitive primer compatible with shop primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer’s written instructions.

END OF SECTION 081113
RENAISSANCE HIGH SCHOOL – TENANT IMPROVEMENT
MERIDIAN, IDAHO
HA PROJECT #17015

SECTION 081416 - FLUSH WOOD DOORS

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. Solid-core doors with wood-veneer faces.
   2. Factory finishing flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.
   4. Factory-glazing of flush wood doors.

B. Related Sections:
   1. Division 08 Section "Hollow Metal Doors and Frames" for hollow metal frames for flush wood doors.
   2. Division 08 Section "Door Hardware" for door hardware for flush wood doors.
   3. Division 08 Section "Glazing" for glass requirements.
   4. Division 28 Sections for wiring for access control and intrusion detection devices.
   5. Division 28 Section “Digital Addressable Fire-Alarm System” for connections to automatic-closing fire- and smoke-rated doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate doors to be factory finished and finish requirements.
   4. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
   2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
      a. Provide samples for each species of veneer and solid lumber required.
b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

D. Fire-Rated and Smoke-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.

E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Door Schedule in Drawings and on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.

   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
5. Oshkosh Architectural Door Company.
6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Aesthetic Grade: Premium.

C. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

D. Prefitting: Doors shall be pre-fit and beveled at the factory to fit the openings. Prefit tolerances shall be in accordance with the requirements of WDMA I.S. 1-A and NFPA-80 at fire- and smoke-rated openings.

E. Machining: Doors shall be machined in the factory for mortised hardware items, including pilot holes for butt hinge screws and lock fronts.

F. Particleboard-Core Doors:


G. Hardware Blocking: Provide structural composite lumber or Firestop blocking for surface applied hardware on particleboard-core doors. Through-bolting is not an acceptable substitution. Gluing screws into particleboard core is not an acceptable substitution. Blocking is required for all hardware mounting on all mineral core doors.

1. Mortise locks with through-bolting trim:
   a. Particleboard core: Blocking not required.
   b. Structural composite lumber core: Blocking not required.

2. Panic and Fire Exit Hardware:
   a. Particleboard core: Blocking required.
   b. Structural composite lumber core: Blocking not required.

3. Closers:
   a. Particleboard core: Blocking required.
   b. Structural composite lumber core: Blocking not required.
4. Automatic Door Bottoms:
   a. Particleboard core: Blocking required.
   b. Structural composite lumber core: Blocking required

H. Tops and Bottoms: Factory seal top and bottom rails with and approved wood sealer, where required for specified warranty.

I. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

J. 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.
   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 5-PLY FLUSH WOOD VENEER-FACED DOORS

A. All doors indicated to be flush wood veneer doors on the Door Schedule shall receive factory finishes indicated below.

B. Grade: WDMA I.S. I-A Premium, type PC-5 (particleboard cores) and SCLC-5 (structural composite lumber cores). (Seven-ply and non-bonded core construction are not acceptable substitutions).

C. Stiles: Structural composite lumber, except that the outer stile shall be the same species as the face veneer, and shall be applied prior to beveling doors.

H. Rails: Structural composite lumber.

J. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before crossbands and face veneers are applied.

K. Faces Veneers: Match existing doors within Renaissance High School.
   1. Veneer Matching: Match existing doors within Renaissance High School
      a. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.

L. Factory Finishes: WDMA TR-6 catalyzed polyurethane, premium grade. Wash coat, followed by 3 coats of sealer, followed by sanding with 200 grit paper, followed by 2 top coats.
M. Match existing doors within Renaissance High School.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
   1. Wood Species: Same or compatible species as door faces.
   2. Profile: Flush rectangular beads.
   3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. 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.

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 requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Coordinate with Division 27 Sections for wiring requirements for access control and intrusion detection devices.

C. Openings: Cut and trim openings through doors in factory.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section “Glazing.”

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:
   1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: As specified above.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Hardware: For installation, see Division 08 Section "Door Hardware."
B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTION
A. Operation: Rehang or replace doors that do not swing or operate freely.
B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
C. Protect doors as recommended by door manufacturer to ensure that wood doors shall be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 081416
PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes the following:
   1. Access doors and frames for walls and ceilings.
B. Related Sections include the following:
   1. Division 05 Section “Cold-Formed Metal Framing” for anchoring access doors and frames in gypsum board walls and ceilings.
   2. Division 09 Sections “Non-Load-Bearing Metal Framing” and “Gypsum Board” for anchoring access doors and frames in gypsum board walls and ceilings.

1.3 SUBMITTALS
A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE
A. Source Limitations: Obtain each type of access door and frame through one source from a single manufacturer.
B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for vertical access doors and frames.
   2. ASTM E 119 or UL 263 for horizontal access doors and frames.
C. Size Variations: Obtain Architect’s acceptance of manufacturer’s standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

C. Steel Finishes: Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   2. 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 paint manufacturer’s written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
   3. 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 (0.04 mm). Prepare, treat, and coat metal to comply with resin manufacturer’s written instructions.

D. Drywall Beads: Edge trim formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Acudor Products, Inc.
   2. Babcock-Davis; A Cierra Products Co.
4. Cendrex Inc.
5. Dur-Red Products.
6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
7. Jensen Industries.
8. J. L. Industries, Inc.
10. Larsen’s Manufacturing Company.
11. MiFab, Inc.
12. Milcor Inc.

1. Locations: Gypsum board wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-(1.5-mm-) thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-(1.5-mm-) thick sheet metal with drywall bead flange.
5. Lock: Cylinder.

1. Locations: Gypsum board wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than 45 minutes.
3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch (0.9 mm).
5. Frame: Minimum 0.060-inch-(1.5-mm-) thick sheet metal with drywall bead.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
1. Exposed Flanges: As indicated.
2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
1. For cylinder lock, furnish two keys per lock and key all locks alike.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113
SECTION 083326 - OVERHEAD COILING DOORS

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 open-curtain overhead coiling grilles.

B. Related Section:
   1. Division 05 Section “Structural Steel Framing” for structural supports.
   2. Division 05 Section "Metal Fabrications" for miscellaneous steel framing.
   3. Division 08 Section "Door Hardware" for lock cylinders and keying.
   4. Division 09 Section “Interior Painting” for finish paint of frame, door, and accessories.
   5. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer’s product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, for each color and texture specified.

D. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

E. Installer Certificates: Signed by manufacturer, certifying that installers comply with specified requirements, and are acceptable to the manufacturer.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Fire Rated Assemblies: Provide assemblies complying with UL 1784.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's two-year limited warranty.

PART 2 - PRODUCTS

2.1 OVERHEAD COILING COUNTER DOORS OC-1

A. Galvanized Steel Counter Doors:

1. Basis-of-Design Product: Manufacturer: Overhead Door Corporation; Product: 640 Series Counter Fire Doors, between jambs Mounted Overhead Coiling Galvanized Steel Counter door with counter, or a comparable product by one of the following:

a. Cookson Company.
b. Cornell Iron Works, Inc.
c. Mahon Door Corporation.
d. McKeon Rolling Steel Door Company, Inc.
e. Raynor.
f. Windsor Door.

B. Operation Cycles: Not less than 20,000.

C. Curtain Material: Galvanized Steel.

1. Interlocking slats, Type F-158 fabricated of 22-gauge galvanized steel. End locks attached to alternate slabs to maintain curtain alignment and prevent lateral slat movement.

D. Finish:

1. Slats and hood galvanized steel in accordance with ASTM A 653 with rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester (powder coated) top coat.
2. Non-galvanized exposed ferrous surfaces shall be black powder coated.

E. Bottom Bar: tubular locking bottom bar.

F. Guides:

a. Roll-formed black powder coated steel with brush smoke seals.
b. Fastening Guides: seal all penetrations in wall per Division 07 “Joint Sealants”

G. Brackets: black powder coated steel to support counterbalance, curtain, and hood.

H. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel.

I. Hood: Galvanized painted steel. Provide with exterior UL Listed, brush smoke seal.

J. Operation: Crank Operation.
K. Automatic Closure: Fire Sentinel time-delay release mechanism.

L. Locking: Cylinder lock for manually operated doors.

M. Wall Mounting Condition:
   1. Between jambs mounting.

N. Counter: provide stainless steel counter.
   1. Size: as indicated on drawings.
   2. Color: Stainless steel
   3. Mounting Hardware and Supports: Provide with necessary hardware and overhang supports, as recommended by the manufacturer.

2.2 TIME-DELAY RELEASE

A. Basis of Design Product: Manufacturer: Overhead Door Corporation; Product: Fire Sentinel Time-Delay Release; Model FSAX24V, or a comparable product by one of the following:
   a. Cookson Company.
   b. Cornell Iron Works, Inc.
   c. Mahon Door Corporation.
   d. McKeon Rolling Steel Door Company, Inc.
   e. Raynor.
   f. Windsor Door.

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. Adjust hardware and moving parts to function smoothly so that grilles operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain overhead coiling door.
SECTION 083613 - SECTIONAL DOORS

PART I - 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 electrically operated sectional doors.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
   2. Section 088000 “Glazing” for glazing requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

C. Samples: For each type of exposed finish on the following components, in manufacturer's standard sizes:
   1. Flat door sections with sensor edge on bottom section.
   2. Frame for paneled door sections; of each width of stile and rail required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.
1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 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.

1.7 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. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Failure of components or operators before reaching required number of operation cycles.
   c. Faulty operation of hardware.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
   e. Delamination of exterior or interior facing materials.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain electric operators and controls from sectional door manufacturer.

2.2 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. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: As indicated on Structural Drawings.

2.3 DOOR ASSEMBLY OH

A. Full-Vision Aluminum Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Series 521 Aluminum Sectional Door, as manufactured by Overhead Door Corporation, or comparable product by one of the following:
   a. Clopay Building Products.
   b. Haas Door.
   c. Northwest Door.
   d. Raynor.
   e. Windsor Door.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Aluminum Sections: Full vision.

D. Track Configuration: Low headroom track.

E. Windows: As indicated on Drawings, with square corners, and spaced apart the approximate distance as indicated on Drawings; in three columns; installed with fully-tempered safety glass.

F. Roller-Tire Material: Case-hardened steel.

G. Counterbalance Type: Torsion spring.

H. Electric Door Operator:
   1. Usage Classification: Medium duty, up to 12 cycles per hour and up to 50 cycles per day.
   2. Operator Type: Jackshaft, side mounted.
   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.
   5. Emergency Manual Operation: Chain type
      a. Pressure sensor at bottom edge of door stile.
   7. Control Station: Interior-side mounted.

I. Door Finish:
2.4 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.

2.5 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, 1/4-inch- minimum diameter, aluminum or nonmagnetic stainless-steel through bolts, full height of door section; and with meeting rails shaped to provide a weather-resistant seal.

1. Aluminum: ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; minimum thickness 0.065 inch for door section 1-3/4 inches deep, and as required to comply with requirements.

2. 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.

3. Provide reinforcement for hardware attachment.

2.6 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.


2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.

3. 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.

   a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.

   b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Windows: Manufacturer's standard window units of type, size, and in arrangement indicated. Provide removable stops of same material as door-section frames.

2.7 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 of not less than 0.079-inch- nominal coated thickness 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 with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-diameter roller tires for 3-inch-wide track and 2-inch-diameter roller tires for 2-inch-wide track.

2.8 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. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at one-third points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

C. Cables: Galvanized-steel, multi-strand, lifting cables [with cable safety factor of at least 5 to 1] [with cable safety factor of at least 7 to 1].

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.

2.9 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. Products: Provide door manufacturer’s standard electric door operator for configuration indicated.

   a. Comply with NFPA 70.

   b. 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.

1. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.
D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:
   b. Volts: 115 VAC, ½ HP.
   c. Hertz: 60.

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.

4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. 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. 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 pressure on close button.

2. 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.
   a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Key-controlled 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.

2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

I. **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.

J. **Motor Removal:** Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. **Audible and Visual Signals:** Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

### 2.10 **GENERAL FINISH REQUIREMENTS**

A. Comply with NAAMM/NOMMA’s "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### 2.11 **ALUMINUM FINISHES**

A. Clear Anodic Finish: AAMA 611, AA-M12C22A4I, Class I, 0.018 mm or thicker.

### 2.12 **STEEL AND GALVANIZED-STEEL FINISHES**

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer’s standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

### PART 3 - EXECUTION

#### 3.1 **EXAMINATION**

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

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

#### 3.2 **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:**

   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. 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 according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer’s written instructions.

2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. 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.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 083613
PART 1 - GENERAL

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. SUMMARY
   A. Section Includes:
      1. Exterior and interior storefront framing.
      2. Storefront framing for window walls.
      3. Storefront framing for ribbon walls.
      4. Storefront framing for punched openings.
      5. Exterior and interior manual-swing entrance doors and door-frame units.

   B. Related Sections:
      1. Division 07 Section “Sheet Metal Flashing and Trim” and “Joint Sealants” for adjacent metal flashings, sealants and joint fillers at perimeter of entrance and storefront systems.
      2. Division 08 Section “Glazed Aluminum Curtain Walls” for curtain wall framing and shading devices.
      3. Division 08 Section “Aluminum Windows.”
      4. Division 08 Section “Glazing” for glass units in entrances and storefronts.
      5. Division 08 Section "Door Hardware" for hardware aluminum entrances not specified in this section.
      6. Division 12 Section "Horizontal Louver Blinds" for units at aluminum storefronts.

1.3 DEFINITIONS
   A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities.”

1.4 PERFORMANCE REQUIREMENTS
   A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

      1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
      2. Dimensional tolerances of building frame and other adjacent construction.
      3. Failure includes the following:

         a. Deflection exceeding specified limits.
         b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads - Based on the following:
   a. Basic Wind Speed: 90 mph (40.2 m/s).
   b. Importance Factor: 1.15.
   c. Exposure Category: B.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

E. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8-inch (3.2mm) and clearance between members and operable units directly below them to less than 1/16-inch (1.5mm).

F. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rates shall not exceed 0.06 cfm/ft² at a static air pressure differential of 6.24 psf.

G. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf as defined in AAMA 501.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

I. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

1. Glass to Exterior – 0.47 (low-e) BTU/hr/ft²/°F.
2. Glass to Center – 0.44 (low-e) BTU/hr/ft²/°F.
3. Glass to Interior – 0.41 (low-e) BTU/hr/ft²/°F.
J. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

1. Glass to Exterior – 70 (frame) and 69 (glass, low-e).
2. Glass to Center – 62 (frame) and 68 (glass, low-e).
3. Glass to Interior – 56 (frame) and 67 (glass, low-e).

K. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:

1. a. Glass to Exterior – 38 (STC) and 31 (OITC).
2. b. Glass to Center – 37 (STC) and 30 (OITC).
3. c. Glass to Interior – 38 (STC) and 30 (OITC).

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer’s standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch (300mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
5. Flashing and drainage.

E. Qualification Data: For qualified Installer.

F. Welding certificates.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

I. Warranties: Sample of special warranties.
1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.
   1. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer’s standard units in systems similar to those indicated for this Project.
   2. Hardware Installer’s Qualifications: A person who is experienced in door hardware installations that are comparable in material, design, and extent to that indicated for this project.

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

C. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

D. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

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

F. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Deterioration of metals and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
      e. Failure of operating components.
   2. Warranty Period: Two years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the Trifab VG 451 and 451 T Framing System, front-glazed, and Tuffline 500 Entrance System, as manufactured by Kawneer North America, an Alcoa company. Subject to compliance with requirements, comparable product by one of the following manufacturers may be incorporated into the Work:

1. Arch Aluminum & Glass Co., Inc.
2. EFCO Corporation.
3. TRACO.
4. Tubelite.

B. Comparable Products: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer’s standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer’s standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Nonthermal at interior locations and thermally broken at exterior locations.
2. Glazing System: Retained mechanically with gaskets on four sides.

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

C. Fasteners and Accessories: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer’s standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer’s standard, recommended by manufacturer for joint type.

G. Thermal Sill Flashing: Manufacturer’s high-performance, thermally broken sill flashing, material and finish to match framing system. Provide at all sill conditions.

2.4 GLAZING SYSTEMS

A. As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer’s standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer’s standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer’s standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer’s standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch (50.8-mm) overall thickness, with minimum 0.188-inch-(4.8-mm) 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.

2. Door Design: Wide stile; 5-inch (127-mm) nominal width.
a. Accessible Doors: Provide smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

   a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: Balance of hardware for entrance is specified in Division 08 Section "Door Hardware," with exception of items specified below.

2.6 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware for each entrance door to comply with requirements in this Section.

1. Opening-Force Requirements:
   a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.
   b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

2. Quantities:

B. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.

C. Weather Stripping: Manufacturer's standard replaceable components.
   1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

C. Miscellaneous Break-Shape Aluminum: Fabricate to profile indicated from 0.125-inch (3mm) aluminum sheet.
   1. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Color and Gloss: As selected by Architect from manufacturer's full range of standard and premium colors.
2.8 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. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers’ written instructions.

1. Color and Gloss: As selected by Architect from manufacturer’s full range of standard and custom colors.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General:

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.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

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

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

D. Set continuous sill members and flashing in full bed of butyl sealant as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "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.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Plumb and Level: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner reserves the right to engage a qualified independent testing and inspecting agency to perform field tests and inspections.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Division 1 Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.
   a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft², which ever is greater.
   b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.

2. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
3. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
4. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.
5. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

3.6 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, which ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion

END OF SECTION 084113
SECTION 087100 – DOOR HARDWARE

PART I - GENERAL

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

1.2 SUMMARY
   A. This Section includes commercial door hardware for the following:
      1. Swinging doors.
      2. Other doors to the extent indicated.
   B. Door hardware includes, but is not necessarily limited to, the following:
      1. Mechanical door hardware.
      2. Electromechanical door hardware.
      3. Cylinders specified for doors in other sections.
   C. Related Sections:
      1. Division 08 Section “Door Hardware Schedule”.
      2. Division 08 Section “Hollow Metal Doors and Frames”.
      3. Division 08 Section “Flush Wood Doors”.
      4. Division 08 Section “Access Control Hardware”.
   D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
      6. NFPA 105 - Installation of Smoke Door Assemblies.
      7. State Building Codes, Local Amendments.
   E. Standards: All hardware specified herein shall comply with the following industry standards:
      1. ANSI/BHMA Certified Product Standards - A156 Series
      2. UL10C – Positive Pressure Fire Tests of Door Assemblies

DOOR HARDWARE

087100 - 1
1.3 SUBMITTALS

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

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

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

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

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

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

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

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

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

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

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

1.4 QUALITY ASSURANCE

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

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

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

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer’s product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

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

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

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

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access controlled opening.

4. Review and finalize construction schedule and verify availability of materials.

5. Review the required inspecting, testing, commissioning, and demonstration procedures.

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

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

1.6 COORDINATION

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

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
1.7 WARRANTY

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

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the system's operation.

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

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty-five years for manual surface door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

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

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

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

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer’s Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers’ names are abbreviated in the Door Hardware Schedule.

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

2.2 HANGING DEVICES

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

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

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

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

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

5. Acceptable Manufacturers:
   a. Hager Companies (HA).
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:
   a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) – EL-CEPT Series.
   b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Acceptable Manufacturers:

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:
   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   b. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer’s designated fastener type as indicated in Hardware Sets.

5. Acceptable Manufacturers:
   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   b. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinders: Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   6. All cylinders provided by the owner.

C. Permanent Cores: Manufacturer’s standard; finish face to match lockset; complying with the following:
   1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers’ cylinders.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer’s United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

   1. Acceptable Manufacturers:
      a. Medeco (MC) - Keymark Series.

E. Keying System: Each type of lock and cylinders to be factory keyed.
   1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. Existing System: Key locks to Owner’s existing system.

F. Key Quantity: Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Two (2)
2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Extended cycle test: Locks to have been cycle tested in accordance with ANSI/BHMA 156.13 requirements to 10 million cycles.

2. Acceptable Manufacturers:
   a. Sargent Manufacturing (SA) – 8200 Series.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.

4. Acceptable Manufacturers:
   a. Sargent Manufacturing (SA) - 8200 Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer’s standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.

3. Aluminum-Frame Strike Box: Provide manufacturer’s special strike box fabricated for aluminum framing.

4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the push bar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer’s heavy duty escutcheon trim with threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.

   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

11. Extended cycle test: Devices to have been cycle tested in accordance with ANSI/BHMA 156.3 requirements to 50 million cycles.

12. Rail Sizing: Provide exit device rails factory sized for proper door width application.

13. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:
   a. Sargent Manufacturing (SA) - 80 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:
2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer’s designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Acceptable Manufacturers:

   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   b. Trimco (TC).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

   a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   b. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
1. Acceptable Manufacturers:
   a. Rixson Door Controls (RF).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.14 ELECTRONIC ACCESSORIES

A. Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single, dual, or multi-voltage units as shown in the hardware sets. Units must be expandable up to eight Class 2 power limited outputs. Units must include the capability to incorporate a battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:
   a. Securitron (SU) - AQ Series.
B. Energy Efficient Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single voltage units as shown in the hardware sets. Units must have one access control input and one fire alarm input. Standby power consumption of unit must be less than 10mW at 120VAC. Provide integral battery backup as standard for all units. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:
   a. Securitron (SU) – EPS Series.

2.15 FABRICATION
   A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.16 FINISHES
   A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
   B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer’s standards, but in no case less than specified by referenced standards for the applicable units of hardware
   C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
   B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION
   A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer’s written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer’s published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner’s maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. MR - Markar
3. RO - Rockwood
4. SA - Sargent
5. MC - Medeco
6. RF - Rixson
7. PE - Pemko
8. SU - Securitron

Hardware Sets

Set: 1.0
Doors: 133A, 133B, 351A, 351D

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<th>Item</th>
<th>Specification</th>
<th>Quantity</th>
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<td>630</td>
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<td>Removable Mullion</td>
<td>980</td>
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<td>Rim Exit Device 1</td>
<td>16 55 56 70 8810</td>
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<td>Kick Plate</td>
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</tr>
<tr>
<td>Silencer</td>
<td>608</td>
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RENAISSANCE HIGH SCHOOL – TENANT IMPROVEMENT
MERIDIAN, IDAHO
HA PROJECT #17015

2 Frame Harness
QC-C1500 (as required)
MK

2 Door Harness
QC-C__ (as required)
MK

1 Power Supply
AQP Series (as required)
SU

1 Card Reader
provided by access control.

Notes: Presenting card retracts exit device. Option to electrically or cylinder dog exit devices during business hours.

Set: 2.0
Doors: 512

3 Hinge
T4A3786
US26D
MK

1 Electrified Rim Exit
LD 55 70 8876 ETL
US32D
SA

1 Permanent Core
33700006K MK (provided by owner)
26
MC

1 Door Closer
351 P10
EN
SA

1 Kick Plate
K1050 10"
US32D
RO

1 Door Stop
406/409/441H (as required)
US32D
RO

3 Silencer
608
RO

1 Electric Power Transfer
EL-CEPT
SU

1 Frame Harness
QC-C1500 (as required)
MK

1 Door Harness
QC-C__ (as required)
MK

1 Power Supply
EPS-05 (as needed)
SU

1 Card Reader
provided by access control.

Set: 3.0
Doors: 529A, 529B

2 Continuous Hinge
FM300
630
MR

2 Concealed Vert Rod Exit
12 NB MD8615 ETL
US32D
SA

2 Door Closer
351 P10
EN
SA

2 Kick Plate
K1050 10"
US32D
RO

2 Electromagnetic Holder
99XM (per details)
689
RF

1 Gasketing
S44BL
PE

2 Astragal
303AV
PE

Set: 4.0

3 Hinge
T4A3786
US26D
MK

1 Rim Exit Device
LD 49 70 8816 ETL
US32D
SA

2 Permanent Core
33700006K MK (provided by owner)
26
MC

1 Door Closer
351 P10
EN
SA

1 Kick Plate
K1050 10"
US32D
RO

1 Door Stop
406/409/441H (as required)
US32D
RO

3 Silencer
608
RO

Set: 5.0
Doors: 501D, 514, 514B

3 Hinge
T4A3786
US26D
MK

1 Electrified Mortise Lock
70 NAC-82271 LNL
US26D
SA

1 Permanent Core
33700006K MK (provided by owner)
26
MC

DOOR HARDWARE
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<td>3 Silencer</td>
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**Set: 6.0**
Doors: 501A

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**Set: 8.0**
Doors: 351E

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<td>MK</td>
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<tr>
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**DOOR HARDWARE**
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<tr>
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<td>33700006K MK (provided by owner)</td>
</tr>
<tr>
<td>1 Door Stop</td>
<td>406/409/441H (as required)</td>
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<tr>
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1 Door Stop
3 Silencer

**Set: 15.0**
Doors: 511B

3 Hinge
1 Privacy Set
1 Door Closer
1 Kick Plate
1 Door Stop
3 Silencer

**Set: 16.0**
Doors: 500

3 Hinge
1 Passage Set
1 Door Closer
1 Kick Plate
1 Door Stop
3 Silencer

**Set: 17.0**
Doors: 502A

6 Hinge
2 Push Bar & Pull
2 Door Closer
2 Kick Plate
2 Silencer

**Set: 18.0**
Doors: 351B, 351C, 501B, 514C

1 Hardware by door mfg.

END OF SECTION 087100
1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.
2. Glazed aluminum entrances and storefront framing.
3. Fire-resistive-rated glazing for transparent wall assemblies.

B. Related Sections include the following:

1. Division 06 Section “Interior Architectural Woodwork” for tempered glass cabinet doors.
2. Division 08 Sections “Hollow Metal Doors and Frames”, and “Flush Wood Doors” for glazed doors, lite openings, and windows.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300, according to the following requirements:

   a. Specified Design Wind Loads: 90 mph (144.8 km/hr) exposure B, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures". Section 6.0 "Wind Loads."

   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

      1) Load Duration: 3 seconds.

   c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.

      1) For monolithic-glass lites heat-treated to resist wind loads.

      2) For insulating glass.

   d. Minimum Glass Thickness for Exterior Lites: Not less than ¼-inch (6.0 mm).

   e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer’s published test data, as determined according to procedures indicated below:

   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.

   2. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-(12.7-mm-) wide interspace.

   3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).


I.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.

   1. Coated vision glass.
2. Insulating glass for each designation indicated.
3. Fire-resistive-rated glass.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

E. Qualification Data: For installers.

F. Product Test Reports: For each of the following types of glazing products:
   1. Coated float glass.
   2. Insulating glass.
   3. Fire-rated glass.

G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
   1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

F. Glazing for Transparent Wall Assemblies: Glazing for assemblies that comply that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to ASTM E 119.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1. Provide in locations required by 2003 IBC Section 2406 indicated and
1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.


I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division I Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.
C. Manufacturer's Special Warranty on Fire-Resistance-Rated Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace fire-rated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

A. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

B. Pyrolytic-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide coating applied by pyrolytic deposition process during initial manufacture, and complying with other requirements specified.

C. Ceramic-Coated Spandrel Glass: ASTM C 1048, Condition B (spandrel glass, one surface ceramic coated), Type I (transparent flat glass), Quality-Q3, and complying with other requirements specified.

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.

D. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

4. Sealing System: Dual seal, with primary and secondary sealants as follows:

   a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

E. Fire-Resistance-Rated Glass Units, General: Proprietary, composed of multiple sheets of “Optiwhite” high visible light transmission glass laminated with and intumescent interlayer.

2.3 FIRE-RATED SAFETY GLAZING PRODUCTS

A. Fire-Rated, Safety-Rated Ceramic Glazing Material with Surface-Applied Film: Proprietary Category II safety glazing product in the form of glass ceramic with a high performance, surface-applied, approved fire-rated film, 3/16-inch (5mm) nominal thickness; polished on both surfaces; weighing 2.4 lb/sq. ft. (11.7kg/sq. m); and as follows:

   1. Fire-Protection Rating: As indicated on Drawings, up to 3 hours, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Unpolished surface is clear with a slight waviness, transparent.

2.4 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

   1. EPDM, ASTM C 864.
   2. Silicone, ASTM C 1115.
   3. Thermoplastic polyolefin rubber, ASTM C 1115.
   4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

   1. EPDM.
   2. Silicone.
   3. Thermoplastic polyolefin rubber.
   4. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; 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; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. 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; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

2.8 MONOLITHIC FLOAT GLASS UNITS

A. Uncoated Clear Float Glass MG-1: Provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:

1. Annealed, Kind HS (heat strengthened), or Kind FT (Fully Tempered) as indicated, Condition A (uncoated surfaces), 6.0 mm thick, unless noted otherwise.
   a. Thickness: 6.0 mm.
   b. For glazed guards in gymnasium, provide 9.5 mm-thick, Kind FT.

B. Available Manufacturers: Provide Float Glass Products by one of the following:

1. AGC Industries Inc.
2. Guardian Industries Corp.
4. PPG Industries, Inc.

2.9 FIRE-RESISTIVE-RATED GLAZING UNITS

A. Fire-Rated Safety Glass Units FR-1: Provide either Laminated Ceramic Glazing Material or Laminated Glass with Intumescent Interlayers, at contractor’s option, thickness as required for designated fire-resistance rating of 1-hour.

B. Available Manufacturers:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. 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 (1270 mm) as follows:
1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

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.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in 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. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. 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.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build up of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000
SECTION 092213 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes gypsum board shaft-wall assemblies for the following:
   1. Shaft-wall enclosures.
B. Related Sections include the following:
   1. Division 07 Sections "Penetration Firestopping" for shaft-wall penetrations and "Fire-Resistive Joint Systems" for head-of-wall assemblies.
   2. Divisions 21, 22 and 23 Sections for duct and pipe penetrations of shaft walls.
   3. Divisions 26 and 27 Sections for conduit penetrations of shaft walls.

1.3 SUBMITTALS
A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.4 QUALITY ASSURANCE
A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.
B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:
   1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
   2. Sprayed fire-resistive materials applied to structural steel framing.
   3. Elevator equipment, including hoistway doors, elevator call buttons, and elevator floor indicators.
   4. Wiring devices in shaft-wall assemblies.
   5. Doors and other items penetrating shaft-wall assemblies.
   6. Items supported by shaft-wall-assembly framing.
   7. Mechanical work enclosed within shaft-wall assemblies.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.
B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Shaft Wall: Manufacturer: USG Corporation; Assembly: UL Design No. U415, for 1-hour fire-resistance-rated assembly and STC Rating of 51.

B. Subject to compliance with requirements, provide a comparable product by one of the following, acceptable to the authorities having jurisdiction:
   2. BPB America Inc.
   4. Lafarge North America Inc.
   6. PABCO Gypsum.

C. Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
   2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   3. Evidence that proposed product provides specified warranty.
   4. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.
2.2  GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

   A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.
   
   1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
   2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

2.3  PANEL PRODUCTS

   A. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.

   1. Fir-Resistive Core: Manufacturer's proprietary liner panels with moisture-resistant paper faces.

      a. Core: 1 inch (25.4 mm) thick.
      b. Long Edges: Double bevel.

   B. Gypsum Board: As specified in Division 09 Section "Gypsum Board."

2.4  NON-LOAD-BEARING STEEL FRAMING

   A. Framing Members: Comply with ASTM C 754 for conditions indicated.

   B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

      1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

2.5  AUXILIARY MATERIALS

   A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.

   B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

   C. Gypsum Board Joint-Treatment Materials: As specified in Division 9 Section "Gypsum Board."

   D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

   E. 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.

      1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
      2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
F. 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.
G. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES - GENERAL

A. Fire-Resistance Rating: 1 hour.
B. STC Rating: 51, minimum.
C. Studs: Manufacturer’s standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
   1. Depth: As indicated.
   2. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
D. Runner Tracks: Manufacturer’s standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches (51 mm) long and in depth matching studs.
   1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
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. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dietrich Metal Framing; The System by Metal-Lite, Inc.
      b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
F. Room-Side Finish: High-Impact Type gypsum board.
G. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.
H. Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section "Sprayed Fire-Resistive Materials."

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runner tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft-wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Division 09 Section "Gypsum Board" for applying and finishing exposed panels.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. 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.

H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3mm) from the plane formed by faces of adjacent framing.
3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092213
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing wall studs; roof rafters and ceiling joists.
2. Division 06 Section "Miscellaneous Rough Carpentry" for backing and blocking in walls.
3. Division 07 Section "Building Insulation" for sound-attenuation blanket insulation installed on interior non-load-bearing partitions.
5. Division 08 Section "Hollow Metal Doors and Frames" for hollow metal frames to be spot-grouted.
6. Division 09 Section "Gypsum Board" for gypsum panels installed over non-load-bearing partitions and on suspended ceiling framing and suspended grid systems.
7. Divisions 21, 22 and 23 Sections for duct and pipe penetrations of framed walls.
8. Divisions 26, 27 and 28 Sections for conduit penetrations of framed walls.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Deflection Limits: Design framing systems to withstand applied loads without deflections greater than the following:


1.4 SUBMITTALS

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

B. Shop Drawings:

1. For Grid Suspension System for Gypsum Board Ceilings, size members in accordance with ASTM C754. Show supporting structural elements, layout, spacings, sizes, thicknesses, and types of ceiling suspension members; fabrication; and fastening and anchorage details, including mechanical fasteners. Show gypsum
panel layout, fastener size and spacing, and all mechanical and electrical items attached to suspension system.

a. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

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.

C. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. 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.


2.2 INTERIOR SUSPENSION SYSTEM (FOR GYPSUM BOARD CEILINGS)

A. Tie Wire: ASTM A 641/A 641M, Class I zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter (16 gage) wire.

B. Wire Hangers: ASTM A 641/A 641M, Class I zinc coating, soft temper, 0.162-inch (4.12-mm) diameter (8 gage).

1. Smaller diameter wire hangers may only be used at spacings and with tributary ceilings areas recommended in ASTM C 754.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch (25.4 by 4.76 mm) by length required.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.
1. Depth: 2-1/2 inches (64 mm) minimum.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) (16 gage) bare-steel thickness, with minimum 1/2-inch-(12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
2. Steel Studs: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm) (20 gage).
   b. Depth: 3-5/8 inches (92.1 mm) minimum. Sized for span indicated.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
   a. Minimum Base Metal Thickness: 0.0312-inch (0.79 mm) (20 gage) minimum. Size for span indicated.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   b. Chicago Metallic Corporation; 660-C (heavy duty) Drywall Furring System.
   c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm) (20 gage). At Auditorium walls and other locations exceeding 24 foot height, use 0.0451 inch (1.15 mm) (18 gage).
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) 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 (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. 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. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      1) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
      2) Superior Metal Trim; Superior Flex Track System (SFT).
C. 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. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fire Trak Corp.; Fire Trak, attached to studs with Fire Trak Slip Clip.
   b. Metal-Lite, Inc.; The System.

D. Flat Strap and Bracing: Steel sheet for bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0538 inch (0.13 mm) (16 gage).
2. Do not use sheet steel for backing and blocking for wall-mounted fixtures use solid wood backing and blocking as specified in Division 6 Section "Miscellaneous Carpentry".

E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: 1-1/2 inches (38.1 mm).
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm) (20 gage).
2. Depth: 1-1/2 inches (38.1 mm).

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 (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

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

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support cabinets, door hardware, fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on engineered shop drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

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 and established deflection limits.

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 permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. 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. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:
   a. Single-Layer Application: 16 inches (406 mm) o.c., unless otherwise indicated.
   b. Multilayer Application: 16 inches (406 mm) o.c., unless otherwise indicated.
   c. Tile backing panels: 16 inches (406 mm) o.c., unless otherwise indicated.
   d. Framing for ceilings and soffits: 16 inches (406 mm) o.c., unless otherwise indicated.

C. 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 penetrating 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 (12.7-mm) 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.

D. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 16 inches (406 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 092216
PART I - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
      1. Interior gypsum board.
   B. Related Sections include the following:
      1. Division 05 Section "Cold-Formed Metal Framing" for exterior wall framing that supports gypsum board.
      2. Division 07 Section "Building Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
      3. Division 07 "Roofing" sections for membrane roofing installed over glass-mat gypsum sheathing.
      4. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
      5. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
      6. Division 09 Section "Tiling" for tile installed on cementitious backer units.
      7. Division 09 painting Sections for primers applied to gypsum board surfaces.
      8. Division 22, 22, 23, 26, and 27 Sections for mechanical, plumbing and electrical items installed in gypsum-sheathed assemblies.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples: For the following products:
      1. Trim Accessories: Full-size Sample in 12-inch (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE
   A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
   B. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
      1. Install mockups for the following:
         a. Each level of gypsum board finish indicated for use in exposed locations.
2. Apply or install final decoration indicated, including painting, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles, bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer’s written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

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

   a. American Gypsum Co.
   b. BPB America Inc.
   c. G-P Gypsum.
   d. Lafarge North America Inc.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. Temple.
B. Type X:

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

C. High-Impact Type:

   a. Core: 5/8 inch (15.9 mm) thick.
   b. Plastic-Film Thickness: 0.010 inch (0.254 mm) 0.020 inch (0.508 mm).

2. Manufactured with reinforcing fiber mesh in fire-resistive core, and no paper face for greater resistance to through-penetration (impact resistance). Manufacturer: USG Corporation; Product: “Fiberock "VHI" Abuse-Resistant Panels.”
   a. Core: 5/8 inch (15.9 mm) thick.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. “V” Reveal Molding:
   a. Basis-of-Design Product: # DRMV-100 “V” Reveal Molding as manufactured by Fry reglet Corp., or a comparable product by one of the following manufacturers:
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Manufacturer's standard chemical conversion coating.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
   a. Basis-of-Design Product: Manufacturer: USG Corporation; Product: Sheetrock Brand, Primer-Surfacer, or an equivalent product by another manufacturer with prior written approval of Architect.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: As specified in Division 07 Section "Building Insulation."

E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

F. Thermal Insulation: As specified in Division 07 Section "Building Insulation."

G. Vapor Retarder: As specified in Division 07 Section "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Install expansion (control) joints with space between edges of adjoining gypsum panels as follows (coordinate location with Architect where location is arbitrary):

1. In partitions, walls, and ceilings that traverse an expansion, seismic, or control joint in the structural system.
2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear ft. (9100 mm).
3. In interior ceilings with perimeter relief, so that linear dimensions between control joints do not exceed 50 ft. (15000 mm), and total area between control joints does not exceed 2500 sq. ft. (230 sq. m).
4. In interior ceilings without perimeter relief, so that linear dimensions between control joints do not exceed 30 ft. (9100 m), and total area between control joints does not exceed 900 sq. ft. (84 sq. m).
5. Where ceiling framing members change direction. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Walls with sound Attenuation Blanket Insulations: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type X: Install on all wall surfaces not normally exposed to students (offices, storage rooms, electrical rooms, etc.) and framed soffits and ceilings, unless indicated otherwise on Drawings.
2. High-Impact Type: Install on all wall surfaces normally exposed to students (hallways, classrooms, labs, collaboration spaces) and where indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   a. Fastening Methods: Apply gypsum panels to supports with steel drill screws spaced at 12-inches (305 mm) on center, unless requirements for fire-resistance ratings indicate otherwise.

2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
   c. Fastening Methods: Apply gypsum panels to supports with steel drill screws, with the following spacing:
      1) Fasten to framing spaced at 16-inches (400 mm) on center with screws spaced at 16-inches (400 mm) on center, unless requirements for fire-resistance ratings indicate otherwise.
      2) Fasten to framing spaced at 24-inches (610 mm) on center with screws spaced at 12-inches (305 mm) on center, unless requirements for fire-resistance ratings indicate otherwise.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   a. Fastening Methods: Fasten base and face layers separately to supports with screws as follows:
      1) Fasten base layer with screws spaced at 24-inches (610 mm) on center, unless requirements for fire-resistance ratings indicate otherwise.
      2) Fasten face layer with screws spaced at 12-inches (305 mm) on center, unless requirements for fire-resistance ratings indicate otherwise.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   a. Fastening Methods: Fasten base and face layers separately to supports with screws as follows:
1) Fasten base layer with screws spaced at 24-inches (610 mm) on center, unless requirements of fire-resistance ratings indicate otherwise.
2) Fasten face layer with screws spaced at 16-inches (400 mm) on center where supports are spaced at 16-inches (400 mm) on center, and with screws spaced at 12-inches (305 mm) on center, where supports are spaced at 24-inches (610 mm) on center, unless requirements of fire-resistance ratings indicate otherwise.

D. Curved Surfaces:
1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 INSTALLING TRIM ACCESSORIES
A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.
B. Control Joints: Install control joints with space between edges of adjoining gypsum panels as follows, and where indicated on Drawings (coordinate location with Architect where location is arbitrary):
1. In partitions, walls, and ceilings that traverse an expansion, seismic, or control joint in the structural system.
2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear ft. (9100 mm).
3. In interior ceilings with perimeter relief, so that linear dimensions between control joints do not exceed 50 ft. (15000 mm), and total area between control joints does not exceed 2500 sq. ft. (230 sq. m).
4. In interior ceilings without perimeter relief, so that linear dimensions between control joints do not exceed 30 ft. (9100 m), and total area between control joints does not exceed 900 sq. ft. (84 sq. m).
5. Where ceiling framing members change direction.
C. Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

3.5 FINISHING GYPSUM BOARD
A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 5: At panels that will be exposed to view, unless otherwise indicated.
a. Use high-build, spray-applied coating.

3.6 PROTECTION

A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant barrier securely fastened to framing. Apply covering immediately after sheathing is installed.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Related Sections include the following:

1. Division 05 Sections for structural support for ceiling suspension systems.
2. Division 07 Section "Building Insulation" for sound attenuation blanket insulation.
3. Division 07 Section "Joint Sealants" for acoustical sealants.
4. Division 09 Sections “Non-Structural Metal Framing” and “Gypsum Board” for suspended gypsum board ceiling clouds.
5. Division 09 Section “Sound-Absorptive Panels.”
6. Division 21, 22, 23, 26 and 27 Sections for fixtures installed in acoustical panel ceilings.

1.3 DEFINITIONS

A. AC: Articulation Class.
B. CAC: Ceiling Attenuation Class.
C. LR: Light Reflectance coefficient.
D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

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

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.
   a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
3. Ceiling-mounted items including, but not limited to, smoke detectors, lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch-(150-mm-) square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-(300-mm-) long Samples of each type, finish, and color.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

E. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.

F. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E1264 for Class B materials as determined by testing identical products per ASTM E84:
   a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

2. 2006 IBC Chapter 16.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: The design is based on the named product. Subject to compliance with requirements, provide either the named product or a comparable product by another manufacturer.

B. Comparable Products: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.
2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING APC-I

A. Basis-of-Design Product: Manufacturer: Armstrong World Industries, Inc.; Product: “Fine-Fissured” # 1729, or a comparable product by one of the following manufacturers, with prior written approval of Architect:

1. BPB USA.
2. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
2. Pattern: CE (perforated, small holes and lightly textured).

C. Color: White.

D. LR: Not less than 0.85.

E. NRC: Not less than 0.55.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Square.

H. Thickness: 5/8 inch (15mm).

I. Modular Size: 24 by 48 inches (610 by 1220mm).

J. Antimicrobial Treatment: Broad-spectrum fungicide and bactericide based.
2.4 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING APC-2

A. Basis-of-Design Product: Manufacturer: Armstrong World Industries, Inc.; Product: “Curves Optima Vector” #3970, 24 x 24-inches or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   1. BPB USA.
   2. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.90.

F. AC: Not less than 190.

G. Edge/Joint Detail: Square.

H. Thickness: 3/4 inch (19mm).

I. Modular Size: 24 by 24 inches (610 by 1220mm).

J. Schedule: Provide the following panels at each cloud size, as scheduled in the drawings:
   1. 6'-0" Circles (3970)
   2. 8'-0" Circles (3973)
   3. 11'-5" Circles (3975)
   4. 14'-0" Circles (3976)

K. Antimicrobial Treatment: Broad-spectrum fungicide and bactericide based.

2.5 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING APC-3

A. Basis-of-Design Product: Manufacturer: Armstrong World Industries, Inc.; Product: “Optima-Open Plan” #3153, or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   1. BPB USA.
   2. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
   1. Type: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.

C. Color: White.

D. LR: Not less than 0.90.
E. NRC: Not less than 0.90.

F. AC: Not less than 190.

G. Edge/Joint Detail: Square.

H. Thickness: 3/4-inch (16mm).

I. Modular Size: 24 by 48 inches (610 by 1220mm).

J. Antimicrobial Treatment: Broad-spectrum fungicide and bactericide based.

2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer’s standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer’s standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch (2.69-mm) (No. 12 gage) diameter wire.

E. Aircraft Cable and Fittings (for suspending Ceiling Clouds):

1. Aircraft Cable: 1/8-inch (3mm) diameter, type 316 stainless steel aircraft cable, 1,760-lb (798kg) breaking strength.
2. Fittings: Wire rope clips or chair clips designed to crimp looped aircraft cable with bolts. Size to accommodate aircraft cable.
3. Provide all other miscellaneous fittings necessary to suspend ceiling clouds as indicated.

F. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

G. Seismic Struts: Manufacturer’s standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer’s standard seismic clips designed and spaced to secure acoustical panels in-place.

I. Hold-Down Clips: Where indicated, provide manufacturer’s standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

J. Impact Clips: Where indicated, provide manufacturer’s standard impact-clip system designed to absorb impact forces against acoustical panels.
2.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING APC-1 AND APC-3

A. Basis-of-Design Product: Manufacturer: Armstrong World Industries, Inc.; 15/16” (24 mm) “PRELUDE,” or a comparable product by one of the following manufacturers, with prior written approval of Architect:

1. BPB USA.
2. Chicago Metallic Corporation.
3. USG Interiors, Inc.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.

C. Extruded Aluminum Perimeter Trim for exposed edges and openings in APC-1:

1. Basis-of-Design Product: Manufacturer; Armstrong World Industries, Inc.; Axiom Classic Perimeter trim, 3-7/8-inches (98mm) deep by 3/4-inch (19mm) wide, or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   a. BPB USA.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.

2. Cap Finish: Painted white.

D. Extruded Aluminum Trim for exposed edges of Ceiling Clouds with APC-3:

1. Basis-of-Design Product: Manufacturer; Armstrong World Industries, Inc.; Axiom Formations Knife Edge Vector,” or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   a. BPB USA.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.

2. Trim Finish: Painted white.

2.8 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING APC-2

A. Basis-of Design Product: Manufacturer: Armstrong World Industries, Inc.; 15/16” (24 mm) “Formations Curves Cloud Kits” or a comparable product by one of the following manufacturers, with prior written approval of Architect:

1. BPB USA.
2. Chicago Metallic Corporation.
3. USG Interiors, Inc.
B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than \textit{G30 (Z90)} coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.

C. Schedule: Provide the following suspension system and trim at each cloud size, as scheduled in the drawings:

1. 6'-0" Circles (C4VES0606C)
2. 8'-0" Circles (C4VES0808C)
3. 11'-5" Circles (C4VES1212C)
4. 14' Circles (C4VES1414C)

D. Extruded Aluminum Perimeter Trim for exposed edges and openings in APC-2:

1. Basis-of-Design Product: Manufacturer; Armstrong World Industries, Inc.; Axiom Vector, 4-inches deep by 3/4-inch (19mm) wide, or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   a. BPB USA.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.

2. Cap Finish: Painted white.

E. Extruded Aluminum Trim for exposed edges of Ceiling Clouds with APC-3:

1. Basis-of-Design Product: Manufacturer; Armstrong World Industries, Inc.; Axiom Formations Knife Edge Vector,” or a comparable product by one of the following manufacturers, with prior written approval of Architect:
   a. BPB USA.
   b. Chicago Metallic Corporation.
   c. USG Interiors, Inc.

2. Trim Finish: Painted white.

2.9 METAL EDGE MOLDINGS AND TRIM

A. Provide metal edge moldings and trim by the same manufacturer as the metal suspension system.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
4. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer’s extruded-aluminum,

2.10 ACOUSTICAL SEALANT

A. As specified in Division 7 Section “Joint Sealants.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 635, ASTM C 636, IBC Chapter 16, ASCE 7, Section 13.5.6, and manufacturer’s written instructions.

B. Suspend ceiling hangers from building’s structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.

8. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

9. Do not attach hangers to steel deck tabs.

10. Do not attach hangers to steel roof deck. Attach hangers to structural members.

11. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building’s structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer’s written instructions, unless otherwise indicated.

5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer’s written instructions for cleaning and touchup of minor finish damage.
Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Resilient wall base.
   2. Resilient stair accessories.

B. Related Sections include the following:
   1. Division 01 Section "Quality Requirements" for requirements for testing Agency.
   2. Division 09 Section “Gypsum Board” for substrate for resilient wall base.
   3. Division 09 Flooring Sections for flooring requiring resilient wall base and accessories.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer’s standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

D. Test Reports:
   1. Submit reports for substrate alkalinity, adhesion, and moisture tests, indicating that conditions of concrete slab conform to requirements of sheet vinyl manufacturer.
   2. Submit prior to beginning sheet vinyl installation.

1.4 QUALITY ASSURANCE

A. Substrate (alkalinity, adhesion, and moisture) Testing Entity: Owners testing agency.

B. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.
1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close stairs to traffic during floor covering installation.

D. Close stairs to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, equivalent products to those specified may be incorporated into the Work with prior written approval of Architect.

2.2 RESILIENT WALL BASE - RWB #

A. RWB-1: Johnsonite 4" Cove Color: Match existing at Renaissance High School.

B. Wall Base: ASTM F 1861.

1. Basis of Design Product: Manufacturer: Roppe Corporation.; Product: 700-Series Wall Base;" Color: Match existing at Renaissance High School, or a matching product by one of the following manufacturers:

2. AFCO-USA, American Floor Products Company, Inc.
3. Armstrong World Industries, Inc.
4. Azrock Commercial Flooring, DOMCO.
5. Burke Mercer Flooring Products.
7. Marley Flexco (USA), Inc.
10. Stoler Industries.

C. Characteristics:

1. Type (Material Requirement): TP (rubber, thermoplastic).
4. Minimum Thickness: 0.125 inch (3.2 mm).
5. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer’s standard length.
7. Inside Corners: Job formed.
8. Surface: Smooth.

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 manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Cove Base Adhesives: 50 g/L.
   b. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer’s written recommendations to ensure adhesion of resilient products.
RESILIENT BASE AND ACCESSORIES

B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   3. Moisture Testing:
      a. Owner’s testing agency shall perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
      b. Owner’s testing agency shall perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
   1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

G. Proceed with installation only after substrates pass tests and all unsatisfactory conditions have been corrected.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer’s recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners:
   1. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.
3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

   a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to stair accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

   a. Use commercially available product acceptable to manufacturer.
   b. Coordinate selection of floor polish with Owner’s maintenance service.

2. Cover stair accessory products with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 096513
SECTION 09 83 19 – ACOUSTICAL WALL PANELS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of the Contract, including General and Supplementary Conditions and Divisions 01 Specification sections, apply to this section.

1.2 SUMMARY

A. This section includes the following:
   a. Fabric-covered, z-clip mounted, acoustical wall panels.
   b. Installation accessories

B. Related Sections include the following:
   a. Division 07 “Building Insulation” for sound attenuation blanket insulation mounted behind wall panels.
   b. Division 06 “Miscellaneous Rough Carpentry” for wood furring and framing behind wall panels.
   c. Division 09 “Gypsum Board” for substrate for wall panels.
   d. Division 26 “Electrical Work”

1.2 REFERENCES

A. Test Methods:
   1. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of acoustical wall panel required.

B. Samples: Minimum 3 inch x 6 inch samples of specified acoustical wall substrate and fabric covering; minimum 4 inch long samples of attachment method including trim and decorative accents.

C. Shop Drawings: Submit shop drawings showing how panels are to be laid out on the walls, details of trim members and width of panels. Show orientation of fabric application, pattern matching, and seams.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Product Test Reports: From a qualified testing agency indicating acoustical wall panels comply with requirements, based on comprehensive testing of current products.
   Product Test Reports: From a qualified testing agency indicating acoustical wall panels comply with requirements, based on comprehensive testing of current products. Delete paragraph below if testing for acoustical properties and fire-test-response characteristics is not available for products selected. See Evaluations.
F. Maintenance Data: For acoustical wall panels and facings to include in maintenance manuals specified in Division 1. Include precautions in use of clearing materials that may be detrimental to surfaces.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and installation components by a single manufacturer.

B. Manufacturer Qualifications: A Firm experienced in manufacturing acoustical wall panels similar to those indicated for this project and with a record of successful in-service performance.

C. Testing Agency Qualifications: An independent testing agency, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Fire Performance Characteristics: Identify acoustical wall components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84,
      a. Flame Spread: 25 or less
      b. Smoke Developed: 450 or less

E. Coordination of Work: Coordinate acoustical wall work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical wall panels to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical wall panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical wall panels carefully to avoid chipping edges or damaged units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: All wet work must be complete and dry prior to installation. Installation shall be carried out where the temperature is between 40 degrees F and 120 degrees F. Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions has been maintained at the levels indicated for Project when occupied for its intended use for a minimum of 72 hours.

B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

C. Field Measurements: Verify wall surface dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish surface dimensions and proceed with fabricating acoustical wall panels without field measurements. Coordinate wall construction to ensure that actual surface dimensions correspond to established dimensions.
1.7 WARRANTY

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

B. Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace components of acoustical wall panel system that fail in performance, materials, or workmanship within specified warranty period. Failure in performance includes, but is not limited to, acoustical performance. Failure in materials includes, but is not limited to, sagging or distortion of facing or warping of core.

C. Warranty Period: Two years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Wall Panels: Full-size units equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS


2.2 ACOUSTICAL WALL PANELS

A. Acoustical Wall Panels AWP-#: Where this designation is indicated, provide fabric-covered, high impact, z-clip mounted, square fabric wrapped edge walls panels, attached to frames, and as follows:

1. Product: Armstrongs Industries, Inc. – Soundsoak Custom Wall Panels
2. Surface Texture: Fabric
3. Composition: Fiberglass
4. Fabric Finish:
   A. Guilford of Maine Open House #2334, color as specified below, or approved equal:
      i. AWP – 1: Angora 2035
      ii. AWP – 2: Goose 2049
      iii. AWP – 3: Vanilla 2130

5. Thickness: 1 inch
6. Width: Refer to drawings.
7. Panel Heights: Refer to drawings.
8. Edge Profile:
   i. Standard - Fabric wrapped square edges on any or all panel sides.

9. Noise Reduction Coefficient (NRC): ASTM C 423; A Mounting: 1 inch (0.80)

10. Flame Spread: ASTM E84; composite rating 25 or less flame spread/200 or less smoke developed.

11. Dimensional Stability: Standard – space must be enclosed with HVAC systems operating at all times.

B. Acoustical Wall Panel Accessories:
   1. Z-clips

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer’s printed recommendations. Examine substrates and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical wall panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each wall area and establish layout of acoustical units to balance border widths at opposite edges of each wall. Coordinate panel layout with mechanical and electrical fixtures. Remove material from packaging and allow to acclimatize in area of installation for 24 hours prior to application.

3.3 INSTALLATION

A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer’s written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.

3.4 CONSTRUCTION TOLERANCES: As follows:

A. Variation from Plumb and Level: plus or minus 1/16 inch (1.6mm)

3.5 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clip loose threads; remove pills and extraneous materials from fabric-covered wall panels.
   a. Clean wall panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer’s written instructions.
b. Remove surplus materials, rubbish, and debris resulting from acoustical wall panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.

3.6 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installs that ensure acoustical wall panels are without damage or deterioration at time of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 098319
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Steel.
4. Wood substrates.
5. Gypsum board.

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers compatible with finish coats specified in this Section.
2. Division 08 Sections for factory priming windows and doors with primers compatible with finish coats specified in this Section.
3. Division 09 Section “Gypsum Board” for near Level 5, high-build, spray-applied coating for walls.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
1.4 QUALITY ASSURANCE

A. MPI Standards:
   
   1. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples 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 specified in Part 3.
      
      a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.

   2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
   
   3. Final approval of color selections will be based on benchmark samples.
      
      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Benjamin Moore & Co.
2. Columbia Paint & Coatings.
3. Coronado Paint.
4. ICI Paints.
7. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:

   a. Acrolein.
   b. Acrylonitrile.
   c. Antimony.
   d. Benzene.
   e. Butyl benzyl phthalate.
   f. Cadmium.
   g. Di (2-ethylhexyl) phthalate.
   h. Di-n-butyl phthalate.
   i. Di-n-octyl phthalate.
   j. 1,2-dichlorobenzene.
   k. Diethyl phthalate.
   l. Dimethyl phthalate.
   m. Ethylbenzene.
   n. Formaldehyde.
   o. Hexavalent chromium.
   p. Isophorone.
   q. Lead.
2.3 PRIMERS/SEALERS FOR GYPSUM BOARD

A. Approved Products, Interior Latex Primer/Sealer:

2. Columbia Paint & Coatings: Premium Pro Latex Enamel Undercoater #02-735-PP.
4. ICI Paints: Prep and Prime Hi-Hide Wall Interior Water-Based Primer Sealer #1000-1200.
5. Kelly-Moore Paints: Acry-Plex Interior PVA Primer/Sealer Low Odor Formula #971.
7. Sherwin-Williams Co.: Quali-Kote Interior Latex Primer #B28WB1; B28WQ8001.

B. Approved Products, Drywall Primers for Epoxy intermediate and topcoats:

1. Benjamin Moore & Co.: Waterborne Acrylic Epoxy Primer # M08/M09.
2. Columbia Paint & Coatings: CPC Pro Shield II Acrylic Primer Sealer #05-208-PP.
4. ICI Paints: Prep & Prime PVA Interior Water-Based Primer # 1030-1200.

2.4 METAL PRIMERS

A. Approved Products, Rust-Inhibitive Primer (Water Based) - (Use only where intermediate/topcoat are not self-
priming):

2. Columbia Paint & Coatings: Professional Metal Prime #05-255-PP.
4. ICI Paints: Devoe Coatings Devflex DTM Flat Interior/Exterior W.B. Primer #4020.
2.5  LATEX PAINTS

A. Approved Products, Interior Latex (Low Sheen - Gloss Level 3):

4. ICI Paints: Dulux Pro-Premium Eggshell Interior Wall & Ceiling Paint #1402-0110N.
5. Kelly-Moore Paints: Dura-Poxy 100% Eggshell Acrylic Enamel #1686-121.
7. Sherwin-Williams Co.: ProGreen 200 Low VOC Interior Eggshell #B20W8521.

B. Approved Products, Water-Borne Light Industrial Coating (Semigloss - Gloss Level 5):

4. ICI Paints: Devflex 659 DTM Gloss Waterborne Acrylic Enamel #659.

C. Approved Products, Latex Dry Fog/Fall (Flat - Exposed Roof Structure):

2. Columbia Paint & Coatings: Professional Latex Dry Fall – Flat # 02-700.
3. Coronado Paint: Latex Flat Dry Fall # 110-1.
4. ICI Paints: Devoe/Fuller Multi-Plex-WB #DP318XX.
6. Kwal-Howells Paint: Accu-Pro Latex Flat Dry Fall # 6152.
7. Sherwin-Williams Co.: Industrial & Marine Architectural Latex Dryfall – Flat # B75WB1

2.6  INTERIOR EPOXY (WATER BASED)

A. Approved Products, Interior Epoxy, Water Based, (Gloss - Gloss Level 6):

7. Sherwin-Williams Co.: Industrial and Marine Water Based Catalyzed Epoxy #B70W Series.

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 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.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating 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 plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer’s written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Wood Substrates:

1. Sand surfaces that will be exposed to view, and dust off.

I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer’s written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply gypsum board primer/sealer to all gypsum wallboard surfaces indicated to receive wallcoverings.

E. 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.

F. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. **Mechanical Work:**
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Tanks that do not have factory-applied final finishes.
   e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. **Electrical Work:**
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 **FIELD QUALITY CONTROL**

A. **Testing of Paint Materials:** Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:
   1. Overhead Structure/Exposed Steel Floor and Roof Deck - Water-Based Dry-Fall System:
      a. Prime Coat: Shop-Primer/Quick-drying alkyd metal primer compatible with topcoat.
      b. Topcoat: Waterborne dry fall.
   2. Other Exposed Metal - Waterborne Light Industrial Coating System:
      a. Prime Coat: Where intermediate/topcoat are not self-priming, use Rust-Inhibitive primer (water based).

B. Galvanized-Metal Substrates:
   1. Water-borne Light Industrial Coating System:
      a. Prime Coat: Rust Inhibitive Primer.
      b. Intermediate Coat: Same as topcoat.
      c. Topcoat: Light Industrial (Semigloss) Coating.

C. Wood Panel Substrates: Including painted plywood medium-density fiberboard.
   1. Latex System:
      c. Topcoat: Interior latex (semigloss).

D. Gypsum Board Substrates (Ceilings):
   1. Latex System:
      c. Topcoat: Interior latex (flat).
      d. Delete intermediate and topcoat on surfaces indicated to receive wall coverings.
E. Gypsum Board Substrates (Walls):

1. Latex System:
   
   a. Prime Coat: High-build near Level 5 primer/sealer Per Division 9 Section "Gypsum Board."
   c. Topcoat: Interior alkyd (eggshell).

END OF SECTION 099123
SECTION 101100 - VISUAL DISPLAY SURFACES (OWNER FURNISHED OWNER INSTALLED)

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes the following:
      1. Markerboards.
   B. Related Sections include the following:
      1. Division 01 Section “Alternates” for alternates that affect the scope of work of this Section.
      2. Division 06 Section “Miscellaneous Rough Carpentry” for backing and blocking in walls for mounting visual display surfaces.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
      1. Include computer system requirements for electronic markerboards.
   B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
      1. Show location of panel joints.
      2. Include sections of typical trim members.
   C. Samples for Initial Selection: For each type of visual display surface indicated and as follows:
      1. Actual sections of porcelain-enamel face sheet and display rail.
      3. Samples of accessories involving color selection.
   D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for surface-burning characteristics of cork tack assembly material.
   E. Qualification Data: For Installer.
   F. Maintenance Data: For visual display surfaces to include in maintenance manuals.
   G. Warranties: Special warranties specified in this Section.
1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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

C. Fire-Test-Response Characteristics: Provide polyester fabric-faced cork tack assemblies with surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. General Warranty: The special porcelain enamel chalkboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Surfaces lose original writing and erasing qualities.
   b. Surfaces become slick or shiny.
   c. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period: 50 years from date of Substantial Completion.

C. Special Warranty for Electronic Markerboards: Manufacturer’s standard form in which manufacturer agrees to repair or replace electronic markerboards that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2. Basis-of-Design Product: The design for each visual display surface is based on the product specified. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

3. Comparable Products: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

   b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

   c. Evidence that proposed product provides specified warranty.

   d. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

2.2 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer’s standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

   1. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.

B. Natural Cork Sheet: Seamless, single layer, compressed fine-grain cork sheet, bulletin board quality; facesanded for natural finish.

C. Polyester Fabric: Nondirectional weave, 100 percent polyester; weighing not less than 15 oz./sq. yd. (508 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.

D. Particleboard: ANSI A208.1, Grade I-M-I, made with binder containing no urea formaldehyde.

E. Fiberboard: ASTM C 208.

F. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.
2.3 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backsheet, core material, and 0.021-inch- (0.53-mm-) thick, porcelain-enamel face sheet with high-gloss finish.

1. Available Manufacturers:
   a. AARCO Products, Inc.
   b. ADP/Lemco, Inc.
   c. Bangor Cork Company, Inc.
   d. Best-Rite Manufacturing.
   e. Claridge Products & Equipment, Inc.
   f. Egan Visual Inc.
   g. Ghent Manufacturing Inc.
   h. Marsh Industries, Inc.
   i. Platinum Visual Systems; a division of ABC School Equipment, Inc.
   j. PolyVision Corporation.

2. Particleboard Core: 1/2 inch (13 mm) thick; with 0.015-inch- (0.38-mm-) thick, aluminum sheet backing.
3. Laminating Adhesive: Manufacturer’s standard moisture-resistant thermoplastic type.
4. Size of units: 48-inches (1219mm) high by length indicated on Drawings.

2.4 TACK ASSEMBLIES

A. Available Manufacturers:
   2. AARCO Products, Inc.
   3. ADP/Lemco, Inc.
   5. Best-Rite Manufacturing.
   6. Claridge Products & Equipment, Inc.
   7. Egan Visual Inc.
   8. Ghent Manufacturing Inc.

B. Polyester-Fabric-Faced Tack Assembly: 1/8-inch- (3-mm-) thick, polyester-fabric-faced cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick fiberboard backing.

1. Color: As selected by Architect from manufacturer’s full range.
2. Size of units: 48-inches (1219mm) high by length indicated on Drawings.

2.5 VISUAL DISPLAY RAILS

A. Available Manufacturers:
   1. Best-Rite Manufacturing.
   2. Claridge Products & Equipment, Inc.
   3. Ghent Manufacturing Inc.
5. PolyVision Corporation.

B. General: Manufacturer’s standard, tackable visual display surface fabricated into narrow rail shape and designed for displaying material.

2.6 MARKERBOARD AND TACKBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- (1.57-mm-) thick, extruded aluminum; of size and shape indicated.

1. Factory-Applied Trim: Manufacturer’s standard.

B. Chalktray: Manufacturer’s standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

C. Map Rail: Provide the following accessories:

1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches (25 to 50 mm) wide.
2. End Stops: Located at each end of map rail.
3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1220 mm) of map rail or fraction thereof.

2.7 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain enamel face sheet and backing sheet to core material under heat and pressure with manufacturer’s standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards, unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer’s factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer’s standard vertical-joint spline system between abutting sections of markerboards.
3. Provide manufacturer’s standard mullion trim at joints between markerboards and tack assemblies of combination units.
4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer’s standard structural support accessories to suit conditions indicated.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer’s factory before shipment.
2.8 ALUMINUM FINISHES

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for electrical power and data systems to verify actual locations of connections before installation of motor-operated, sliding visual display units.

C. Examine walls and partitions for proper backing for visual display surfaces.

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

3.2 PREPARATION

A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

3.3 INSTALLATION, GENERAL

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.

1. Mounting Height: 42 inches (1067mm) above finished floor to bottom of chalktray, unless indicated otherwise.
3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY UNITS

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches (600 mm) o.c.

   a. Attach chalktrays to boards with fasteners at not more than 12 inches (300 mm) o.c.

B. Display Rails: Install rails in locations and at mounting heights indicated on Drawings, or if not indicated, at height indicated below. Attach to wall surface with fasteners at not more than 16 inches (400 mm) o.c.

   1. Mounting Height: As indicated.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer’s written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain electronic markerboard units.

END OF SECTION 101100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Plaques.
   2. Dimensional characters.
   3. Panel signs.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Division 22 and 23 Sections for labels, tags, and nameplates for mechanical equipment.
   3. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
   4. Division 26 "Lighting" Section for illuminated Exit signs.

1.3 DEFINITIONS


1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, 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 for the following:
   1. Aluminum.
   2. Acrylic sheet.
   3. Furnish full-size rubbings for metal plaques.
D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Dimensional Characters: Full-size Samples of each type of dimensional character (letter, number, and graphic element).
2. Aluminum: For each form, finish, and color, on 6-inch (150-mm-) long sections of extrusions and squares of sheet at least 4 by 4 inches (100 by 100 mm).
3. Acrylic Sheet: 8 by 10 inches (200 by 250 mm) for each color required.
4. Panel Signs: Not less than 12 inches (305 mm) square including border.
5. Accessories: Manufacturer's full-size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For fabricator.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 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.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.


1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers’ written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 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 metal and polymer finishes beyond normal weathering.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Stainless Steel Sheet and Plate: ASTM A 240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

C. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).

D. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 PLAQUES

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

1. Advance Corporation; Braille-Tac Division.
4. Matthews International Corporation; Bronze Division.
5. Metal Arts; Div. of L&H Mfg. Co.
8. Southwell Company (The).

B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:

1. Plaque Material: Bronze.
2. Background Texture: Manufacturer’s standard pebble texture.
5. Thickness: 0.250 inch (6.35 mm) thick.

C. Plaque Schedule:

1. Plaque Type:

   a. Plaque Size: As indicated.
   b. Character Size: As indicated.
   c. Text/Message: As indicated.
   d. Location: As indicated.
2.3 DIMENSIONAL CHARACTERS

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

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
4. ASI-Modulex, Inc.
5. Bunting Graphics, Inc.
6. Charleston Industries, Inc.
8. Grimco, Inc.
10. Metal Arts; Div. of L&H Mfg. Co.
15. Southwell Company (The).

B. Cast Characters at Auditorium: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.

1. Character Material: Aluminum
2. Thickness: 1/2 inch (12.7 mm)
3. Letter Height, and copy: As indicated.
4. Letter Style: As selected by Architect from manufacturer's full range.
5. Color(s): As selected by Architect from manufacturer's full range.

2.4 PANEL SIGNS

A. Basis-of-Design Product: Manufacturer: Mowhawk Sign Systems; Product: 200A. Sand-carved, "ES Plastic" panel, with raised, tamper-proof copy. Subject to compliance with requirements, provide a comparable product by one of the following manufacturers may be incorporated into the work, with prior written approval of Architect:

1. ACE Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. Allen Industries Architectural Signage
4. Allenite Signs; Allen Marking Products, Inc.
5. APCO Graphics, Inc.
6. ASI-Modulex, Inc.
7. Best Sign Systems Inc.
11. Grimco, Inc.
12. Innerface Sign Systems, Inc.
13. InPro Corporation
14. Matthews International Corporation; Bronze Division.
17. Seton Identification Products.
18. Signature Signs, Incorporated.
19. Supersine Company (The).

B. Comparable Products: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

C. Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner, complying with the following requirements:

1. Fabricate signs with edges mechanically and smoothly finished, to conform to the following requirements.
   a. Edge Condition: Square Cut.
   b. Corner Condition: Square corners.
2. Graphic Content and Style: Provide sign copy that complies with the requirements for size, style, spacing, content, position, material, thickness, finishers and colors of letters, numbers, and other graphic symbols, as indicated on the sign schedule that follows.
3. Raised Copy: Sand blasted characters from matte-finished plastic sheet with contrasting core color. Produce precisely-formed characters with square-cut edges free from burro and cut marks. Glued-on letters and etched backgrounds are not acceptable.
4. Panel Material:
   a. Laminated, Sandblasted Polymer: Raised graphics with Braille 1/32 inch (0.8 mm) above surface with contrasting colors as selected by Architect from manufacturer’s full range and laminated to acrylic back.
5. Mounting:
   a. Wall mounted with manufacturer’s standard.
6. Colors: To match existing.
7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

D. Panel Sign Types:
1. Sign Type A: Room sign with long name
   a. Sign Size: 6-inches (152 mm) wide x 7-inches (178 mm) high.
   b. Message Panel Finish/Color: As selected by Architect from manufacturer’s full range.
   c. Background Finish/Color: Contrasting color as selected by Architect from manufacturer’s full range.
   d. Upper panel character size: 2-inches (51 mm).
   e. Lower panel character size: 5/8-inches (16.5 mm).
   f. Upper panel: Room number (typical 4 characters) and Braille.
   g. Lower panel: Room name (typical 22 characters) and Braille.
   h. Location: As directed by Architect.

2. Sign Type B: Room sign with short name
   a. Sign Size: 6-inches (152 mm) wide x 6-inches (152 mm) high.
   b. Message Panel Finish/Color: As selected by Architect from manufacturer’s full range.
   c. Background Finish/Color: Contrasting color as selected by Architect from manufacturer’s full range.
   d. Upper panel character size: 2-inches (51 mm).
   e. Lower panel character size: 5/8-inches (16.5 mm).
   f. Upper panel: Room Number (typical 4 characters) and Braille.
   g. Lower panel: Room Name (typical 11 characters) and Braille.
   h. Location: As directed by Architect.

3. Sign Type C: Storage
   a. Sign Size: 7-inches (178 mm) wide x 3-inches (76 mm) high.
   b. Message Panel Finish/Color: As selected by Architect from manufacturer’s full range.
   c. Background Finish/Color: Contrasting color as selected by Architect from manufacturer’s full range.
   d. Panel character size: 5/8-inches (16.5 mm).
   e. Panel copy: Average of 16 characters.
   f. Location: As directed by Architect.

2.5 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.6 FABRICATION

A. General: Provide manufacturer’s standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.7 FINISHES, GENERAL

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer’s standard Class I clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

B. Color Anodic Finish: Manufacturer’s standard Class I integrally colored or electrolytically deposited color anodic coating, 0.018 mm or thicker, in black applied over a satin (directionally textured) mechanical finish, complying with AAMA 611.

C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer’s written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

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

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer’s written instructions.
1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3-inches (75mm) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Flush Mounting: Mount characters with backs in contact with wall surface.
2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

D. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.

1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.
2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

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.

3.4 PANEL SIGN SCHEDULE

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END OF SECTION 10431
PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes the following:

1. Overhead metal curtain track and guides.

2. Cubicle curtains as identified in the Drawings.

1.2 RELATED SECTION
A. Section 095113 – Acoustical Panel Ceilings.

1.3 REFERENCES

1.4 PERFORMANCE REQUIREMENTS
A. Track: To support vertical test load of 50 lbs without visible deflection of track or damage to supports.

B. Size track to support moving loads, sufficiently rigid to resist visible deflection.

1.5 SUBMITTALS
A. Submit shop drawings under provisions of Division 1.

B. Submit shop drawings indicating a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

C. Submit product data under provisions of Division 1.

D. Submit product data for curtain fabric characteristics. Include manufacturer’s standard color chart with proposed color indicated.

E. Submit 12 x 12 inch sample patch of curtain cloth with representative hem stitch detail, heading with reinforcement, and carrier attachment to curtain header.

F. Submit manufacturer’s installation instructions under provisions of Division 1.
1.6 MAINTENANCE DATA
A. Submit maintenance data under provisions of Division 1.
B. Include recommended cleaning methods and materials and stain removal methods.

1.7 REGULATORY REQUIREMENTS
A. Conform to NFPA Std. 701 for flame resistance requirements for curtain fabric.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site under provisions of Division 1.
B. Store and protect products under provisions of Division 1.
C. Accept curtain materials on site and inspect for damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS – CUBICLE TRACKS AND CURTAINS
A. Capital Cubicle Co., Inc.
B. General Cubicle Co.
C. Imperial Fastener Co., Inc.
D. A.R. Nelson Co., Inc.
E. OB/Masco Drapery Hardware Co.
F. Watrous, Inc.
G. Automatic Device Co.
H. Belton Manufacturing Corp.
I. Clickeze Corporation (Basis of Design).
J. Substitutions: Under provisions of Section 012500.

2.2 TRACK MATERIALS
A. Track: Extruded aluminum sections, one piece per cubicle track run.
B. Track Ends: Positive stop to fit track extrusion.
C. Attachment Clips: Per manufacturers.

D. Carriers: Nylon roller to accurately fit track, designed to eliminate bind when curtain is pulled, and fitted to curtain to prevent accidental curtain removal.

2.3 CURTAIN MATERIALS

A. Curtain: 100% Polyester, closely woven, anti-bacterial, self-deodorizing, sanitized, flame-proofed to requirements of NFPA Standard 701. Color: Refer to Drawings.

B. Open Mesh Cloth: Open weave to permit air circulation, flameproof material. Color: Refer to Drawings.

C. Shower Liners: 8 gage vinyl, anti-microbial, water repellent, scrubbable, for installation with shower curtains.

2.4 FINISHING

A. Exposed Aluminum Surfaces: Clear anodized aluminum.

2.5 FABRICATION

A. Manufacture curtains of one piece, sized 10 percent wider than tract length. Terminate cubicle curtain 15 inches from floor; shower curtain ½ inch from floor.

B. Include open mesh cloth at top 20 inches of cubicle curtain for room air circulation.

C. Curtain heading of triple thickness 2 inches wide, with grommeted holes for carriers 6 inches on center, double fold bottom hem 2 inches wide included lead weights. Lockstitch seams in two rows. Turn seam edges and lockstitch.

D. Fabricate track bend with minimum 12-inch radius, without deforming track section, or impeding movement of carriers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and above ceiling supports are ready to receive work.

B. Verify field measurements are as shown on Drawings.

C. Beginning of installation means installer accepts existing surfaces and conditions.

3.2 INSTALLATION

A. Install curtain track secure and rigid, true to ceiling line.

B. Attach track to ceiling grid with attachment clips at 2'-0" o.c.
C. Install end cap and stop device.

D. Install curtains on carriers ensuring smooth operation.

END OF SECTION 102123
SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Owner-furnished, Owner-Installed (O.F.O.I.) and Contractor-Furnished, Contractor-Installed (C.F.C.I.) toilet, bath and laundry accessories.

B. Related Sections include the following:

1. Division 04 Section “Unit Masonry” for wall substrate for accessories.
2. Division 06 Section “Miscellaneous Rough Carpentry” for wood blocking in frame walls for surface-mounted items.
3. Division 06 Section “Interior Architectural Woodwork” for FRP wall paneling substrate for accessories.
4. Division 09 Sections “Non-Structural Metal Framing,” “Gypsum Board” and “Tiling” for wall substrate for accessories.
5. Division 10 Section “Toilet Compartments” for substrate for partition-mounted accessories.
6. Division 26 Sections for power for warm air hand and hair dryers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer’s warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

D. Owner will provide the following information to the Contractor, through the Construction Manager, for O.F.O.I. accessories, for coordination of the Work:

1. Product Data: For each type of O.F.O.I. accessory indicated. Include the following:

   a. Materials and finish, installation details, and roughing-in and mounting measurements.
1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer’s standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and 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 MANUFACTURERS

A. Basis-of-Design Product: The design for each accessory is based on the named product in the schedule that follows. Subject to compliance with requirements, provide either the named product or a comparable product by one of the manufacturers listed below, with prior written approval of Architect:

1. Toilet and Bath Accessories:
   a. A & J Washroom Accessories, Inc.
   b. Bobrick.
   c. Bradley Corporation.
   d. GAMCO - General Accessory Manufacturing Co.

2. Warm Air Dryers:
   a. A & J Washroom Accessories, Inc.
   b. American Dryer, Inc.
   c. Bobrick.
   d. Bradley Corporation.
   e. Excel Dryer Corporation.
   f. General Accessory Manufacturing Co. (GAMCO).
   g. World Dryer.

3. Emergency Shower Modesty Curtains:
RENAISSANCE HIGH SCHOOL – TENANT IMPROVEMENT
MERIDIAN, IDAHO
HA PROJECT #17015

January 12, 2018

TOILET, BATH, AND LAUNDRY ACCESSORIES

b. Guardian Equipment.
c. Haws Company.

B. Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip zinc coating.


E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.


2.3 OWNER-FURNISHED, OWNER-INSTALLED (O.F.O.I.) AND CONTRACTOR-FURNISHED, CONTRACTOR INSTALLED (C.F.C.I.) TOILET, BATH AND LAUNDRY ACCESSORIES

A. Paper Towel Dispenser, item ‘D’ of toilet accessories 5/A5.01. (O.F.O.I.)

B. Soap Dispenser: Surface-mount: B-2Bobrick B-2111, 626 finish. (O.F.O.I.)

C. Grab Bars: (C.F.C.I.)

1. Provide one (1) of each length at each Lab Restroom 511B as indicated: Bobrick B-6806.99 x 36, B-6806.99 x 42, and B-6806.99 x 18 (vertical) with peened surface, 630 finish.

D. Toilet Tissue Dispenser: Bobrick B-2746, satin finish cast aluminum. (O.F.O.I.)
1. Vandal-resistant double-roll toilet tissue dispenser with controlled delivery, equipped with a tumbler lock keyed to match other washroom accessories.

E. Mirror: Bobrick B-290 x 2436, 630 finish. (C.F.C.I.)

F. Custodial Utility Shelf: Bobrick B-239 x 34, 626 finish. (C.F.C.I.)

1. Provide (1) Custodial Utility Shelf at each janitor sink indicated on mechanical drawings. Locate on wall adjacent to mixing valve.

G. Emergency Eyewash Modesty Curtain: (C.F.C.I.)

1. Guardian Equipment; Product: Wall-Mounted Modesty Curtain, model # APBF 250-065, with stainless steel bar rail, hooks and vinyl curtain. Subject to compliance with requirements, a comparable model in construction and configuration, by one of the following manufacturers, may be incorporated into the work, with prior written approval of Architect.

2. Provide one modesty curtain assembly at each Emergency Eyewash station (plumbing fixture ESHR-1).

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lb (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800
SECTION 104413 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Fire Protection Cabinets for Owner-Furnished, Owner-Installed (O.F.O.I.) portable fire extinguishers.
   2. Fire-Protection cabinets and blankets.

B. Owner-Furnished Material: Portable fire extinguishers and brackets for bracket-mounted portable fire extinguishers.

C. Related Sections include the following:
   1. Division 01 Section “Alternates” for alternates that affect the scope of work of this Section.
   2. Division 05 Section “Cold-Formed Metal Framing” for walls to receive fire protection cabinets.
   3. Division 07 Section “Through-Penetration Firestop Systems” for firestopping sealants at fire-rated cabinets.
   4. Division 09 Sections “Non-Load-Bearing Steel Framing” and “Gypsum Board” for walls to receive fire protection cabinets.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
   1. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.

C. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work are limited to manufacturers specified.

2. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

3. Comparable Products: Architect will consider Contractor’s request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

   b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

   c. Evidence that proposed product provides specified warranty.

   d. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.3 PORTABLE FIRE EXTINGUISHERS - OWNER FURNISHED, OWNER INSTALLED (O.F.O.I.)

A. Multipurpose Dry-Chemical Type in Steel Container:

   1. UL-rated 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

   2. Locations: All indicated fire extinguishers other than those indicated below.

B. Multipurpose Dry-Chemical Type in Steel Container:

   1. UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

   2. Locations: Chemistry Classrooms, Chemistry Labs, Dispensing, Physics Classroom, Biology Classrooms, and Earth Science Classrooms.
2.4 FIRE PROTECTION CABINET FOR FIRE EXTINGUISHERS) – CONTRACTOR-FURNISHED, CONTRACTOR-INSTALLED (C.F.C.I.)


1. Subject to compliance with requirements, provide an equivalent product by one of the following manufacturers:
   a. Fire End & Croker Corporation.
   c. Kidde Fyrnetics.
   d. Larsen’s Manufacturing Company.
   e. Modern Metal Products; Div. of Technico.
   f. Moon American.
   g. Potter Roemer; Div. of Smith Industries, Inc.
   h. Watrous; Div. of American Specialties, Inc.

B. Cabinet Type: Suitable for fire extinguisher.


D. Semirecessed Fire Extinguisher Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch (64-mm) backbend depth.

E. Cabinet Trim Material: Steel sheet.

F. Door Material: Steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer’s standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting lever handle with cam-action latch.
2. Provide manufacturer’s standard hinge permitting door to open 180 degrees.

J. Accessories:

1. Mounting Bracket: Manufacturer’s standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
   a. Identify fire extinguisher in fire-protection cabinet with the words “FIRE EXTINGUISHER.”
1) Location: Applied to cabinet door.
2) Application Process: Silk-screened or Pressure-sensitive vinyl letters.
3) Lettering Color: White.
4) Orientation: Vertical.

K. Finishes:
1. Manufacturer’s standard baked-enamel paint for the following:
   a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet and door.

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

2.5 FIRE-PROTECTION CABINET FOR FIRE BLANKET – CONTRACTOR-FURNISHED, CONTRACTOR-INSTALLED (C.F.C.I.)


1. Subject to compliance with requirements, provide an equivalent product by one of the following manufacturers:
   a. Fire End & Croker Corporation.
   c. Kidde Fyrnetics.
   d. Larsen’s Manufacturing Company.
   e. Modern Metal Products; Div. of Technico.
   f. Moon American.
   g. Potter Roemer; Div. of Smith Industries, Inc.
   h. Watrous; Div. of American Specialties, Inc.

B. Cabinet Type: Suitable for fire blanket.

C. Cabinet Construction: Nonrated.

D. Cabinet Material: Enameled-steel sheet.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall; with no trim.

F. Door Material: Steel sheet.

G. Door Style: Solid opaque panel with frame.

H. Door Hardware: Manufacturer’s standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

   1. Provide projecting lever handle with cam-action latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

I. 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 by Architect.

   a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE BLANKET."
      
      1) Location: Applied to cabinet door.
      2) Application Process: Silk-screened or Pressure-sensitive vinyl letters.
      3) Lettering Color: Black.
      4) Orientation: Vertical.

3. Fire Blanket.

   a. Roller Type Fire Blanket: Furnish and install a complete fire blanket and surface mounted cabinet system. The fire blanket shall be attached to a roller and enabled for rapid release through an arm loop system. The cabinet unit shall be constructed of cold-rolled steel with a standard finish of red baked acrylic enamel. Manufacturer’s standard lettering in a contrasting “white” color shall clearly indicate the cabinet’s function. Lettering shall read: “Fire Blanket.” The cabinet door shall be provided with manufacturer’s standard hardware, including hinges, latch, and door pull.

J. Finishes:

   1. Manufacturer’s standard baked-enamel paint for the following:
       
       a. Exterior of cabinet, door, and trim, except for those surfaces indicated to receive another finish.
       b. Interior of cabinet and door.
       
       1) Color: As selected by Architect from manufacturer’s full range.

2.6 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer’s standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

   1. Weld joints and grind smooth.
   2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.

   a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer’s standards, from materials indicated and coordinated with cabinet types and trim styles selected.

   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
   2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 FINISHES, GENERAL

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer’s standard methods.

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 paint manufacturer’s written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.
3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer’s written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413
SECTION 113100 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Contractor-Furnished, Contractor-Installed (C.F.C.I.) Residential Appliances include the following:
      a. Electric Cooktop.
      b. Dishwasher
   2. Owner-Furnished, Owner-Installed (O.F.C.I.) Residential Appliances include the following:
      a. Refrigerator/Freezers.

B. Related Sections include the following:
   1. Division 06 Section "Interior Architectural Woodwork" for cabinets and plastic-laminate tops that receive residential appliances.
   2. Division 22 Section "Plumbing" Sections for water distribution piping connections and drainage and vent piping connections to residential appliances.
   3. Division 23 "Mechanical" Sections for exhaust hoods.
   4. Division 26 Section "Electrical" Sections for services and connections to residential appliances.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.
   1. O.F.C.I. Residential Appliances: Owner shall provide product data for O.F.C.I. residential appliances, for utility rough-in coordination.

B. Appliance Schedule: For appliances; use same designations indicated on Drawings.

C. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for each product.

E. Maintenance Data: For each product to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 30 miles (48 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain residential appliances through one source from a single manufacturer.

   1. To the greatest extent possible, provide appliances by a single manufacturer for entire Project.

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

E. Regulatory Requirements: Comply with provisions of the following product certifications:

   1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.
   3. NAECA: Provide residential appliances that comply with NAECA standards.

F. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with ICC/ANSI A117.1.

   1. Operable Parts: Provide controls with forward reach no higher than 48 inches (1219 mm) above the floor, horizontal front reach no more than 25 inches (635 mm), horizontal side reach no more than 24 inches (610 mm), and that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
   2. Range or Cooktop: Provide top surface 34 inches (865 mm) above the floor, with controls that do not require reaching across burners.
   3. Refrigerator/Freezer: Provide 50 percent of freezer space within 54 inches (1370 mm) of the floor.

G. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the FTC Appliance Labeling Rule.

   1. Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 WARRANTY

A. Special Warranties: Manufacturer’s standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

   1. Electric Cooktop: Five-year limited warranty for in-home service on surface-burner elements.
2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. **Basis-of-Design Product:** The design for each residential appliance is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2. **Comparable Products:** Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   
a. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

c. Evidence that proposed product provides specified warranty.

d. Additional construction costs required for the incorporation of a comparable product into the Work shall be the responsibility of the Contractor.

2.2 RESIDENTIAL APPLIANCES – (C.F.C.I.)

A. **Electric Cooktop:**

1. **Basis-of-Design Product:** Manufacturer: General Electric Company; Product: JP626WFFF or a comparable product by one of the following:

   a. Hotpoint.
   b. Whirlpool Corporation.

2. **Electric Cooktop:**

   a. Four electric burner elements.

      1) **Coil Type:** 2 - 2200 W and 2 - 1200 W.

   b. **Size:** 36 inches (915 mm)

   c. **Top Material:** Porcelain-enamel steel

      1) **Finish:** White.

   d. **Controls Location:** Front.

   e. **Power/Rating Requirement:** 208-240 V, 30 A.

B. **Dishwasher**

1. **Basis-of-Design Product:** Manufacturer: Whirlpool; Product: WDTA50SAHV or a comparable product by one of the following:
a. Hotpoint.
  b. General Electric.

2. Dishwasher:
   a. Size: 24 inches
   b. Interior material: Stainless steel
      1) Finish: White.
   c. Controls Location: Front.

2.3 FINISHES, GENERAL

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

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Color-Coated Finish: Provide appliances with manufacturer's standard finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, color, gloss, and minimum dry film thickness for painted finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

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

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Utilities: Refer to Mechanical and Electrical Sections for plumbing and electrical requirements.

3.3 CLEANING AND PROTECTION

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.
C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION 113100
SECTION 115313 - LABORATORY FUME HOODS

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. Laboratory fume hoods and component fittings, fixtures, and accessories.
   2. Epoxy resin work surfaces and cupsinks for fume hoods.

B. The Work includes, but is not necessarily limited to, furnishing, uncrating, setting in place, leveling, and installing laboratory fume hoods as described on the drawings and this specification. Completely install and erect all fixtures, equipment, and accessories ready for use. Hoods shall be pre-piped and pre-wired at the factory. Final connection of plumbing fixtures/fittings to building supply and waste piping will be done as the work of Division 22 Section “Plumbing.” The final electrical connections shall be by Division 26 “Electrical” contractor. As the work of this section, the fume hood supplier and installer shall coordinate the final connection work with the Construction Manager and the plumbing and electrical contractors to insure a complete installation.

C. Additionally, the Work shall include, but not necessarily be limited to, the following:
   1. Scribes and filler panels.
   2. Piping, conduit and accessories necessary to properly connect fixtures, fittings, sinks, and electrical outlets to building services.
   3. Plumbing fixtures.
   4. Connection of fume hoods to building exhaust system ductwork.
   5. Pipe supports, service tunnels, service turrets and supporting structures.

D. Final Electrical Connection to fume hoods shall be by Electrical Contractor at the single connection point provided by the fume hood sub-contractor at the top of the hood.

E. Hood shall be Constant Volume unless noted otherwise.

F. Related Sections:
   1. Division Division 06 Section “Interior Architectural Woodwork” for substructure supporting fume hood, work surface, sinks and cupsinks associated with fume hoods.
   2. Division 22 plumbing Sections for water/piped utility services and for drain/waste/vent service for fume hoods.
   3. Division 23 HVAC Sections for exhaust ductwork and ventilators for fume hoods.
   4. Division 26 Sections for electrical service and connections to fume hoods.

1.3 SUBMITTALS

A. Product Data: For each type of fume hood and accessory product indicated.
B. Fume Hood Testing in Manufacturing Facility:

1. Provide certification of fume hood compliance at the point of manufacture in accordance with ASHRAE 110-R (110-1995) testing requirements. Provide testing certification prior to fume hood delivery of each style and size of fume hood on the project.

C. Shop Drawings: For fume hoods, showing plan layout, elevations, ends, cross-sections, service run-spaces, location and type of fixtures and service fittings:

1. Include details and location of anchorages and fitting to floors, walls, cabinets, and base.
2. Include layout of units with relation to surrounding walls, laboratory cabinets, doors, windows, lighting and air-conditioning fixtures, connections of hood-to-hood exhaust system, location of access doors, cut-off valves, junction boxes.
3. Coordination drawings with other trades whose work affects installation or performance of fume hoods.

D. Installer’s qualifications.

E. Samples for Initial Selection: For factory finishes of component parts and accessories, provide color charts with manufacturer’s full range of available colors, textures and patterns.

F. Samples for Verification:

1. Submit two (2) 6 x 6-inch (152 x 152mm) samples of each type of specified finish and color selected by Architect.

G. Operations/Maintenance Manuals:

1. Accompanying certification, submit for 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.

H. Certifications: stating that equipment is installed per applicable and referenced codes and standards, is adjusted and balanced for design operations, and is complete and ready for intended function.

I. Maintenance Data: For projection screens to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer’s Qualifications: Factory-certified in writing by the manufacturer of the fume hood.

B. Source Limitations: Obtain fume hoods and accessories from single manufacturer, including necessary mounting hardware.

C. 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.

D. Contractor for Work in this section shall have an established organization and production facilities specializing in the type of equipment specified, with an experienced engineering department. Each shall have the demonstrated ability 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.

E. General Performance: Design fume hoods so that, when connected to exhaust system that provides proper exhaust volume under normal laboratory conditions, fume hoods will operate in a safe, efficient manner, within
acceptable tolerances for face velocities specified. Dead-air pockets and reverse-air currents will not be permitted along surface of hood interiors.

1. All factory pre-wired hoods shall carry a nationally recognized label such as Underwriters or ETL listing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of fume hoods with delivery of other laboratory components.

B. Environmental Limitations: Do not deliver or install fume hoods until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

C. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for each fume hood is based on the product specified. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 FUME HOOD MATERIALS

A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard.

B. Ceiling closure panels: Minimum 18 gauge; finish matching hood exterior.

C. Bypass grilles: Low resistant type, 18-gauge steel, upward directional louvers.

D. Safety glass: 7/32" (5.6 mm) -thick laminated safety glass.

E. Work surface: Black epoxy resin, 1-1/4-inch (32 mm) thick.

F. Cupsinks: Manufacturer's standard low-profile polyolefin.

G. Sash cables: Stainless steel, uncoated, 1/8" diameter.

H. Sash guides: Corrosion resistant polyvinyl chloride.

I. Pulley assembly for sash cable: 2" diameter, zinc dichromate finish, ball bearing type, with cable retaining device.

J. Sash pull: Full width steel with chemical resistant powder coating.

K. Gaskets: 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

L. Fasteners:
1. Exterior structural member attachments: Sheet metal screws, zinc plated.
2. Interior fastening devices concealed. Exposed screws and screw head caps not acceptable.
3. Exterior panel member fastening devices to be corrosion resistant non-metallic material. Exposed screws not acceptable.

M. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings, and use of sash.

2.3 RESTRICTED BYPASS FUME HOOD FH-1 (For use with constant volume or variable air volume exhaust systems)

A. Basis-of-Design Product: Manufacturer: Fisher Hamilton Industries, Inc.; Product: "SafeAire II – Restricted Bypass Superstructure Assembly," model # Model 54L2780 PB, 96" (2438 mm) wide hood. Subject to compliance with requirements, provide one product from the following manufacturers:

2. Labconco Corporation.

B. Products, General: Subject to compliance with requirements, provide the following:

1. Fisher Hamilton Industries "SafeAire II" product numbers are used in this specification as the standard of quality and construction for laboratory fume hoods. Fume hood units by other manufacturers may be furnished provided they are equal in dimensions, profiles, construction, quality, safety, and function as judged by the architect. The burden of proof of equality is on the proposer.
2. Provide constant volume/bypass unit designed to operate with a face velocity of 100 lineal fpm with sash raised. As sash is lowered or raised, volume of air exhausted shall remain constant.
3. Hood shall be "bench type."
4. Face Velocity: 100 FPM.
5. Size: 96-inches (2438 mm) wide x 31-1/4-inches (794 mm) deep x 54-1/4-inches (1378 mm) high.
6. Allow an additional 7 inches (178 mm) in height of installation for door in fully open position.

2.4 HOOD SUPERSTRUCTURE CONSTRUCTION

A. General: Design hoods to be highly fume resistant, to collect, retain and dispose of hazardous fumes with complete safety, minimum purging of air from room supply, and minimum turbulence within hood chamber.

B. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8" thick.

1. Walls consist of a sheet steel outer shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels must be attached to a full frame construction, minimum 14-gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
2. Access to fixture valves concealed in wall provided by exterior removable access panels, gasketed access panels on the inside liner walls, or through removable front posts.

C. Exhaust outlet: Rectangular with ends radiused, shaped and flanged, with manufacturers standard epoxy powder coated finish. Provide transition pieces, of same material and finish of exhaust outlet, from hood collar to exhaust duct for a complete installation.

D. Access opening perimeter: Airfoil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide nominal one-inch bypass when sash is in the closed position. Bottom foil shall be
removable without use of special tools. Bottom foil shall provide access areas for electrical cords. Bottom foil: Steel with chemical resistant black powder coating.

E. Fume hood sash: Full view type with clear, un-obstructed, side to side view of fume hood interior and service fixture connections.

1. Bottom sash rail: 2" maximum, 18-gauge steel with powder coating finish. Provide integral formed, flush pull the full width of bottom rail.
2. Set safety glass into rails in deep form, extruded polyvinyl chloride glazing channels.
3. Counter balance system: Single weight, pulley, cable, counter balance system which prevents sash tilting and permits one finger operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of travel. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure.
4. Open and close sash against rubber bumper stops.
5. Life cycle test sash and weight to 100,000 cycles without failure. Provide independent test data.


G. Baffles: Baffles providing controlled air vectors into and through the fume hood shall be fabricated of the same material as the liner. Provide exhaust slots full height on vertical sides of the baffle with upper and lower slots adjustable. Provide fixed, permanently open horizontal slot 17" above the work surface. Minimum height of 19" for interior workspace is acceptable at the extreme upper portion of the fume hood to provide maximum interior work area. All baffle supports/brackets to be non-metallic.

1. Remote baffle adjustment: Single point control, accomplished while hood is in use, without disturbing apparatus, from outside right hand corner post of fume hood with sash in either the open or closed position, and permitting setting for (1) high thermal loading, (2) heavier than air gases or fumes generated near work surface, and (3) normal or average operation
   a. Remote adjuster: Control handle and an acid resistant label indicating proper control handle location for baffle function.
   b. Rigidly correlate control handles to baffle positioner; cable-type adjustments are not acceptable.
   c. Design baffle adjuster to engage and disengage from the adjustable baffle without the use of tools.
   d. Shall comply with OSHA Lab Standard Guidelines.
   e. Baffles providing no adjustment or requiring internal manipulations are not acceptable.
   f. Non-metallic supports and fasteners required inside of hood.
   g. Life cycle test to 10,000 cycles without failure. Provide independent test data.

H. Service fixtures and fittings: Color coded washers at hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color coded service inserts in the handles.

1. Valves: Needlepoint type with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be removable and replaceable.
2. Provide piping for all service fixtures from valve to outlet: Type L copper for water, and schedule 40 ASTM 53 black steel Type E iron for gas.
3. Fixtures exposed to hood interior: Brass with chemically resistant vinyl coating, black vinyl with color-coded washer.
5. Services: As shown on the drawings and as specified.
6. All water service fittings shall be equipped with a vacuum breaker.
7. All water fittings shall be positioned to discharge into their respective sinks or cupsinks.
8. Service Outlets Identification: Provide colored plastic index discs with embossed identification letter at each service fitting handle or knob. Secure discs to fitting handles to be virtually tamperproof. Color code discs as follows:
<table>
<thead>
<tr>
<th><strong>Service</strong></th>
<th><strong>Color</strong></th>
<th><strong>Letter Code</strong></th>
<th><strong>Color</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>Dark blue</td>
<td>Gas</td>
<td>White</td>
</tr>
<tr>
<td>Cold water</td>
<td>Dark green</td>
<td>CW</td>
<td>White</td>
</tr>
</tbody>
</table>

I. Hood light fixture: Two lamp, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of roof. Provide safety glass panel cemented and sealed to the hood roof.

1. Interior of fixture: White, high reflecting plastic enamel.
2. Size of fixture: Largest possible to provide required illumination.
3. Include lamps with fixtures.
4. Illumination: Minimum 80 foot-candles.
5. Replacement of the bulbs to be accomplished from outside of the hood.

J. Electrical services: Receptacles as indicated on the drawings including compliant rating. Flush plates: Black acid resistant thermo-plastic.

1. At all hoods with water fittings, all electrical receptacles shall be wired for protection with ground fault interrupter (GFI). At least one receptacle at each hood shall have a built-in ground fault interrupter.

K. Work surface for fume hood: 1-1/4" thick surface, dished a nominal one-half inch to contain spills, equivalent to a Fisher Hamilton model # 21L96262BF, with two cutouts for front-mounted cupsinks.

1. Work surface material: Molded epoxy resin work surfaces, black.
2. Provide two 6 x 3-inch (152 x 76 mm) nominal, shallow-profile, polyolefin cupsinks equivalent to Fisher Hamilton model # 34L13700.
3. Waste and vent piping for cupsinks: The Division 22 Contractor shall provide and install traps, tailpieces and any offsets required to connect sinks and cupsinks to building waste and vent piping.

L. Electronic Safety Monitor: At each hood provide an electronic safety monitor which monitors high, low, and blockage conditions and triggers an alarm signal when unsafe conditions exist.

1. Cutout for monitor will be provided at the factory. Provide the monitor as work of this section.
2. LED display.
3. Audible and visual alarm signals.
4. Solid state, thermistor-based, multi-point sensing system.
5. U.L. listed.
6. Provide hood manufacturer standard unit to fit hood.

M. Closure Strips: Metal as applicable to match adjoining surfaces. Provide where required to close openings between fume hood base cabinet and superstructure and adjacent building wall or ceiling construction.

N. Ceiling Closure Panel: Provide manufacturer’s standard, minimum 18-gauge, height as indicated on the drawings, finished to match superstructure.

O. Hoods shall not have pre-punched holes except for services noted or required.

2.5 METAL FINISHES

A. 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.
B. Electrostatically applied urethane powder coat, baked 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:

1. Exterior and interior surfaces exposed to view: 1.5 mil average and 1.2 mil minimum.
2. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.
3. Color: Fume hood superstructure and mobile storage cabinets shall be the same color, as selected by Architect from manufacturer's full range.

2.6 SOURCE QUALITY CONTROL

A. Owner reserves right to require manufacturer to demonstrate hood performance prior to shipment to prove compliance with contract requirements. Test hoods, testing facility, necessary instrumentation, apparatus, and equipment shall be supplied by manufacturer at no cost to Owner. Test hoods to verify performance requirements, using smoke and air-flow meters in accordance with ASHRAE 110-R (110-1995).

PART 3 - EXECUTION

3.1 PREPARATION

A. Examination:

1. Prior to installation of the work of this section, carefully examine the installed work of all other trades 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, approved submittals, and the manufacturer’s recommendations.
3. Notify the Architect in writing of unsatisfactory conditions requiring correction prior to installation.
4. Do not proceed with installation in areas of discrepancy until unsatisfactory conditions been fully corrected.

3.2 INSTALLATION

A. General: Install fume hoods plumb, level, aligned, rigid, and securely anchored to building and adjacent cabinetry, in proper location, in accordance with manufacturer’s instructions and approved shop (layout) drawings. Install closures neatly. Securely attach access panels, but provide for easy removal and secure reattachment.

B. Accessory Installation: Install accessories and fittings in accordance with manufacturer’s recommendations. All fittings, outlets, cupsinks, and remote control handles shall be ADA accessible.

C. Coordinate sequence of work with mechanical and electrical trades and with related work such as substructure cabinets specified in Division 06.

3.3 FIELD QUALITY CONTROL

A. Field Test: Field-test each unit after completion of installation to verify proper operation of hoods.
3.4 ADJUSTING AND CLEANING

A. Moving Parts: Carefully check and adjust moving parts to insure smooth, near-silent, and accurate sash operation with one hand and with uniform contact of rubber bumpers; ensure counter-balances operate without interference.

B. Clean surfaces, including both sides of glass.

C. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to Architect.

D. All units shall be protected before, during, and after installation. Damaged materials due to improper protection shall be cause for rejection.

3.5 INSTRUCTION OF OWNER’S PERSONNEL

A. Provide a 15-minute instructional video on safe operating and maintenance procedures for laboratory fume hoods. Deliver to the Owner at the time of Substantial Completion.

END OF SECTION 115313