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DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.02 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.03 SUBMITTALS

- A. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of 3 years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

- A. Remove portions of existing building components as shown on the drawings.
- B. Remove other items indicated, for salvage, relocation, and recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 8. Do not close or obstruct roadways or sidewalks without permit.
 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- F. If hazardous materials are discovered during removal operations, stop work and notify Architect/Engineer and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
 2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.03 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect/Engineer before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction indicated on drawings .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire retardant treated wood materials.
- B. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Metal stud framing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- D. PS 20 - American Softwood Lumber Standard; 2010.
- E. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

- A. Grading Agency: Western Wood Products Association (WWPA).

- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.04 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
- B. Fire Retardant Treatment:
 - 1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- C. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and

roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing unless indicated otherwise on the drawings.
- D. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

3.03 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3.04 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.05 SCHEDULES

- A. Blocking in Fire Rated and Non-Rated Walls: Fire retardant treated.

END OF SECTION

**SECTION 06 41 00
CUSTOM CASEWORK**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated wood cabinet units.
- B. Cabinet hardware.
- C. Factory finishing.
- D. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

- A. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2009 (ANSI/HPVA HP-1).
- E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- F. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2011.
- G. PS 1 - Structural Plywood; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, fastening methods, jointing details, and accessories, hardware locations and schedule of finishes.
 - 1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.
 - 2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
- B. Product Data: Provide data for hardware and accessories.
- C. Samples: Submit actual sample of a drawer and door panel indicating drawer and door profiles and factory finished.

- D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Reject and return to fabricator units that are missing hardware components.
- B. Protect units from moisture damage.

1.08 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWII/AWMAC/WI Architectural Woodwork Standards for Premium Grade.
 - 1. Wood Veneer Faced Cabinets: Premium grade.
 - a. Exposed Surfaces: Grade AA, Maple, quarter cut, book-matched.
 - b. Semi-Exposed Surfaces: Grade A, Maple, plain sliced, random-matched.
 - c. Concealed Surfaces: Grade B, Maple, plain sliced, random-matched.
 - d. Door and Drawer Front Edge Profiles: Square Edge, Flush Panel.
 - 2. Plastic Laminate Faced Cabinets: Custom grade, unless another grade is specified.
- B. Cabinets :
 - 1. Finish - Exposed Exterior Surfaces: Wood.
 - 2. Finish - Exposed Interior Surfaces: Wood.
 - 3. Finish - Concealed Surfaces: Wood.
 - 4. Door and Drawer Front Edge Profiles: Square edge with thick applied band.
 - 5. Door and Drawer Front Retention Profiles: Fixed panel.
 - 6. Casework Construction Type: Type A - Frameless.
 - 7. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 - 8. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Premium Grade:
 - 1) Provide vertical run and match for doors, drawer fronts and false fronts within each cabinet unit.
 - 2) Provide well-matched doors, drawer fronts and false fronts across multiple cabinet faces in one elevation.

- 3) Cathedral Grain: Point grain crown up and run in the same direction for entire project.
- 9. Adjustable Shelf Loading: 50 lbs. per sq. ft..
 - a. Deflection: L/144.
- 10. Casework Integrity: Comply with Acceptance Level requirements of AWI/AWMAC/WI (AWS) Appendix A for the following tests:
 - a. Structural Integrity Test - Base Cabinet.
 - b. Concentrated Load Test - Base Cabinet.
 - c. Torsion Test - Base Cabinet.
 - d. Structural Integrity Test - Wall Cabinet.
 - e. Door Durability Test.
 - f. Door Impact Test.
 - g. Door Hinge Test.
 - h. Drawer Bottom Impact Test.
 - i. Drawer Support Test.
 - j. Drawer and Door Pull Test.
 - k. Drawer Rolling Load Test.
 - l. Shelf Load Test.
- 11. Cabinet Doors and Drawer Fronts: Flush style.
- 12. Drawer Side Construction: Multiple-dovetailed.
- 13. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL MATERIALS

- A. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of particleboard, medium density fiberboard, strawboard, or engineered combination of core materials listed; type of glue recommended for specific application; thickness as required; face veneer as follows:
 - 1. Exposed Surfaces: Grade AA, Maple, quarter cut, book-matched.
 - 2. Semi-Exposed Surfaces: Grade A, Maple, plain sliced, random-matched.
 - 3. Concealed Surfaces: Grade B, Maple, plain sliced, random-matched.

2.04 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation: www.formica.com.
 - 2. Lamin-Art, Inc.: www.laminart.com.
 - 3. Panolam Industries International, Inc; Nevamar: www.nevamar.com.
 - 4. Wilsonart LLC: www.wilsonart.com/#sle.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as follows:
 - 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, colors as scheduled, finish as scheduled.

2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, colors as scheduled, finish as scheduled.
3. Door & Drawer Edges: VGS, 0.028 inch nominal thickness, colors as scheduled, finish as scheduled.
4. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
5. Laminate Backer: BKL, nominal thickness to match that of opposing face sheet, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, consisting of sleeve and cap, in color to blend with adjacent surface.
 1. Provide one (1) per 6 lineal feet of countertop. Coordinate exact locations in field with Owner.

2.06 HARDWARE

- A. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
 1. Manufacturer: Knape & Vogt Manufacturing Company: www.kv.com.
 2. Pin Supports for drilled holes: #333 ZC zinc-plated steel.
 3. Use for adjustable shelving within cabinet assemblies.
 4. Other acceptable manufacturers:
 - a. John Sterling Company: www.johnsterling.com.
- B. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, for nominal 1 inch spacing adjustments.
 1. Heavy Duty Standards and Brackets:
 - a. Product: #85 standards and #185 brackets manufactured by Knape & Vogt Manufacturing Company: www.kv.com.
 - b. Finish: Electroplated, Anachrome.
 - c. Use for wall-attached adjustable shelving
- C. Drawer and Door Pulls: 14 mm dia., with stainless steel finish, 96 mm centers. Provide two (2) pulls for drawers greater than 24 inches wide.. Provide two (2) pulls for drawers greater then 24 inches wide.
- D. Cabinet Locks: Cam-type to suit door/drawer application, non-captive key operation, steel with satin finish.
 1. Manufacturers:
 - a. CCL Security Products: www.cclsecurity.com.

- b. Compx International, Inc.: www.compxnet.com.
 - c. Illinois Lock Company: www.illinoislock.com.
 - d. Kenstan Lock Company: www.kenstan.com.
2. Cam Rotation: 90° turn from 3 to 12 locks drawer/right hand door; 90° turn from 12 to 3 locks left hand door.
 3. Core Type: Flat key, 5 disc tumbler.
 4. Keying: Coordinate keying of doors and drawers with Owner. Provide two keys per lock and six master keys.
 5. Strike: None; notch or route cabinet panel.
 6. Provide one (1) per drawer and one (1) per cabinet. For locked paired cabinet doors, provide double door lock on right hand leaf that has two cams that engage cabinet frame and strike plate on left hand leaf, so that no independent concealed latch for left hand leaf is required.
- E. Drawer Slides:
1. Type: Full extension.
 2. Static Load Capacity: 100 pounds, minimum.
 3. Mounting: Bottom mounted.
 4. Stops: Positive type.
 5. Features: Provide self closing/stay closed type, lift-out disconnect with release bumper to prevent accidental drawer removal.
 6. Manufacturers:
 - a. Grass America Inc; Product #3215: www.grassusa.com.
 - b. Knappe & Vogt Manufacturing Company; Product Standard #430E: www.kv.com.
 - c. Blum, Inc.: www.blum.us.
- F. Door Hinges: European style concealed self-closing type, steel with polished finish, allowing 3-dimensional adjustment. Provide complete with black plastic cover caps, and manufacturer's recommended mounting plates with dowel inserts and fasteners.
1. Manufacturers:
 - a. Grass America Inc; Tiomos Hinge System: www.grassusa.com/#sle.
 - b. Hardware Resources; Product 170 Degree Basic Clip On with Dowels #248.0M73.05: www.hardwareresources.com.
 - c. Blum, Inc; Product CLIP top 170° Press-in #71T6580: www.blum.com.

2.07 FABRICATION

- A. Case Body Joinery Method:
- B. Drawer Construction Technique: Dovetail, Doweled or Lock Shoulder..
- C. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- D. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- E. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

- F. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- G. Provide cutouts for fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.
- H. Shop glaze glass materials using the Interior Dry method specified in Section 08 80 00.

2.08 SHOP FINISHING

- A. Hardware: Install hardware components in fabricator's shop. Carpenter installation of cabinet hardware components in field is not permitted.
- B. Sand work smooth and set exposed nails and screws.
- C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
- D. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
 - 1. Transparent:
 - a. System - 11, Polyurethane, Catalyzed.
 - b. Stain: As selected by Architect/Engineer.
 - c. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.

C. Repair damaged and defective casework to eliminate defects functionally and visually. Where not possible to repair properly, replace casework.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

B. Remove sawdust, leftover materials and other debris from within cabinets and drawers.

3.05 SCHEDULES

A. Copy Area 1046: Plastic Laminate Faced Casework.

B. Tutoring Center Intake Area: Wood Veneer Faced Casework.

END OF SECTION

**SECTION 07 90 05
JOINT SEALERS**

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Provide elastomeric joint sealants, joint backer materials and accessories needed to ensure a complete and durable weather tight seal at all locations indicated.

1.02 SUBMITTALS

- A. Product data:
1. Materials list of items proposed to be provided under this Section.
 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
 4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.
 6. Certifications from sealant manufacturer that their products are suitable for the use indicated and comply with specification requirements.
 7. Report from sealant applicator summarizing results of pre-construction field adhesion testing.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Applicator qualifications:
1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
 2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.
- C. Single source responsibility for joint sealants:
1. Obtain joint sealants from single manufacturer for each different product required ensuring compatibility.
 2. Manufacturer shall instruct applicator in procedures for intersecting sealants.
- D. Perform work in accord with ASTM C-1193 guidelines except where more stringent requirements are indicated or specified.
- E. Pre-construction compatibility and adhesion testing:
1. Submit to joint sealant manufacturer samples of actual materials that will contact or affect their joint sealants in the Work for compatibility and adhesion testing.

2. This testing will not be required where sealant manufacturer is able to furnish data acceptable to Architect based on previous testing for adhesion and compatibility to materials matching those of the Work.

F. Pre-construction field adhesion testing:

1. In jobsite field samples prior to general installation, conduct field-tests for adhesion of joint sealants to actual joint substrates using proposed joint preparation methods recommended by manufacturer.
2. Conduct tests for each type of sealant and substrate.
3. Locate field-test joints where inconspicuous or as approved by Architect.
 - a. Include areas typical of those requiring removal of existing sealants and utilize methods proposed for sealant removal that have been pre-approved by Architect.
4. Test method: Use manufacturer's standard field adhesion test methods and methods proposed for joint preparation to verify proper priming and joint preparation techniques required to obtain optimum adhesion of joint sealants to joint substrate.
5. Evaluate and report results of field adhesion testing.
6. Do not use joint preparation methods or sealants that produce less than satisfactory adhesion to joint substrates during testing.

G. Standard of acceptance:

1. Joints installed during pre-construction field adhesion testing that are accepted by Architect shall be retained as standard of acceptability and incorporated into Work of that area during general installation.
2. At least one such standard of minimum 5 feet in length shall be established for each type of sealant and substrate.

- H. Schedule applications of waterproofing water repellents and preservative finishes after sealant installation unless sealant manufacturer approves otherwise in writing. Ensure that installed sealant is allowed to cure sufficiently prior to subsequent applications.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver the materials to the job site in the manufacturer's unopened containers with all labels intact and legible at time of use.
- B. Store materials in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.05 SUBSTRATE CONDITIONS

A. General:

1. Provide joints properly dimensioned to receive the approved sealant system.
2. Provide joint surfaces that are clean, dry, sound and free of voids, deformations, protrusions and contaminants that may inhibit application or performance of the joint sealant.
3. Where expansion joints having preformed joint fillers are scheduled to be sealed, provide a reservoir to accept the sealant such as by a molded breakaway joint cap or a removable block out.

PART 2 PRODUCTS

2.01 GENERAL

- A. Acceptable manufacturer: Bondaflex, Matt Rogers 440-487-2397
- B. Dow Corning
- C. Pecora
- D. Compatibility:
 - 1. Provide joint sealants, joint fillers and accessory joint materials that are compatible with one another and with joint substrates under project conditions.
 - 2. Install joint sealants, joint fillers and related joint materials that are non-staining to visible joint surfaces and surrounding substrate surfaces.
- E. Provide colors selected by Architect from manufacturer's standard color range.

2.02 ELASTOMERIC SEALANTS

- A. Sealant Type A (S-1):
 - 1. For interior and exterior joints (that will not be painted) in vertical surfaces and non-traffic horizontal surfaces such as, but not limited to:
 - a. Control and expansion joints in cast-in-place concrete.
 - b. Joints between architectural pre-cast concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Butt joints between metal panels.
 - e. Joints between marble and/or granite.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of doors, windows, storefronts, louvers and similar openings.
 - h. Control and expansion joints in ceiling and overhead surfaces.
 - i. between metal thresholds or sheet metal seems
 - 2. Provide single-component or multi-component, low-modulus, non-sag sealant; comply with ASTM C920, Type S or M, Grade NS, Class +50/-50, Class +100/-50
 - 3. Acceptable sealants:
 - a. Silicones
 - 1) Single Component
 - a) Bondaflex Technologies Sil 290
 - b) Bondaflex Technologies Sil 295
 - c) Pecora 890
 - d) Dow 790
- B. Sealant Type B (S-2):
 - 1. For interior joints (that will be painted) in vertical surfaces and non-traffic horizontal surfaces such as, but not limited to:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints on exposed interior surfaces of exterior openings.
 - c. Joints on pre-cast beams and planks.

- d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, storefronts, louvers, elevator entrances and similar openings.
 - e. Trim or finish joints subject to movement.
 - f. Sheet metal seams and metal thresholds
2. Acceptable sealants
- a. Urethanes
 - 1) Single Component
 - a) Bondaflex Technologies PUR 25
 - b) Pecora Dynatrol I XL
 - c) Bostik Chemcaulk 915
- C. Sealant Type C (S-3):
- 1. For exterior and interior joints (that will not be painted) in horizontal and sloped traffic surfaces such as, but not limited to:
 - a. Control expansion and isolation joints in cast-in-place concrete.
 - b. Control expansion and isolation joints in structural pre-cast concrete units.
 - c. Joints between architectural pre-cast concrete paving units.
 - d. Tile control and expansion joints.
 - e. Joints between different materials listed above.
 - 2. Provide single-component silicone sealant complying with ASTM C920, Type S or M, Grade P or NS, Class 100/50.
 - 3. Acceptable sealants:
 - a. Silicone
 - 1) Single Component
 - a) Bondaflex Technologies Sil 728 NS
 - b) Bondaflex Technologies Sil 728 SL
 - c) Pecora 301 NS or 300 SL
 - d) Dow 888 or 890
- D. Sealant Type E (S-4):
- 1. For exterior and interior joints (that will not be painted) in vertical and horizontal surfaces of potable water storage or incidental food contact areas.
 - 2. Provide single-component or multi-component polyurethane sealant certified by National Sanitation Foundation as conforming to the requirements of NSF Standard 61-Drinking Water System Components-Health Effects; comply with ASTM C920, Type S or M, Grade P or NS, Class 25; select color from the NSF listing.
 - 3. Acceptable sealants:
 - a. Silicone
 - 1) Single Component
 - a) Bondaflex Technologies Sil 100 GP
 - b) Bondaflex Technologies SIL 100 WF
 - c) Pecora 898
 - d) Dow 786

2.03 ACCESSORIES

- A. Joint cleaner: Cleaner as recommended by sealant manufacturer for substrates indicated.

- B. Joint primer: As recommended by sealant manufacturer for substrates, conditions and exposures indicated.
- C. Bond breaker: Polyethylene tape or other adhesive faced tape as recommended by sealant manufacturer to prevent sealant contact where it would be detrimental to sealant performance.
- D. Joint backer: Closed cell, open cell polyurethane, non-gassing polyolefin or soft rod polyethylene foam rod or other compatible non-waxing, non-extruding, non-staining resilient material in dimension 25 percent to 40 percent wider than joint width as recommended by sealant manufacturer for conditions and exposures indicated.
- E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces that is suitable for masking.

2.04 OTHER MATERIALS

- A. Provide other materials not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant manufacturer as compatible, subject to review of the Architect.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
 - 1. Verify conformance with manufacturer's requirements;
 - 2. Report unsatisfactory conditions in writing to the Architect;
 - 3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Prepare surfaces to receive sealants in accordance with sealant manufacturer's instructions and recommendations except where more stringent requirements are indicated.
- B. Thoroughly clean joint surfaces using cleaners approved by sealant manufacturer whether primers are required or not.
 - 1. Remove all traces of previous sealant and joint backer by mechanical methods, such as by cutting, grinding and wire brushing, in manner not damaging to surrounding surfaces.
 - 2. Remove paints from joint surfaces except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer.
 - 3. Remove wax, oil, grease, dirt film residues, temporary protective coatings and other residues by wiping with cleaner recommended for that purpose. Use clean, white, lint-free cloths and change cloths frequently.
 - 4. Remove dust by blowing clean with oil-free, compressed air.
 - 5. Joints must be dry prior to installing sealant, otherwise bubbling may occur
 - 6. Install sealant immediately after surface prep. Dry tool only

- C. Provide joint backer material uniformly to depth required by sealant manufacturer for proper joint design using a blunt instrument.
 - 1. Fit securely by compressing backer material 25 percent to 40 percent so no displacement occurs during tooling.
 - 2. Avoid stretching or twisting joint backer.
- D. Provide bond-breaker where indicated or recommended by sealant manufacturer, adhering strictly to the manufacturers installation requirements.
- E. Prime joint substrates where required.
 - 1. Use and apply primer according to sealant manufacturers recommendations.
 - 2. Confine primers to sealant bond surfaces; do not allow spillage or migration onto adjoining surfaces.
- F. Taping:
 - 1. Use masking tape where required to prevent sealant or primer contact with adjoining surfaces that would be permanently stained or otherwise damaged by such contact or the cleaning methods required for removal.
 - 2. Apply tape so as not to shift readily and remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION

- A. Provide the approved sealant system where shown on the Drawings, and in strict accord with the manufacturer's recommendations as approved by the Architect.
- B. Install sealants immediately after joint preparation.
- C. Mix and apply multi-component sealants in accord with manufacturer's printed instructions.
- D. Install sealants to fill joints completely from the back, without voids or entrapped air, using proven techniques, proper nozzles and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.
- E. Install sealants to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.
- F. Tool sealants in manner that forces sealant against back of joint, ensures firm, full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities.
 - 1. Dry tool.
 - 2. Provide concave tooled joints unless otherwise indicated to provide flush tooling or recessed tooling.
 - 3. Provide recessed tooled joints where the outer face of substrate is irregular.
- G. Remove sealant from adjacent surfaces in accord with sealant and substrate manufacturer recommendations as work progresses.

H. Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of substantial completion.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal borrowed lites glazing frames.
- C. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- G. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- I. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- J. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- K. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- L. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- N. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

- O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

- A. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Curries, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
 - 4. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Interior Doors, Non-Fire Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
2. Face Sheet Gage: In accordance with specified Grade unless scheduled otherwise on drawings.
3. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
4. Door Thickness: 1-3/4 inch, nominal.
5. Door Face Sheets: Flush.
6. Texture: Smooth.
7. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. General:
 1. Comply with the requirements of grade specified for corresponding door, except:
 - a. Provide thickness (gage) of material as scheduled on drawings.
 2. Finish: Same as for door.
 3. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- C. Interior Door Frames, Non-Fire Rated: Face welded, seamless with joints filled.
 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- D. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 ACCESSORIES

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door.
- C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 08 71 00.
- D. Comply with glazing installation requirements of Section 08 80 00.
- E. Touch up damaged factory finishes.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - 1. Design Wind Loads: Comply with requirements of local building code.
 - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

1.05 SUBMITTALS

- A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details .
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- C. Samples: Submit two samples 4 x 4 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 FIELD CONDITIONS

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

1.09 WARRANTY

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

2.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- F. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install hardware using templates provided.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

2.03 TOLERANCES

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

2.04 CLEANING

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

2.05 PROTECTION

- A. Protect installed products from damage during subsequent construction.

**SECTION 08 71 00
DOOR HARDWARE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for hollow steel doors.
- B. Electrically operated and controlled hardware.

1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.
- C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.
- D. BHMA A156.3 - American National Standard for Exit Devices; 2014.
- E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- F. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.
- G. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.
- H. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2016.
- I. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2010.
- J. BHMA A156.12 - American National Standard for Interconnected Locks; 2013.
- K. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.
- L. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2011.
- M. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.
- N. BHMA A156.23 - American National Standard for Electromagnetic Locks; 2010.
- O. BHMA A156.24 - American National Standard for Delayed Egress Locks; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.24).
- P. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.
- Q. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

S. NFPA 101 - Life Safety Code; 2015.

T. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project. Include catalog cuts, installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Final Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements. Coordinate 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 SEQF.
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - 3. Content: Schedules without the following will not be acceptable:
 - a. Location, type, style, function, size, fire rating, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information
 - d. Cross reference of specification set number to schedule item number.
 - e. Cross reference manufacturer's product numbers of each type of Hardware specified to the specified hardware included in schedule.
 - f. door index.
 - g. Explanation of abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for door hardware.
 - i. Door and frame sizes and materials.
 - 4. Include in Hardware Schedule a description of each electrified door hardware function, including product's location sequence of operation, and interface with other building control systems.
 - a. Sequence of Operation: include description of component functions that occur in the following situations: outside operation, inside operation, LED indicators, power on/power off and any other pertinent information.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

- D. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
- F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect/Engineer and Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 10 years of documented experience.
- D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC), certified by DHI, to prepare hardware schedules, perform Post Installation Inspection, and otherwise assist in the work of this section.
- E. Hardware Installer: Factory-authorized personnel certified for installation of the Products of this Section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 WARRANTY

- A. Provide five year warranty for door closers and three year warranty on locksets.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

- A. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
 - 4. Fire-Rated Doors: NFPA 80.

5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Finishes: Identified in schedule at end of section.

2.02 DOOR HARDWARE - GENERAL

- A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide all items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
 1. Applicable provisions of federal, state, and local codes.
 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 3. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
- D. Function: Lock and latch function descriptions as shown in Hardware Sets.
- E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.
- F. Finishes: All door hardware the same finish unless otherwise indicated.
 1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 2. Secondary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
 - a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
 3. Finish Definitions: BHMA A156.18.
 4. Exceptions:
 - a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.

2.03 BUTT HINGES

- A. Comply with ANSI/BHMA A156.1 and A156.7 requirements.
- B. General: Provide hinges on every swinging door.
 1. Provide five-knuckle, button tip, full mortise butt hinges with square corners and non-rising loose pins unless otherwise indicated.
 2. Provide ball-bearing hinges at all doors having closers.
 3. Provide hinges in the quantities indicated.
 4. Provide non-removable pins or security studs on exterior outswinging doors.
 5. Provide non-removable pins security studs on outswinging doors at "secured" areas.
 6. Where electrified hardware is mounted in door leaf, provide power transfer hinges. Provide four- or eight-wire type as appropriate for complete installation of:

- a. Concealed door monitoring contacts and other security access components.
 - b. Power transfer to/from other scheduled door hardware.
- C. Manufacturers - Hinges:
- 1. Hager Companies: www.hagerco.com.
 - 2. Ives: www.ives.ingersollrand.com.
 - 3. Substitutions: Not permitted.
- D. Quantity:
- 1. Doors From 60 inches High up to 90 inches High: Three hinges per leaf.
 - 2. Doors 90 inches High up to 120 inches High: Four hinges per leaf.
- E. Material:
- 1. Interior Door Leafs Up To 36 Inches Wide: Wrought or stainless steel, standard weight (0.134 inch).
 - 2. Vestibule Doors, Exterior Doors, and Door Leafs Over 36 Inches Wide: Solid bronze or stainless steel, heavy weight (0.180 or 0.190 inch).
- F. Size: Sufficient to clear trim and allow doors, otherwise free of obstruction, to open 180 degrees.
- 1. 4½ x 4 ½ inch: For door leafs up to 36 inches wide and 1¾ inches thick.
 - 2. 5 x 5 inch: For door leafs over 36 inches wide and/or over 1¾ inches thick.
- G. Finish: For each opening, match finish of other hardware components.

2.04 CYLINDRICAL LOCKS AND LATCHES

- A. Comply with ANSI/BHMA A156.2, Series 4000, Grade 1 requirements, except as noted below.
- B. Locking Functions: As defined in BHMA A156.2, and as follows:
- 1. Passage: F75, no locking, always free entry and exit.
 - 2. Privacy: F76, emergency tool unlocks.
 - 3. Office: F82 Grade 1, key not required to lock, unlocks upon exit.
 - 4. Classroom: F84, key required to lock.
 - 5. Intruder Classroom: F110, keyed both sides.
 - 6. Communicating: F80 or F113.
 - 7. Hotel: F93.
 - 8. Store Room: F86, key required to lock, may not be left unlocked.
 - 9. Two-Key Entry: F88, outside locked by key from both sides, free egress
 - 10. Store Door: F91, locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).
 - 11. Exit Only: F89, may not be left unlocked.
- C. Manufacturer:
- 1. Schlage Lock Company: www.schlage.com.
 - 2. Substitutions: Not permitted.
- D. Single Source Responsibility: Provide locksets, latchsets, and trim of one manufacturer as listed above for continuity of design and consideration of warranty.
- E. Heavy Duty Cylindrical Locksets and Latchsets:
- 1. Mechanical Locks:

- a. Model:
 - 1) Schlage ND Series.
- 2. Function: As scheduled in the individual hardware sets.
- 3. Construction: Comply with ANSI/ICC A117.1 accessibility requirements.
 - a. Lock Body: Corrosion resistant wrought steel.
 - 1) Provide non-ferrous lock bodies and internal parts in corrosive environment areas and wet areas.
 - b. Handing: Easily field reversible without disassembly of lock body case.
- F. Trim: Comply with ANSI/ICC A117.1 accessibility requirements, and with ANSI/BHMA A156.6 requirements for a minimum of 1,000 inch pounds of pressure without allowing access.
 - 1. Construction: Cast zinc with wrought roses of heavy cold-forged material; welded thru-posts bolted through the door and lock body.
 - 2. Lever and Rose Style:
 - a. Schlage - Rhodes.
- G. Strikes: Curved lip with proper lip length to protect trim of the frame; match function of lock; straight strikes are acceptable for pairs of doors and deadbolt locks.
- H. Finish: BHMA 626 - Satin Chromium Plated.

2.05 MORTISE LOCKS AND LATCHES

- A. Comply with ANSI/BHMA A156.1, Series 1000, Grade 1 requirements, except as noted below.
- B. Locking Functions: As defined in BHMA A156.13, and as follows:
 - 1. Passage: F01.
 - 2. Privacy: F19, or F02 with retraction of deadbolt by use of inside lever/knob.
 - 3. Office: F04, key not required to lock, remains locked upon exit.
 - 4. Classroom: F05, key required to lock.
 - 5. Communicating: F03, deadbolts operated independently from each side, not an exit.
 - 6. Entry, Deadbolt: F20, may be locked without key, free egress.
 - 7. Hotel: F15, when locked from inside only emergency key may unlock.
 - 8. Always-Locked: F07, may not be left unlocked.
 - 9. Two-Key Entry: F09, outside locked by key from both sides, free egress.
 - 10. Store Door: F14, deadbolt locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).
 - 11. Exit Only: F07 or F31, may have outside trim, may not be left unlocked.
- C. Manufacturer:
 - 1. Schlage Lock Company: www.schlage.com.
 - 2. Substitutions: Not permitted.
- D. Single Source Responsibility: Provide locksets, latchsets, electrified locksets, and trim of one manufacturer as listed above for continuity of design and consideration of warranty.
- E. Mortise Locksets and Latchsets:
 - 1. Mechanical Mortise Locks: Exceed ANSI/BHMA A156.13 Grade 1 requirements for Operational and Security tests.

- a. Latch Bolts: Two-piece, anti-friction type with stainless steel auxiliary deadlocking latch; 3/4 inch minimum throw.
- b. Model:
 - 1) Schlage L9000 Series.
- 2. Function: As scheduled in the individual hardware sets.
- 3. Construction: Comply with ANSI/ICC A117.1 accessibility requirements.
 - a. Case: Corrosion resistant wrought steel.
 - 1) Provide non-ferrous lock cases and internal parts in corrosive environment areas and wet areas.
 - b. Handing: Easily field reversible without disassembly of lock body case.
- F. Trim: Comply with ANSI/ICC A117.1 accessibility requirements, and with ANSI/BHMA A156.6 requirements for a minimum of 1,000 inch pounds of pressure without allowing access.
 - 1. Construction: Cast brass, bronze or stainless steel with wrought roses of heavy cold-forged material; welded thru-posts bolted through the door and lock case.
 - 2. Style: Lever and rose.
 - a. Schlage - 06A.
- G. Strikes: Curved lip with proper lip length to protect trim of the frame; match function of lock; straight strikes are acceptable for pairs of doors and deadbolt locks.
- H. Finish: 626 - Satin Chromium Plated.

2.06 ELECTRIC STRIKES

- A. Comply with BHMA A156.31 and UL listed as a Burglary-Resistant Electric Door Strike; style to suit locks.
- B. Manufacturer: Von Duprin model #6211.
 - 1. Substitutions: Not permitted.

2.07 CLOSERS

- A. Comply with ANSI/BHMA A156.4, Grade 1 requirements; comply with ICC/ANSI A117.1 accessibility requirements for opening force and delayed action closing.
- B. General:
 - 1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 - 2. At corridors, locate door-mounted closer on room side of door.
 - 3. At outswinging exterior doors, mount closer in inside of door.
 - 4. Provide appropriate arm assemblies, installation accessories, and special templating for each closer so that closer body and arm are mounted on non-public side of door opening and on the interior side of exterior openings, except where required otherwise in the hardware sets.
 - a. Where closers are scheduled for openings with acoustical doors and frames, provide closer type, arm assemblies, installation accessories and special templating compatible with cam-lift hinge operation and to maintain STC ratings of doors and frames.
 - 5. Provide inspection after installation by a factory representative to ensure proper adjustment and operation. File report with the architect after said visit has been made.
- C. Manufacturers:

1. LCN Closers: www.lcnclosers.com.
 2. Substitutions: Not permitted.
- D. Single Source Responsibility: All door closers to be of one manufacturer as listed above to provide for proper installation and servicing after installation.
- E. Model:
1. LCN 4040 / 4040SE.
- F. Materials:
1. Cylinders: High strength cast iron, with one-piece forged steel piston.
 2. Hydraulic Fluid: Temperature stable fluid capable of withstanding temperature ranges of 120 degrees F. to -30F without requiring seasonal adjustment of closer speed to properly close the door.
 3. Arms: Forged steel with 1-9/16" x 1/2" steel stud shoulder bolts.
 4. Parallel Arms: Forged steel with bronze bushings.
 5. Covers: Metal, with installation and adjusting information on inside of cover.
- G. Sizing: Double arm closers shall have non-sized cylinders adjustable over a range of at least 5 closing power sizes. Size closers in accordance with manufacturer's recommendations, depending upon size of door, exposure to weather, compliance with ADA requirements for operating force and anticipated frequency of use.
- H. Operation: Fully hydraulic, rack and pinion action with adjustable back-check to provide a cushioning effect toward the end of the closing cycle for double-arm closers; low friction track and roller combination for single arm closers. Provide back-check positioning valve and separate, non-critical valves for adjusting sweep and latch speeds.
- I. Finish: Powder coated aluminum.

2.08 STOPS

- A. Comply with BHMA A156.8 requirements.
- B. General:
1. Provide a stop for every swinging door.
 2. Provide wall stops, unless otherwise indicated.
 3. Locate stops in such a position that they permit maximum door swing, but do not present a hazard or obstruction. Provide floor strikes for floor holders of proper height to engage holders of doors.
- C. Electromagnetic Holder/Releases: Complying with BHMA A156.15; fail safe; doors release to close automatically when electrical current is interrupted; holding force: 25 to 40 pounds-force.
- D. Manufacturers - Wall Stops:
1. C. R. Laurence Co., Inc: www.crlaurence.com.
 2. Hager Companies: www.hagerco.com.
 3. Hiawatha, Inc: www.hiawathainc.com.
 4. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.
- E. Models:

1. Wall Stops:
 - a. Hager #232W, 252F.
 - b. Ives #WS401/402, FS441.
 - c. Trimco #1270.

F. Finish: Same as other hardware, except use 32D and 32 (stainless steel) in lieu of 26D and 26 (plated chrome finishes), respectively, where available.

2.09 PROTECTION PLATES AND ARCHITECTURAL TRIM

A. Comply with ANSI/BHMA A156.6 requirements.

B. Protection Plates:

1. Kickplates: Provide on push side of every door with closer, except storefront and all-glass doors.
2. Width:
 - a. Pull side: 1 inch less than door width (LDW).
 - b. Stop Side: 2 inches less than door width (LDW).
3. Height:
 - a. Kickplates: 10 inches.
 - b. Doors with louvers or narrow bottom rails: 1 inch less than dimension from the bottom of the door to the bottom of the louver or lite, or to the top of the bottom rail.

C. Manufacturers:

1. Assa Abloy McKinney: www.assaabloydss.com.
2. C. R. Laurence Co., Inc: www.crlaurence.com.
3. Hager Companies: www.hagerco.com.
4. Hiawatha, Inc: www.hiawathainc.com.
5. Ives: www.ives.ingersollrand.com.
6. Rockwood Manufacturing Company: www.rockwood.com.
7. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.

D. Finish: Same as other hardware, except use 32D and 32 (stainless steel) in lieu of 26D and 26 (plated chrome finishes), respectively, where available.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Mounting heights for hardware from finished floor to center line of hardware item:

1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

3.03 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.05 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Sealant and back-up material.
- B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2004.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. GANA (SM) - GANA Sealant Manual; 2008.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.
 - 1. Attendance: Glazing manufacturer's representative, sealant manufacturer's representative, glazier and fabricator of framing or supporting structure to receive glass.
 - 2. Agenda:
 - a. Review procedures for applying glazing materials and installing removable stops.
 - b. Evaluate suitability of specified compounds and sealants for anticipated weather conditions.
 - c. Review coordination with other work.

1.05 SUBMITTALS

- A. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

- C. Samples: Submit two samples 12 x 12 inch in size of glass units.
- D. Manufacturer's Certificate: Certify that sealed insulated glass meets or exceeds specified requirements.
- E. Manufacturer's Certificate: Certify that fire-rated glass meets or exceeds specified requirements.
- F. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to specified destination in manufacturer's or distributor's packaging, undamaged, complete with installation instructions.
- B. Store off ground, under cover, protected from weather and construction activities.
- C. Store sheets of glass vertically. DO NOT lean.

1.08 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F, unless manufacturer of glazing materials specifically recommends application of his materials above a lower temperature.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 GLAZING TYPES

- A. Type FG1 - Safety Glazing:
 - 1. Applications: All interior glazing unless otherwise indicated.
 - 2. Type: Fully tempered float glass.
 - 3. Tint: Clear.
 - 4. Thickness: 1/4 inch.

2.02 GLASS MATERIALS

- A. Float Glass: All glazing is to be float glass unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
 - 3. Tinted Types: Color and performance characteristics as indicated.
 - 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

5. Fabricators:
 - a. Zeledyne: www.versaluxglass.com.
 - b. AGC Flat Glass North America, Inc: www.afgglass.com.
 - c. Guardian Industries Corp: www.sunguardglass.com.
 - d. Pilkington North America Inc: www.pilkington.com.
 - e. PPG Industries, Inc: www.ppg.com.
 - f. Viracon, Inc.: www.viracon.com.

2.03 GLAZING COMPOUNDS

- A. Manufacturers:
 1. Bostik Inc: www.bostik-us.com.
 2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 3. Pecora Corporation: www.pecora.com.
 4. BASF Construction Chemicals-Building Systems: www.chemrex.com.
 5. Substitutions: permitted.

2.04 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; gray color.
- E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.05 MANUFACTURER'S FIELD SERVICES

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

**SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
 - 1. Resilient tile.
 - 2. Carpet tile.
- B. Removal of existing floor coverings, except VCT and mastic abated by the Owner under a separate contract prior to the work of this Project.
- C. Preparation of existing concrete floor slabs for installation of floor coverings.
- D. Patching compound.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).
- C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Preliminary cleaning.
 - 2. Patching, smoothing, and leveling, as required.
 - 3. Skim coating.
 - 4. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent skim coat bond.
- B. Do not use solvents or other chemicals for cleaning.

3.04 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Apply patching compound in a uniform, 1/8 inch thick layer over concrete floor slabs in the Project area scheduled to receive resilient or carpet tile flooring finishes.
- E. Feather patching compound skim coat to nothing at perimeter of project area where transition to existing floor finishes to remain occurs.
- F. Do not fill expansion joints, isolation joints, or other moving joints.

3.05 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

**SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Joint treatment and accessories.
- E. Predecorated gypsum board.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- L. GA-216 - Application and Finishing of Gypsum Board; 2013.
- M. GA-224 - Installation of Predecorated Gypsum Board; Gypsum Association; 2008.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
 - 2. Marino: www.marinoware.com.
 - 3. Phillips Manufacturing Company: www.phillipsmfg.com.
 - 4. The Steel Network, Inc: www.SteelNetwork.com.
 - 5. Substitutions: permitted.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: "C" shaped with flat or formed webs .
 - 2. Runners: U shaped, sized to match studs.
 - 3. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
 - 3. Deflection and Firestop Track:
 - a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.
 - b. Acceptable Products:
 - 1) FireTrak Corporation; Posi Klip.
 - 2) Metal-Lite, Inc; The System.

4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: www.certainteed.com.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 3. Lafarge North America Inc: www.lafargenorthamerica.com.
 4. National Gypsum Company: www.nationalgypsum.com/#sle.
 5. USG Corporation: www.usg.com.
 6. Substitutions: Not permitted.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
- C. Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch.
 3. Edges: Tapered.

2.04 PREDECORATED GYPSUM BOARD

- A. Predecorated Gypsum Board: ASTM C1396/C1396M, Class I - Laminated Sheet or Film, sizes to minimize joints in place; ends square cut.
1. Application: Doors to existing Mechanical Room 2024.
 2. Core Type: Type X.
 3. Thickness: 5/8 inch.
- B. Predecorated Facing: Sheet vinyl, fabric reinforced; flame spread/smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84; white.
1. Moldings and Trim: Manufacturer's standard shapes for specific project conditions, in white.

2.05 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch.
- B. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.
- C. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
- D. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.

3. Ready-mixed vinyl-based joint compound.
- E. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- F. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.
- G. Screws for Attachment to Steel Members From 0.033 to 0.112 Inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center.
 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
- E. Blocking: Install fire retardent wood blocking for support of:
 1. Framed openings.
 2. Wall mounted cabinets.
 3. Plumbing fixtures.
 4. Toilet partitions.
 5. Toilet accessories.
 6. Wall mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place one bead continuously on substrate before installation of perimeter framing members.

2. Place continuous bead at perimeter of each layer of gypsum board.
3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Installation on Metal Framing: Use screws for attachment of all gypsum board .

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 3. Level 3: Walls to receive textured wall finish.
 4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
 6. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 2. Taping, filling and sanding is not required at base layer of double layer applications.
- D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 PREDECORATED GYPSUM BOARD INSTALLATION

- A. Erect predecorated gypsum board in accordance with GA-224 and manufacturer's instructions.

1. Install trim as recommended by manufacturer at corners and at intersections with other materials.

3.08 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

**SECTION 09 51 00
ACOUSTICAL CEILINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- B. Section 26 51 10 - Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- E. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. Product Data: Provide data on suspension system components.
- B. Samples: Submit two samples each, 12 inches long, of suspension system main runner.
- C. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

- A. Manufacturers:
 - 1. USG: www.usg.com.
 - 2. Substitutions: Not permitted.
- B. Acoustical Units - General: ASTM E1264, Class A.
- C. Acoustical Panels Type ACTA: X-Technology mineral fiber, ASTM E 1264 Type III, with the following characteristics:
 - 1. Size: 24 x 24 inches.
 - 2. Thickness: 5/8 inches.
 - 3. Composition: Wet felted.
 - 4. Light Reflectance: 86 percent, determined as specified in ASTM E1264.
 - 5. NRC Range: 0.55 to 0.55, determined as specified in ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
 - 7. Edge: SLT (Shadow Line Taper).
 - 8. Surface Color: White.
 - 9. Surface Pattern: Fine Texture.
 - 10. Product: ASTRO Clima Plus #8223 by USG. Owner will supply tiles for Contractor install.
 - 11. Suspension System: Exposed grid Type SS1.

2.02 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 - 1. Chicago Metallic Corporation: www.chicagometallic.com.
 - 2. USG: www.usg.com.
 - 3. Substitutions: Not permitted.
- B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System Type SS1: Formed steel, commercial quality cold rolled; intermediate-duty.
 - 1. Profile: Tee; 15/16 inch wide face.
 - 2. Construction: Double web.
 - 3. Finish: White painted.
 - 4. Product: Snap-Grid 200 by Chicago Metallic or approved equal from USG.

2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
 - 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.

- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.

- G. Where round obstructions occur, provide preformed closures to match perimeter molding.
- H. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.
- I. Install hold-down clips on panels within 20 ft of an exterior door.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

**SECTION 09 65 00
RESILIENT FLOORING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient base.
- B. Resilient stair accessories.
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.

1.04 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Verification Samples: Submit two samples, 3x3 inch in size illustrating color and pattern for each resilient flooring product specified.
- C. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Wall Base: 50 linear feet of each type and color.
 - 2. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Do not double stack pallets.

1.06 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 STAIR COVERING

- A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com.
 - b. Substitutions: Not permitted.
 - 2. Nominal Thickness: 0.1875 inch.
 - 3. Nosing: Square.
 - 4. Striping: 2 inch wide black abrasive strips.
 - 5. Color: As indicated on drawings.
- B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color:
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com.
 - 2. Thickness: 0.080 inch.
- C. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
 - 1. Nominal Thickness: 0.080 inch.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
 - 1. Product: Traditionl Wall Base.
 - 2. Height: 4 inch.
 - 3. Thickness: 0.125 inch thick.
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Color: As indicated on drawings.
 - 7. Accessories: Premolded external corners.
 - 8. Manufacturers:
 - a. Johnsonite, Inc: www.johnsonite.com.
 - b. Substitutions: Not permitted.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: same material as base.
- D. Filler for Coved Base: Plastic.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

- B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.05 Installation - Stair Coverings

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Install stringers configured tightly to stair profile.
- C. Adhere over entire surface. Fit accurately and securely.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax in accordance with manufacturer's instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

**SECTION 09 68 13
TILE CARPETING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.
- B. Section 09 65 00 - Resilient Flooring: Floor Base.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.
- E. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical characteristics; sizes, patterns, colors available, and method of installation.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum 3 years experience.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interface Flor: www.interfaceflor.com (No Substitutions).

2.02 MATERIALS (Provided by Owner and Installed by Contractor)

- A. Carpet Tile Type CAA: Owner Provided.
 - 1. Tile Size: 16.69 x 16.69 inch, nominal.
 - 2. Thickness: 0.26 inch.
 - 3. Primary Backing Material: GlasBac RE Tile
 - 4. Installation Method: Brick layout w/linear pattern oriented North/South.
- B. Note: Carpet tile products will be supplied by Owner and installed by Contractor from materials already in Owner's stock. Contractor is responsible to transport stored materials within the campus to the project site for installation by the contractor.

2.03 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, color as selected.
- C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.
- B. Obtain carpeting products from Owner's existing stock.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Fully adhere carpet tile to substrate.
- F. Trim carpet tile neatly at walls and around interruptions.
- G. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

**SECTION 09 90 00
PAINTING AND COATING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints, stains, varnishes, and other coatings.
- C. Surfaces to be finished are indicated in this section and on the Drawings.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.03 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system (copy of relevant MPI Manual page is acceptable).
 - 4. Manufacturer's installation instructions.
- B. Certification by manufacturer that products comply with Contract Documents and are compatible with applicable substrates and with each other.
- C. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- D. Samples: Submit three paper "drop" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.05 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Paints: Acceptable manufacturers are limited to the following:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 3. Sherwin Williams Company: www.sherwinwilliams.com.

2.02 MATERIALS - GENERAL

- A. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- B. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI Categories, except as otherwise indicated.
 - 1. Provide ready mixed paints and coatings, except field-catalyzed coatings.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

- C. Patching Material: Latex filler.
- D. Fastener Head Cover Material: Latex filler.

2.03 PAINT SYSTEMS

- A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
- C. Where sheen is not specified or more than one sheen is specified, sheen will be selected later by Architect/Engineer from the manufacturer's full line.
- D. Provide colors as scheduled on Drawings.

2.04 INTERIOR PAINT SYSTEMS

- A. Structural Steel and Metal Fabrications:
 - 1. INT 5.1DD Alkyd Dry Fall: Q.D. Shop Primer MPI #275, Alkyd Dry Fall MPI #55, 89 or 225.
 - 2. INT 5.1S Institutional Low Odor/VOC: Rust Inhibitive Primer #107, Institutional Low Odor/VOC MPI #146, gloss level 4.
- B. Plaster and Gypsum Board:
 - 1. INT 9.2M Institutional Low Odor/VOC: Latex Primer Sealer MPI #149, Institutional Low Odor/VOC MPI #145, gloss level 3.

PART 3 EXECUTION

3.01 SCOPE -- SURFACES TO BE FINISHED

- A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
- B. Paint the surfaces described in PART 2, indicated on the Drawings, and as follows:
 - 1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
 - 2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
 - 3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
 - 4. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.
 - 5. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 6. Paint equipment, piping, conduit, and exposed duct work in utility areas in colors according to the color coding scheme indicated.
 - 7. Paint all gas piping exposed to weather or to view on the roof and outdoors with one prime coat and two finish coats of paint.

8. Paint interior surfaces of air ducts and convector and baseboard heating cabinets with flat, nonspecular black paint where visible through registers, grilles, or louvers.
 9. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- C. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
 2. Items indicated to receive other finish.
 3. Items indicated to remain naturally finished.
 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 5. Brick, precast concrete, integrally colored plaster.
 6. Polished and brushed stainless steel, anodized aluminum, bronze, terne, and lead.
 7. Acoustical materials.
 8. Concealed piping, ductwork, and conduit.

3.02 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for Architect/Engineer's approval.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Plaster and Gypsum Board: 12 percent.

3.03 PREPARATION

- A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
- B. Coordinate painting work with cleaning and preparation work so that dust and other contaminants do not fall on newly painted, wet surfaces.
- C. Surface Appurtenances: Prior to preparing surfaces or finishing, remove electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings, and similar items already installed that are not to be painted.
 1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
 2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.

- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Marks: Seal with shellac those which may bleed through surface finishes.
- F. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
 - 1. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- I. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3.04 APPLICATION

- A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.
 - 1. Remove, refinish, or repaint work not complying with requirements.
- B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.
- C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
 - 1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
 - 2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 - 3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 - 4. Where application method is listed in the MPI Manual for the paint system that application method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
 - 1. Number of coats and film thickness required are the same regardless of application method.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
 3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
 2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
 3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
 4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
 5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
 6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.05 CLEANING AND PROTECTION

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.
- C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect/Engineer.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in MPI Manual.

END OF SECTION

**SECTION 12 36 00
COUNTERTOPS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinetwork.

1.02 REFERENCE STANDARDS

- A. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 SUBMITTALS

- A. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- B. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- C. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.06 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOP ASSEMBLIES

- A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 and NEMA LD 3; acrylic resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

- a. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
- b. NSF approved for food contact.
- c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
- d. Color and Pattern: As selected by Architect/Engineer from manufacturer's full line.
- e. Manufacturers:
 - 1) Dupont : www.corian.com.
 - 2) Substitutions: Not permitted.
- 3. Other Components Thickness: 1/2 inch, minimum.
- 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge .
- 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
- 6. Substrate: 1/2 inch Wheatboard to buld up to a 1 1/2 inch total countertop Thickness.

2.02 ACCESSORY MATERIALS

- A. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
- B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. Joint Sealant: Mildew-resistant silicone sealant, clear.
- E. Grommets for Holes in Countertops: Molded plastic; matching caps with slots for cord passage. Color(s) as selected by Owner from manufacturer's full line.
- F. Support Brackets:
 - 1. Manufacturer: Rakks/Rangine Corporation: www.rakks.com.
 - 2. Products:
 - a. Counters Up To 18" Deep: #EH-1212.
 - b. Counters Up To 24" Deep: #EH-1818.
 - c. Counters Up To 30" Deep: #EH-2424.
 - 3. Use "Flush Mount " configuration (vertical leg concealed in wall) at drywall locations and where indicated on Drawings.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.

- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.04 CLEANING

- A. Clean countertop surfaces thoroughly.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect/Engineer.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC MN-1, AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

3.07 SCOPE

- A. Test, adjust, and balance the following:

1. Air Handling Units
2. Air Inlets and Outlets

END OF SECTION

**SECTION 23 07 13
DUCT INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct Liner.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- C. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.
- D. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Knauf Fiber Glass.
 - 2. Johns Manville Corporation.
 - 3. Owens Corning Corp.
 - 4. CertainTeed Corporation.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.04 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Tie Wire: Annealed steel, 16 gage.

2.03 DUCT LINER

- A. Manufacturers:
 - 1. Johns Manville Corporation.
 - 2. Knauf Insulation.
 - 3. CertainTeed Corporation.

- B. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
 - 1. Fungi Resistance: ASTM G21.
 - 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 - 3. Service Temperature: Up to 250 degrees F.
 - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 - 5. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
- C. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- D. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
 - 1. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. External Duct Insulation Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- F. Duct Liner Application:
 - 1. Adhere insulation with adhesive for 90 percent coverage.

2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Supply Ducts:

1. Flexible Glass Fiber Duct Insulation: 2 inches thick.

B. Air Transfer Ducts:

1. Duct Liner: 1/2 inches thick.

END OF SECTION

**SECTION 23 31 00
HVAC DUCTS AND CASINGS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Duct cleaning.

1.02 RELATED REQUIREMENTS

- A. Section 23 07 13 - Duct Insulation: External insulation and duct liner.
- B. Section 23 33 00 - Air Duct Accessories.
- C. Section 23 37 00 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2017.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.05 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

2.02 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

2. VOC Content: Not more than 250 g/L, excluding water.
 3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E84.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
 - D. All Ducts: Galvanized steel, unless otherwise indicated.
 - E. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. pressure class, galvanized steel.
 - F. Return and Relief: 1 inch w.g. pressure class, galvanized steel.
 - G. Ductmate or WDCI duct connection systems are acceptable. Ductwork constructed using these systems shall refer to manufacturer's recommendations for sheet metal gage intermediate and joint reinforcement.
 - H. Interior gaskets for flanged connections shall be Ductmate 440 butyl rubber.

2.03 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Transfer Air and Sound Boots: 1/2 inch w.g. pressure class, fibrous glass.
- C. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- D. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- E. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
 1. Insulation: Fiberglass insulation with aluminized vapor barrier film.
 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 3. Maximum Velocity: 4000 fpm.
 4. Temperature Range: -20 degrees F to 210 degrees F.

- B. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
 - 1. Manufacturers:

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Duct sizes indicated shall be of sizes indicated. However, necessary changes in shape offsets or crossovers to clear piping, lighting, building construction obstructions, etc. shall be made without additional cost.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use double nuts and lock washers on threaded rod supports.
- I. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION

**SECTION 23 33 00
AIR DUCT ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flexible duct connections and forming brace.
- B. Volume control dampers.
- C. Miscellaneous products:
 - 1. Duct opening closure film.

1.02 RELATED REQUIREMENTS

- A. Section 23 31 00 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

- A. Product Data: Provide for shop fabricated assemblies including volume control dampers and duct access doors. Include electrical characteristics and connection requirements.
- B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.
- D. Project Record Drawings: Record actual locations of access doors and test holes.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 FLEXIBLE DUCTS FORMING BRACE

- A. Manufacturers:
 - 1. Titus; Model FlexRight.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. UL Listed. Radius forming brace to hold flexible duct into a 90 degree elbow. Fits flexible duct sizes and diffuser inlets from 4 inches to 16 inches in diameter. Manufactured from copolymer polypropylene.

2.02 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Ruskin Company.
 - 2. Greenheck.
 - 3. Air Balance.

- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- C. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch.
 - 2. Blade: 24 gage, 0.0239 inch, minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1. Blade: 18 gage, 0.0478 inch, minimum.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.03 MISCELLANEOUS PRODUCTS

- A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- C. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

**SECTION 23 37 00
AIR OUTLETS AND INLETS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (R2011).

1.03 SUBMITTALS

- A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Price Industries.
- B. Titus.
- C. Tuttle & Bailey.

2.02 SQUARE CEILING DIFFUSERS

- A. Type: Provide square, stamped, multi-core diffuser to discharge air in 360 degree pattern .
- B. Connections: As scheduled on drawings.
- C. Frame: Provide inverted T-bar type.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As selected by Architect/Engineer from manufacturer's standard range.
- F. Accessories: Provide radial opposed blade volume control damper; removable core with damper adjustable from diffuser face.
- G. Titus Model TMS.

2.03 PERFORATED FACE CEILING RETURN REGISTERS/GRILLES

- A. Type: Perforated face.

- B. Frame: Inverted T-bar type.
- C. Fabrication: Steel with steel frame and baked enamel finish.
- D. Color: As selected by Architect with manufacturer's standard range.
- E. Titus Model PAR.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION

SECTION 26 05 00
BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SECTION INCLUDES

- A. Basic Electrical Requirements and materials specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements. Section includes:
 1. Electrical Identification.
 2. Minor Demolition.
 3. Conductors and Devices.
 4. Raceways and Boxes.
 5. Supporting Devices.

1.03 REGULATORY REQUIREMENTS

- A. Conform to NFPA 70 - National Electrical Code, latest edition with amendments as adopted by the City of Joliet, IL.
- B. Conform to building codes as adopted by the City of Joliet, IL.
- C. Install electrical Work in accordance with the NECA Standard of Installation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store and protect all materials as specified under the provisions of Section 01 60 00 and as specified herein.
- B. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- C. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.
- D. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

1.05 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on Drawings, unless prevented by Project conditions. Drawings have omitted certain branch circuitry in areas for ease of reading. All branch circuitry is to be provided by Contractor.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission from Architect/Engineer before proceeding as specified under modification procedures.

1.06 QUALITY ASSURANCE

- A. Provide Work as required for a complete and operational electrical installation.
- B. All products shall be designed, manufactured, and tested in accordance with industry standards. Standards, organizations, and their abbreviations as used hereafter, include the following:
 - 1. American National Standards Institute, Inc (ANSI).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. Underwriters Laboratories, Inc. (UL).
- C. Install all Work in accordance with the NECA Standard of Installation.

1.07 PROJECT MANAGEMENT AND COORDINATION

- A. Proper project management and coordination is critical for a successful project. Manage and coordinate the Work with all other trades in accordance with Section 01 30 00 requirements. Reliance on the Drawings and Specifications only for exact project requirements is insufficient for proper coordination.

PART 2 PRODUCTS

2.01 WIRING METHODS

- A. All locations: Building wire in raceway.
- B. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14 AWG for control wiring.
 - 1. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 100 feet. Use minimum #10 AWG conductor wire in all the following locations:
 - a. All programmable panel branch circuits (larger where indicated).
 - b. All emergency lighting and exit branch circuits.

2.02 WIRE AND CABLE

- A. Manufacturers:
 - 1. Okonite.
 - 2. Southwire.
 - 3. Collyer.
- B. Building Wire:
 - 1. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation.
 - 2. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, stranded conductor (solid for device terminations).
 - 3. Control Circuits: Copper, stranded conductor, 600 volt insulation.
 - 4. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
 - 5. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
 - 6. Use conductor not smaller than 12 AWG for power and lighting circuits.
 - 7. Use conductor not smaller than 16 AWG for control circuits.

C. Locations:

1. Concealed Dry Interior Locations: Use only building wire with Type THHN insulation in raceway.
2. Exposed Dry Interior Locations: Use only building wire with Type THHN insulation in raceway.
3. Above Accessible Ceilings: Use only building wire with Type THHN insulation in raceway.
4. Wet or Damp Interior Locations: Use only building wire with Type THWN insulation in raceway.
5. Exterior Locations: Use only building wire with Type XHHW insulation in raceway.
6. Underground Installations: Use only building wire with Type XHHW insulation in raceway.

2.03 WIRING DEVICES AND WALL PLATES

A. Single Pole Switch: Specification grade.

1. Hubbell Model 1121.
2. P & S Model 521.
3. Leviton Model 1121.
4. Color: Ivory.

B. Three-way Switch: Specification grade.

1. Hubbell Model 1123.
2. P & S Model 523.
3. Leviton Model 1123.
4. Color: Ivory.

C. Four-way Switch: Specification grade.

1. Hubbell Model 1124.
2. P & S Model 524.
3. Leviton Model 1124.
4. Color: Ivory.

D. Single-pole LED Dimmer Switch: Specification grade.

1. Leviton IP710-LFZ
2. Description: Linear slide fluorescent dimmer, compatible with ballast and number of lamps.
3. Voltage: 277 volt.
4. Power Rating: Match load shown on drawings.

E. Duplex Convenience Receptacle: Nema 5-20R, duplex, specification grade.

1. Hubbell.
2. Bryant.
3. Leviton.
4. Color: Ivory.

F. GFCI Receptacle: Nema 5-20R, duplex, GFCI, specification grade.

1. Hubbell Model GF-5362.
2. Slater Model SIR-20-F.
3. Eagle Model 647.
4. Color: Ivory.

G. Decorative Cover Plate:

1. Hubbell.

2. Bryant.
3. Leviton.
4. Description: Stainless Steel, metal.

2.04 RACEWAY REQUIREMENTS

- A. Use only specified raceway in the following locations:
 1. Branch Circuits and Feeders:
 - a. Concealed Dry Interior Locations: Electrical metallic tubing.
 - b. Exposed Dry Interior Finished Locations: Electrical metallic tubing.
 - c. Exposed Dry Interior Unfinished Locations: Electrical metallic tubing.
 - d. All other locations: Galvanized Rigid Metallic Conduit.
- B. Size raceways for conductor type installed.
 1. Minimum Size Conduit Homerun to Panelboard: 3/4-inch.
 2. Minimum Size Conduit Tele/Data/LV: 3/4-inch.

2.05 METALLIC CONDUIT AND FITTINGS

- A. Conduit:
 1. Rigid Steel Conduit: ANSI C80.1.
 2. Electrical metallic tubing: ANSI C80.3.
 3. Flexible Conduit: UL 1, zinc-coated steel.
 - a. Liquidtight Flexible Conduit: UL360. Fittings shall be specifically approved for use with this raceway.
- B. Conduit Fittings:
 1. Metal Fittings and Conduit Bodies: NEMA FB 1.
 - a. EMT fittings: Use set-screw indentor-type fittings.

2.06 NONMETALLIC TUBING

- A. Manufacturers:
 1. Carlon Co.
 2. LCP National Plastics, Inc.
 3. Pacific Western Extruded Plastics Co.
- B. Description: UL651A "Type EB and A PVC Conduit and HDPE Conduit."
 1. Conduit: Schedule 40. Suitable for exposure to sunlight and direct burial.

2.07 CONDUIT HANGERS

- A. Manufacturers:
 1. Minerrallac Electric Company.
 2. Substitutions: Or Approved Equal.
- B. Description:
 1. Standard conduit hanger, zinc-plated steel with bolts.
 2. Threaded rod and hardware: Plated finish, size and length as required for loading and conditions.

2.08 BEAM CLAMPS

- A. Manufacturers:
 - 1. Appleton.
 - 2. Midwest.
 - 3. Raco.
- B. Description: Malleable beam clamp, zinc plated steel.

2.09 ELECTRICAL BOXES

- A. Manufacturers:
 - 1. Raco.
 - 2. Steel City.
 - 3. Appleton.
 - 4. Substitutions: Or Approved Equal.
- B. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel, suitable for installation in masonry:
- C. Equipment Support Boxes: Rated for weight of equipment supported; include 2 inch male fixture studs where required.
- D. Wet Location Outlet Boxes: Cast aluminum: Cast alloy, deep type, gasket cover, threaded hubs.

2.10 ELECTRICAL FLOOR BOXES

- A. Manufacturers:
 - 1. Hubbell.
 - 2. Appleton.
 - 3. Walker.
- B. Concrete floor slab: Fully adjustable, stamped steel, 3" deep, two compartment (power/data), recessed flip top cover service box style floor box.
- C. Provide surface mounted ("dog house" type) service fittings where called out on drawings.
 - 1. Service fitting shall:
 - a. accept up to (2) 1" locking nipples.
 - b. have interchangeable faceplates.
- D. Cafeteria: Fully adjustable, cast iron, 4" deep, brass screw covers with threaded brass protective rings for plugs (mechanical/wet mop protection).

2.11 MULTI-SERVICE STEEL RECESSED FLOOR BOXES

- A. Manufacturers
 - 1. Hubbell Wiring Devices - Kellems - www.hubbell-wiring.com
 - 2. Thomas & Betts Corporation - www.tnb.com
 - 3. The Wiremold Company - www.wiremold.com
- B. Description:
 - 1. Recessed type.

2. Provide capacity of up to six duplex receptacles and/or communication services.
3. Fully adjustable before concrete pour.
4. Openings for up to (4) 1" conduits and (4) 3/4" conduits.

C. Flush Cover and Flange Assembly:

1. Steel Cover with Carpet Flange Assembly.
2. Cover shall provide protection from water, dirt and debris.
3. Cover shall close completely when plugs are connected into receptacles and/or communications jacks.

D. Backbox dimensions (minimum).

1. 10" Length x 10" Width x 3" Depth.

2.12 ELECTRICAL CEILING BOXES.

A. Manufacturers:

1. Panduit.
2. Leviton.
3. Walker.

B. Description: Two gang, separated power/data surface metallic box. Combination duplex receptacle with two port data faceplate, compatible with data jacks. Ivory.

2.13 PENETRATION SEALANTS

A. Fire-rated assemblies: Provide firestopping of all penetrations made by Work under this Contract in accordance with provisions of Section 07 84 00 requirements.

B. Thermal and Moisture Protection: Provide thermal and moisture protection made by Work under this Contract of all exterior wall, floor and roof penetrations in accordance with Division 7 requirements.

2.14 WIREWAY

A. Manufacturers:

1. Hoffman.
2. Cooper Industries.
3. Approved Equal.

B. Description:

1. NEMA Type 1 Lay-In Galvanized Wireway, UL 870. Flat cover design. Size as shown on drawings.
2. Provide hinged covers where noted on drawings.
3. Provide all elbows, tee's, covers and fittings as required

C. Finish:

1. To be selected by Architect/Engineer.

2.15 MOTION SENSORS

A. Manufacturers:

1. Hubbell - OMNI DT

2. Approved Equal
- B. Combination Wall Switch/Occupancy Sensor
1. Dual technology (passive infrared and ultrasonic), 277V sensor with 180degree field-of-view and maximum coverage of 2400 square feet.
 2. Manual push button for ON/OFF light switching.
 3. Time delay settings: 30 seconds, 10, 20 or 30 minutes).
 4. Adjustable Integral blinders.
 5. Sensor shall continuously monitor space to identify usage patterns. Unit shall automatically adjust time delay and sensitivity settings for optimal performance and energy efficiency.
- C. Ceiling Mounted.
1. Dual technology (passive infrared and ultrasonic), 24VDC sensor with unobtrusive appearance and 360 degrees of coverage.
 - a. Provide type/quantity of motion sensors to meet square foot coverage requirements.
 2. Provide power pack for 24VDC controls and switching of 120/277V circuits. Minimum quantity of sensors per power pack: 2.
 3. Sensor shall continuously monitor space to identify usage patterns. Unit shall automatically adjust time delay and sensitivity settings for optimal performance and energy efficiency.
 4. Time delay settings: Auto, fixed (5,10,15,20 or 30 minutes).
 5. Sensitivity settings: Auto, reduced sensitivity (passive infrared) variable (ultrasonic).
 6. (1) N/O and (1) N/C output.

2.16 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Locations:
1. Each electrical distribution and control equipment enclosure.
- C. Letter Size:
1. Use 1/8 inch letters for identifying individual equipment and loads.
 2. Use 1/4 inch letters for identifying grouped equipment and loads.
- D. Labels: Embossed adhesive tape, with 3/16 inch white letters on a black background. Use only for identification of individual wall switches and receptacles and control device stations.

2.17 WIRE AND CABLE MARKERS

- A. Manufacturers:
1. Brady Model PCPS.
 2. Panduit Model PCM.
 3. T & B Model WM.
- B. Description: Cloth type wire markers.
- C. Locations: Each conductor at panelboard gutters, pull boxes, and each load connection.
- D. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.18 CONDUIT MARKERS

- A. Location: Furnish markers for each conduit longer than 6 feet.
- B. Spacing: 20 feet on center.
- C. Color:
 - 1. 480 Volt System: Orange
 - 2. 208 Volt System: Black
 - 3. Fire Alarm System: Red.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

- A. Demolition Drawings are based on casual field observation and are intended to identify the limits of the construction site. Remove all electrical systems in their entirety in proper sequence with the Work.
- B. Disconnect electrical systems in walls, floors, and ceilings for removal.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service and Emergency Electrical Service: Disable system only to make switchovers and connections. Obtain permission from Owner and Architect at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner, Architect/Engineer and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- F. Beginning of demolition means installer accepts existing conditions.
- G. Verify that supporting surfaces are ready to receive work.
- H. Electrical boxes are shown on Drawings, in approximate locations, unless dimensioned.
 - 1. Obtain verification from Architect/Engineer for locations of outlets throughout prior to rough-in.
- I. Degrease and clean surfaces to receive wire markers.
- J. Verify that interior of building is physically protected from weather.
- K. Verify that mechanical work which is likely to injure conductors has been completed.
- L. Completely and thoroughly swab raceway system before installing conductors.

3.02 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove all existing electrical installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.

- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Relocate existing fire alarm devices affected by wall, ceiling and floor demolition.
- E. Repair adjacent construction and finishes damaged during demolition and extension work.
- F. Properly dispose of all ballast to approved ballast recycler. Do not land fill ballasts.

3.03 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.
- E. Neatly train and secure wiring inside boxes, equipment, and panelboards.
- F. Use wire pulling lubricant for pulling 4 AWG and larger wires.
- G. Route wire and cable as required to meet project conditions.
 - 1. Wire and cable routing indicated is approximate unless dimensioned.
 - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
- H. Pull all conductors into raceway at same time.
- I. Protect exposed cable from damage.
- J. Neatly train and lace wiring inside boxes, equipment and panelboards.
- K. Support cables above accessible ceilings to keep them from resting on ceiling tiles.
- L. Make splices, taps, and terminations to carry full ampacity of conductors without perceptible temperature rise.
- M. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- N. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- O. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- P. Do not use powder-actuated anchors.
- Q. Do not drill or cut structural members.
- R. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

- S. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- T. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- U. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- V. Terminate spare conductors with electrical tape.
- W. Do not share neutral conductor on load side of dimmers.
- X. Install wiring devices in accordance with manufacturer's instructions.
 - 1. Install wall switches at height shown on drawings, OFF position down.
 - 2. Install convenience receptacles at height shown on drawings grounding pole on bottom.
 - 3. Install specific purpose receptacles at heights shown on Drawings.
- Y. Install wall plates flush and level.
 - 1. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
 - 2. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

END OF SECTION

**SECTION 26 51 00
LIGHTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Lamps.
- F. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 - Basic Electrical Requirements

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; National Electrical Contractors Association; 2006.
- C. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2012.
- D. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- E. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.
- F. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; Illuminating Engineering Society; 2002 (Reaffirmed 2008).
- G. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for

mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
3. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
4. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
5. Notify Architect/Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. Shop Drawings:

1. Provide photometric calculations where luminaires are proposed for substitution upon request.
2. Indicate construction, installation and mounting details for products.
3. Wiring Diagrams: Submit wiring diagrams for all exit sign, night light, self-contained back-up battery lighting, battery ballasts and associated circuit breakers, programmable circuit breakers and/or emergency circuit breakers.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
3. Wiring diagrams: Provide wiring diagrams for dimmable ballasts and dimmable switches.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as specified below.
- B. Substitutions: Not Permitted.
- C. Type A: Recessed 2'x2' LED.
 - 1. Products:
 - a. Truly Green Solutions - 882240-40-T-F-90CRI.
 - 2. Nominal Size: 2 by 2 feet.
 - 3. Ceiling Trim: NEMA type G (grid).
 - 4. Lamp(s): One-40 W LED.
 - a. Correlated Color Temperature: 4,000 K.
 - 5. Voltage: Universal 120-277 V.
 - 6. Driver(s): One 0-10V dimmable driver.
 - 7. Mounting: Lay-in, grid ceiling.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Provide products complying with Federal Energy Management Program (FEMP) requirements.
- E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- I. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- J. LED Luminaire Components: UL 8750 recognized or listed as applicable.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Basis of Design: Dual-Lite EV Series Emergency Lighting Unit.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Sealed maintenance-free lead calcium unless otherwise indicated.
 - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - 2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
 - 3. Provide compatible accessory wire guards where indicated.
 - 4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

- A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single or double as indicated or as required for the installed location.

2. Directional Arrows: As indicated or as required for the installed location.

B. Self-Powered Exit Signs:

1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
4. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 BALLASTS AND DRIVERS

A. Manufacturers:

1. General Electric Company/GE Lighting: www.gelighting.com.
2. Osram Sylvania: www.sylvania.com.
3. Philips Lighting Electronics/Advance: www.advance.philips.com.
4. Universal; www.unvlt.com
5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. All Ballasts:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.06 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

2.07 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.

- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.
- F. Examine substrate and supporting grids for luminaires.
- G. Examine each fixture to determine suitability for lamps specified.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- F. Install wall mounted luminaires, emergency units and exit signs at height as indicated on Drawings and directed in the field by Architect. Obtain final approval from Architect prior to commencement of this portion of work.
- G. Install accessories furnished with each luminaire.
- H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- I. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Support luminaires larger than 2 foot by 4 foot size independent of ceiling framing.
 - 3. Secure pendant-mounted luminaires to building structure.
 - 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- J. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Install recessed luminaires to permit removal from below.
 - 3. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
 - 4. Install clips to secure recessed grid-supported luminaires in place.
- K. Suspended Luminaires:

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 2. Unless otherwise indicated, support pendants from swivel hangers.
- L. Install accessories furnished with each luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.
- N. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- O. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- P. Install lamps in each luminaire.
- Q. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect/Engineer.
- E. Energy Code Commissioning: The electrical contractor shall program, test, calibrate and confirm the proper operation and placement of all lighting controls in accordance with the International Energy Code, 2012 Edition Paragraph C408.3 "Lighting system functional testing".

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect/Engineer. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect/Engineer or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect/Engineer or authority having jurisdiction.
- D. Relamp luminaires which have failed lamps at completion of work.

3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Architect/Engineer, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.
- C. Project record documents: Accurately record location of each luminaire.

3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

**SECTION 27 10 00
STRUCTURED CABLING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Project drawings, all divisions of the specification, general provisions of the Contract, including General Conditions apply to this specification section.
- B. Architectural drawings (includes interior architectural drawings).

1.02 SUMMARY

- A. Section and Scope of Work Includes
 - 1. Installation of all low voltage cable, connectors, faceplates, outlet housings, patch panels, cable support systems, cable ties..
 - 2. Verification testing and documentation of each installed cable and termination outlined below.
 - 3. Fire stopping all telecommunication penetrations through fire rated barriers created as a pathway for voice and data cabling and infrastructure with code, and AHJ compliant UL-rated assemblies.

1.03 REFERENCES

- A. Reference Data:
 - 1. To ensure conformance to the Work described in the Contract Documents, the Trade Contractor shall have access to, and adhere at all times to, the most recent version of any Codes, Publications and Industry Standards noted, below.
 - 2. If the year of the adoption or latest revision is omitted from any designation, it shall mean the specification, manual or test designation in effect the date the Notice to Proceed with the Work is given shall be utilized as the most accurate year and date of record.
 - 3. All work must conform to the most stringent of applicable codes. If during installation the Contractor identifies work that does not meet the most stringent code, the Contractor is to stop work immediately on that portion of the project and notify the Owner in writing. The Contractor must understand and have a working knowledge of all applicable codes.
 - 4. Contractor shall keep on site and available for review all standards, codes, and installation guidelines that govern the work specified in the Contract Documents. These shall include, but are not limited to: the current edition of the BICSI Telecommunications Distribution Methods Manual, TIA/EIA standards governing the telecommunications industry, and any installation guidelines specific to the selected manufacturer of system components.
 - 5. The reference material shall be on-site and readily available for review by field personnel, the Construction Manager, Designer and the Owner at any time throughout the Work.
- B. Codes (Note: Reference Division One for specific code versions governing the Work in addition to the information noted below.)
 - 1. FCC
 - a. Part 15 Unlicensed Radio Frequency Devices
 - b. Part 68 Terminal Equipment Certification Requirements
 - 2. National Electric Code, (NEC)
 - 3. National Electric Safety Code (NESC)

4. National Fire Protection Association (NFPA)
 5. State Electric Code
 6. State Building Code
 7. Local Municipal Codes
 - a. Electric Code
 - b. Building Code
- C. Industry Standard Requirements:
1. Underwriters Laboratories (UL)
 2. Telecommunications Industry Association/ Electronics Industries Alliance (TIA/EIA) publications and standards, including all related addenda and superseding documentation:
 - a. TIA/EIA 568-B.1: Commercial Building Telecommunications Wiring Standard Part-1: General Requirements and all related addenda.
 - b. TIA/EIA 568-B.2: Commercial Building Telecommunications Wiring Standard Part-2: Balanced twisted pair cabling standard and all related addenda.

1.04 SUBMITTALS

- A. Submit product data and test results.

PART 2 - PRODUCTS

2.01 SUMMARY

- A. The Trade Contractor is required to furnish, install, label, certify, warrant, and guarantee the performance of a complete, functional, standards-based technology utility as described herein. This includes all materials, products, and skilled labor necessary to provide this complete utility whether specifically described in this section, the Contract Documents or, implied by the general intent provided by the description of the Voice Data Communication System within the Contract Documents.
- B. The Contract Documents define the minimum acceptable quality and performance of a component by describing attributes, performance, and other associated standards and by designating a manufacturer's trade or brand name or part number associated with the voice data communications system or components of the voice data communications system.
- C. All products selected by the Contractor based on the Contract Documents shall be reviewed and approved by the Designer and Owner even if products are noted within the minimum acceptable quality and performance descriptions noted below.
- D. For products described only by attributes, performance or standards, the Contractor shall select products that meet or exceed the specified attributes verified by two (2) independent sources within the past 6 months, treat them as substitute products or components, and submit a request for Designer and Owner approval of their use. This request shall include the two (2) independent sources, the original product's specification sheet, the proposed substitute product cut sheet, and a written request to review the substitute product.
- E. All products for which no substitute is allowed are so described as such by omitting the designation term "or equal" within the Contract Documents. See 2.02, Substitutions and Alternates, below.

- F. All Product shall be new, unused and in perfect condition upon arrival at the Project Site, prior to installation, and prior to acceptance by the Owner. It shall be the Trade Contractor's responsibility to verify the status of the products and report, in writing to the Designer and Owner, any products that do not conform to the requirements described within the Contract Documents prior to installation. Commencement of the Work described herein associated with each system component constitutes the Trade Contractor's acceptance of new and unused products as stated.

2.02 HORIZONTAL CATEGORY 6 U/UTP CABLING

- A. All premium performance four (4) pair category-6 UTP cable shall consist of eight (8) twenty-four (24) gauge, or greater, thermoplastic insulated solid twisted conductors that utilize the industry standard color code designations.
- B. All individual copper conductor insulation material shall be 100% FEP on all conductors when a plenum cable is required by code.
- C. The performance criteria for Horizontal UTP cable shall be above and beyond the specific EIA/TIA 568B standards for the particular cable's rating and shall show stable performance out to 500 MHz. A category-6-rated cable must perform over and above each of the current specification parameters for the published TIA 568B for category-5e.
- D. Category 6 UTP cable shall be a fluted design with a pair isolator/separator that supports voice, analog baseband video/audio, fax, modem, switched-56, T-1, ISDN, RS-232, RS422, RS-485, 10BASE - T Ethernet, Token Ring, 100Mbps TP-PMD, 100BASE-T Ethernet, 155 Mbps ATM, AES/EBU digital audio, 270 Mbps digital video, 622 Mbps 64-CAP ATM and emerging high-bandwidth applications, including 1 Gbps Ethernet, as well as all 77 channels (550 Mhz) of analog broadband video.
- E. UTP cable shall be rated per the installation environment as required by the local Authority Having Jurisdiction and/or National Fire Codes. Select an appropriate cable construction, including external jacket properties, when installing cables in aerial, outdoor, underground and corrosive environments.
- F. Manufacturers - Category-6 UTP Cable
 1. Panduit - PUP6504WH-UY
 2. No substitutions.

2.03 UNIVERSAL UTP MODULAR OUTLET CONNECTORS

- A. All Universal UTP Modular Outlet Connectors shall be rated to perform at or above current TIA/EIA performance parameters when terminating a copper cable within the voice/data communications system.
- B. All Universal UTP Modular Outlet Connectors shall have an eight (8) position, eight (8)-conductor module that accepts both RJ45 and RJ11 modular plugs. Performance of the outlet jack shall not be decreased with an RJ-11 modular plug at any time.
- C. When utilized as part of a channel or permanent link, all high performance modular outlet connectors shall not decrease the elevated category - 5e transmission requirements before and

after installation as specified in ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section in all noted performance parameters.

D. Manufacturers - Category-6 UTP Modular Outlet Connectors

1. Panduit - CJ688TGIW

2.04 OUTLET HOUSING

- A. All outlet-housings at technology outlet locations shall provide the designated number modular insert ports as indicated on the Drawings. All flush-mounted faceplates shall be available in one (1), two (2), three (3), four (4), and six (6) port configurations of the same single gang style outlet and eight (8) port configurations of the same double gang style outlet.
- B. Color of all faceplates and outlet housing components shall be coordinated with the Owner before purchase and shall match electrical receptacle faceplates.
- C. Faceplates for flush floor mounted outlets shall be coordinated with the floor box that will be selected and installed by the Electrical Contractor.
- D. System furniture faceplates shall be capable of fitting in the furniture system selected by the Owner. Quantity of furniture faceplates shall satisfy outlet jack requirements. Furniture faceplate extenders shall be used if required to maintain proper bend radii within the furniture raceway/pathway. Colors shall be coordinated with the Owner before purchase.
- E. All outlet-housings shall provide a clear TIA/EIA 606-A labeling location for both the individual outlet port and the entire outlet housing location.
- F. Manufacturers - Outlet Housings
 1. Panduit - CFP_IW
 2. No substitutions.

2.05 FIRE STOPPING

- A. All Fire Stopping material shall re-establish the integrity of fire-rated walls, floors, ceilings, etc. when these barriers are either partially or completely been penetrated by cables, conduit, slots and other penetration elements. In many cases, fire stop penetration seals may be required to perform other safety or security functions such as environmental protection seals.
- B. Provide fire-resistance protection using either a mechanical or non-mechanical fire stop system that consists of pre-manufactured elastomeric components shaped to fit around standard cables, tubes, and conduit.
- C. All Fire Stopping material associated with the telecommunications transport system shall comply with all applicable laws, regulations, standards, and codes and shall be re-enterable by design.
- D. If a non-mechanical fire stop system is to be used, the Contractor shall state what form will be used and state the properties of the material to be used in each specific situation, i.e., putty (with intumescent sheet materials, ceramic fiber or rock wool fill), caulk, silicone foam, pre-manufactured "pillows", or other materials of a cement-like nature.
- E. All Fire Stopping materials and methods shall be approved by the Owner for final approval by the Authority Having Jurisdiction (AHJ) prior to purchase and installation by the Contractor.

- F. Manufacturer - Firestop Systems
 - 1. Wiremold
 - 2. Nelson

2.06 LABELS

- A. All Labels shall be machine-manufactured by a labeling machine. Handwritten labels will not be accepted for final labeling.
- B. The intention of the labeling scheme is to be TIA/EIA 606 compliant.
- C. It is the responsibility of the Contractor to acquire, understand, and utilize the Owner's labeling scheme for all component of the Voice Data Communications System including, but not limited to:
 - 1. Station cables (both ends)
 - 2. Workstation outlets Faceplates and Individual outlet connectors
 - 3. Termination panels, block, trays
 - 4. IT Room entry and exit pathways
 - 5. Telecommunication Conduit Pathways
- D. Manufacturer - Label Device
 - 1. Brady
 - 2. Or equal

2.07 CABLE TIES, VELCRO AND SPIRAL WRAP

- A. Cable Ties shall be UL listed, rated, and approved for the installation environment they are utilized. All Cable Ties shall contain an internal, metal locking bard to provide consistent resistance and shall be provided where necessary in accordance with all EIA/TIA 568-B standards and BICSI guidelines.
- B. Hook and loop Velcro™ tie wraps shall be a one-piece wrap UL listed, rated, and approved for the installation environment they are utilized. Velcro™ tie wraps shall have hooks on one side and loops on the other side to allow attachment to itself. Velcro™ tie wrap length shall allow for a minimum of two inches (0'-2") overlap to achieve loop tensile rating.
- C. Heli-tube Spiral Wrap tubing shall be UL recognized, rated, and approved for the installation environment they are utilized. Spiral Wrap tubing shall wrap onto all exposed cable bundles like tape and be quickly and simply reusable allowing easy inline breakout of cables, if necessary.
- D. Manufacturer - Cable Ties, Velcro, and Spiral Wrap
 - 1. Thomas & Betts Cable Ties
 - 2. Panduit HLTP Velcro™ Wrap
 - 3. M.M. Newman HTxxxx Nylon Heli-Tube Spiral Cut Tubing
 - 4. Or equal

PART 3 - EXECUTION

END OF SECTION