



ADDENDUM No 2

2025/05/19

SMYRNA SCHOOL DISTRICT

Sunnyside Intermediate School – New School
BID NO. SSD22004-NC_NEWIS

ADDENDUM No: **2**
2025/05/19

ARCHITECT'S PROJECT No: 22019

Smyrna School District
Sunnyside Intermediate School
70 Graceville Drive, Smyrna, DE 19977

Fearn-Clendaniel Architects, Inc.
6 Larch Avenue Suite 398
Wilmington, Delaware, 19804
Phone: (302) 998-7615

BIDS DUE: **2:00 p.m. on Thursday June 05, 2025**

LOCATION: **Smyrna School District Administrative Office**
82 Monrovia Avenue
Smyrna, DE 19977

1.0 NOTICE TO ALL BIDDERS

- 1.1 Bidders are hereby notified that this Addendum shall be and hereby becomes part of their Contract Documents, and shall be attached to the Project Manual for this project.
- 1.2 The following items are intended to revise and clarify the Contract Documents, and shall be included by the Bidder in their proposal.
- 1.3 Bidders shall verify that their sub-bidders are in full receipt of the information contained herein. Bidders shall acknowledge receipt of each addendum on their Bid Form.

2.0 CLARIFICATIONS

- 2.1 Drawings and specifications provided on the State of Delaware procurement website for advertisement purposes should not be used for bidding. Only the documents issued at the Pre-bid Meeting or purchased directly from FC Architects should be used for bidding purposes.



- 2.2 This and all future addenda will be emailed to all planholders at the addresses given on the sign-in sheet.
- 2.3 Bidders are reminded that the subcontractors they list on the Bid Form must be the subcontractors who perform the work. Bidders listing themselves as performing any portion of the work must be qualified, licensed, and manufacturer-certified to do so.
- 2.4 Contractor to coordinate with the following, Owner-provided third-party testing (Note Line-itemed testing of third-party scope not included, general overview provided):
 - 2.4.1 Site Work: Placement/compaction of fill and backfill, including structural.
 - 2.4.2 Lab Testing: Soil testing/density. Compressive strength of concrete.
 - 2.4.3 Foundations: Bearing capacity and sizes of footings.
 - 2.4.4 Reinforcing Steel: Size, grade, number, support, location, and cover.
 - 2.4.5 Cast-in-Place Concrete: Slump, temperature, air entrainment, and unit weight.
 - 2.4.6 Concrete Masonry: Observation, field and lab testing of block, mortar and grout. Site mixed mortar/grout proportions.
 - 2.4.7 Structural Steel: Observe welds for length, size and appearance. Observe installation of bolted connections.
 - 2.4.8 Light Gauge Metal Framing: Verify member installation, sizing, spacing, and associated bracing.
 - 2.4.9 CCR Services: Weekly sediment and storm site review reports. Review sediment and erosion controls. Observe installation of perimeter controls, stormwater management facilities.

3.0 QUESTIONS

3.1 **Q:** Is this a LEED Project?

A: No, this project is not seeking any LEED Certifications.

3.2 **Q:** Is the medium voltage transformer provided by the utility company or by the EC? Spec 261120 refers to a “utility transformer” but the following spec section 261200 indicates the EC would be responsible for furnishing and installing the medium voltage transformer. The phone number provided for the utility company contact in spec section 261120 is an invalid phone number.



A: The medium voltage transformer shall be provided by the electrical contractor. See revised Specification Section 26 11 20 for updated utility contact information.

3.3 **Q:** Can the AISC Certification be waived for the steel fabricator and erector?

A: The AISC fabrication certification can be waived provided that a third party inspector inspect the fabrication process, if the fabricator is not AISC Certified, see Specification Section 05 12 00, Item 1.8. The AISC erection certification can be waived provided a third party inspector inspects steel as installed per Specification 3.5 – Field Quality Control.

3.4 **Q:** Please provide specifications for carpet tile. No specification section found.

A: See attached Specification Section 096813 - Tile Carpeting.

3.5 **Q:** Specification Section 096519 Resilient Tile Flooring does not include resilient flooring products listed on Finish Material Legend, Drawing A80.01.

A: See attached, updated Specification Section 096519 - Resilient Tile Flooring and Section 096516 - Resilient Sheet Flooring.

3.6 **Q:** Drawing S4.10 calls for cast stone at the site sign, and drawing A83.02 calls for aluminum coping. Please clarify.

A: Sheet S4.10 to remove reference to cast stone. Sheet A83.02 details to dictate site sign design, per question above.

3.7 **Q:** Is the GC to carry the Maintenance of the landscaping as detailed on drawing L-02, or will the Owner be handling it?

A: Per Sheet L-02, The Contractor shall warrant all plants and materials for one year from acceptance by the owners representative and replace them in kind during the appropriate growing season.

3.8 **Q:** There is no metal roofing specification.

A: See attached Specification Section 074113.16 Standing-Seam Metal Roof Panels.

3.9 **Q:** Site Contractor is requesting an AutoCAD File.

A: AutoCAD Files are not available at this time, they will be provided to successful Bidder.

3.10 **Q:** The Specification Section 081113 appears to be missing/from another project.

A: See attached revised Specification Section 081113 - Hollow Metal Doors and Frames.



3.11 **Q:** In the wall type schedule under assemblies, Type #9, calls out for stacked partition types. We want clarification to make sure that this just means that there are multiple partition types in the same wall and not that the masonry in the wall needs to be stack bond.

A: The wall type schedule with assemblies, as noted in question, refers to two partition types that are stacked on top of one another. The note does not refer to the bonding of the masonry.

3.12 **Q:** There is a kiln hood system noted, but there isn't a specification section for the kiln. Is it owner provided?

A: Yes, owner to provide Kiln.

3.13 **Q:** Please provide specifications for FRP. No specification section found.

A: See attached Specification Section 066400 - Plastic Paneling.

3.14 **Q:** Who supplies the appliances?

A: Owner will supply appliances for washer and dryer in room 1511 and 1205. Owner will supply refrigerators in room 1202 and 1607.

3.15 **Q:** Can you better highlight the equipment screens on the roof?

A: Equipment screens called out on Sheet A10.03. Additionally shown in elevations, sections, and details.

****Additional questions have been received and not included in this Addendum. Some questions require additional time to answer and were not ready when this Addendum was released****

4.0 SUBSTITUTIONS

4.1 There are no substitution Requests at this time.

5.0 CHANGES TO THE DRAWINGS

5.1 Sheets C-09, C-10, & C-11. Remove and replace with attached Sheets. Clouded portions clarify base bid, alternate, and future construction. "Future Pole Barn" is not in the scope of this project.

5.2 Sheet E30.11 – Details – Electrical: Revise details 2 & 5, see revised Drawing E30.11

5.3 Sheet E30.13 – Details – Electrical: Revise details 4 & 8, see revised Drawing E30.13



6.0 CHANGES TO THE PROJECT MANUAL

- 6.1 Specification Section 066400 - Plastic Paneling, add attached section.
- 6.2 Specification Section 074113.16 Standing Seam Metal Roof Panels, add attached section.
- 6.3 Specification Section 081113 Hollow Metal Doors and Frames, remove and replace with attached section.
- 6.4 Specification Section 096516 Resilient Sheet Flooring, add attached section.
- 6.5 Specification Section 096519 Resilient Tile Flooring, remove and replace with attached section.
- 6.6 Specification Section 096813 Tile Carpeting, add attached section.
- 6.7 Specification Section 098433 Sound-Absorbing Wall Units, add attached section.
- 6.8 Specification Section 26 11 20 – Utility Incoming Service Provisions: Revise Paragraph 2.1 as indicated in the attached, Revised Specification Section 26 11 20 – Utility Incoming Service Provisions.
- 6.9 Specification Section 26 32 13 – Engine Generators – Replace entire existing Specification Section 26 32 13 Engine Generators with the enclosed Revised Specification Section 26 32 13 – Engine Generators.

7.0 ATTACHMENTS

- 7.1 Sheets
 - 7.1.1 Sheets C-09 – C-11
 - 7.1.2 Sheets E30.11 and E30.13
- 7.2 Specification Sections
 - 7.2.1 Section 06 64 00 – Plastic Paneling
 - 7.2.2 Section 07 41 13.16 – Standing Seam Metal Roof Panels
 - 7.2.3 Section 08 11 13 – Hollow Metal Doors and Frames
 - 7.2.4 Section 09 65 16 – Resilient Sheet Flooring
 - 7.2.5 Section 09 65 19 – Resilient Tile Flooring



- 7.2.6 Section 09 68 13 – Tile Carpeting
- 7.2.7 Section 09 84 33 – Sound Absorbing Wall Units
- 7.2.8 Section 26 11 20 – Utility Incoming Service Provisions
- 7.2.9 Section 26 32 13 – Engine Generators

END OF ADDENDUM No 2

SECTION 066400

PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic sheet paneling.
 - 2. Factory-laminated plastic sheet paneling.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

- A. Testing Agency: Acceptable to authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319.
1. Manufacturer: The Basis of Design subject to compliance with requirements, provide Plastic Paneling from Marlite, Standard FRP; or subject to compliance with requirements, provide Plastic Paneling products from one of the following:
 - a. Crane Composites
 - b. Glasteel
 - c. Kemlite Company Inc.
 - d. Newcourt, Inc.
 - e. Nudo Products, Inc.
 2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 3. Nominal Thickness: Not less than 0.09 inch (2.3 mm).
 4. Surface Finish: Molded pebble texture.
 5. Color: P 100 White.

2.3 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
1. Color: White
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.
- D. Adhesive: As recommended by plastic paneling manufacturer and with a VOC content of 50 g/L or less.
- E. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."
1. Sealant shall have a VOC content of 250 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.
- B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.
- C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches (300 mm) wide.
 - 1. Mark plumb lines on substrate at trim accessory and panel joint locations for accurate installation.
 - 2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

- G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00

SECTION 07 41 13.16
STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes standing-seam metal roof panels.
- B. Related Sections:
 - 1. Section 072100 Section "Thermal Insulation" for underlayment cover board.
 - 2. Section 076200 Section "Sheet Metal Flashing and Trim" for factory- and field-formed flashings, roof drainage systems, and other sheet metal work not part of metal roof panel assemblies.
 - 3. Section 077100 "Roof Specialties" for factory- and field-formed fasciae, roof-edge drainage systems, and copings.
 - 4. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
 - 2. Review temporary protection requirements for metal panel systems during and after installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

- D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low and steep-slope roof products.
- B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646[or ASTM E 331] at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically

attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening pencil ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Petersen Aluminum Corporation, Tite-Loc Plus Panel or comparable product by one of the following:
 - a. AEP-Span.
 - b. Architectural Metal Systems.
 - c. Architectural Roofing and Siding, Inc.
 - d. ATAS International, Inc.
 - e. Berridge Manufacturing Company.
 - f. CENTRIA Architectural Systems.
 - g. Firestone Building Products
 - h. MBCI; a division of NCI Building Systems, L. P.
 - i. Morin Corporation; a Kingspan Group Company
 - j. Steelo Systems, L.L.C.
 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 22 GA, 0.034 inch (0.86 mm).
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Color: As selected by architect from manufacturers full range.
 3. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: 0.064-inch- (1.63-mm-) nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 4. Joint Type: Double folded.
 5. Panel Coverage: 18 inches (457 mm).
 6. Panel Height: 2.5 inches (64 mm).

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
 - f. or equal.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
- C. Polyisocyanurate Cover Board, Glass-Fiber-Mat Faced (Beneath Metal Roofing Panels and where noted): ASTM C 1289, glass-fiber-mat faced, Type II, Class 4, Grade 1. See Section 072100 Thermal Insulation.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

- D. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

- a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
 - 1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Install panels in continuous lengths. Do not splice.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

- I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:

1. Elevations of each door type.
 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 7. Details of anchorages, joints, field splices, and connections.
 8. Details of accessories.
 9. Details of moldings, removable stops, and glazing.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; AADG, Inc.; ASSA ABLOY.
 2. Curries, AADG, Inc.; ASSA ABLOY Group.
 3. Pioneer Industries; AADG, Inc.; ASSA ABLOY.
 4. Republic Doors and Frames; an Allegion brand.
 5. Steelcraft; Allegion plc.
 6. Or equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide assemblies with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 3. Temperature-Rise Limit: Where indicated and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- C. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested according to ASTM C 518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A..
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - d. Edge Construction: Model 1, Full Flush.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.
 - 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A..

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches (44.5 mm).
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
- d. Edge Construction: Model 1, Full Flush.
- e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
- f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- h. Core: Manufacturer's standard.
- i. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated doors.

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
- b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches (610 mm) of frame height above 7 feet (2.1 m).
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.8 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-

developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

- G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. All moldings and lite trims shall be through-bolted from face to face of door panel. Do not secure with screws.
 2. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
 3. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 4. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

6. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.10 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11.
 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 4. Solidly pack mineral-fiber insulation inside frames.

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Non-Fire-Rated Steel Doors: Comply with SDI A250.8.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 09 65 16
RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl sheet flooring with backing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of resilient sheet flooring.
 - 1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, and cutouts.
 - 2. Show details of special patterns.
- C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections.
- D. Samples for Initial Selection: For each type of resilient sheet flooring indicated.
- E. Samples for Verification: For each type of resilient sheet flooring, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each color, texture, and pattern required.
- F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project.
- G. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.]

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Sheet Flooring: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - a. Size: Minimum 100 sq. ft. (9.3 sq. m) for each type, color, and pattern in locations directed by Architect.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive resilient sheet flooring during the following periods:

1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL SHEET FLOORING WITH BACKING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Patcraft & Shaw Industries Group, Inc.; Bounce Back 6.5, or comparable product by one of the following:
1. Or equal.
- B. Product Standard: ASTM F2772.
1. Construction: Commercial Heterogeneous Sheet.
 2. Wear-Layer Thickness: 39 mil / 0.039 inches (0.991 mm).
 3. Overall Thickness: 0.256 inches (6.5 mm)
 4. Backing Class: Closed Cell Foam.
- C. Wearing Surface: Manufacturer's standard.
- D. Sheet Width: 70.9 in x 49.2 in.
- E. Seamless-Installation Method: Heat welded or Chemically bonded.
- F. Colors and Patterns: Field: As indicated on Drawing finish schedule. Line Markings: Crimson

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Colors: Match flooring.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: radius provided or approved by resilient sheet flooring manufacturer.
 - 2. Transition Strip: Tapered vinyl cap provided or approved by resilient sheet flooring manufacturer.
 - 3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 1. Maintain uniformity of flooring direction.
 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
 3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
 5. Install Line markings/stripping as indicated on drawings.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- J. Integral-Flash-Cove Base: Cove resilient sheet flooring 4.5 inches (114 mm) up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
 - 1. Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid vinyl floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full-size units of each color, texture, and pattern of floor tile required.
- C. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL TILES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mannington Commercial; a business unit of Mannington Mills, Inc.; Color Anchor LVT (Stride and Groove), Amtico Active Lines LVT: Shift or comparable product by one of the following:
1. Or equal.
 - a. Tile Standard: ASTM F 1700, Class III, Type B embossed surface. See "Rubber Floor Tile" Article in the Evaluations for a discussion of hardness values.
 - b. Hardness: Grade 1, minimum hardness of 85, measured using Shore, Type A durometer according to ASTM D 2240.
 - c. Wearing Surface: Embossed.
 - d. Thickness: 0.10 inch (2.5 mm).
 - e. Size: As indicated on Drawings
 - f. Colors and Patterns: As indicated on Drawings by manufacturer's designations.
 - g. Limited Wear Warranty: 15 years.

INSTALLATION MATERIALS

- B. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- C. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 1. Moisture Testing: Perform tests recommended by manufacturer to verify conditions meet manufacturer's written installation requirements.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis or in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.9 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
3. Warranty Periods:
 - a. Wear and Backing Warranty: Limited, lifetime.
 - b. Stain and Bleach Resistance Warranty: Limited, 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Mannington Commercial; a business unit of Mannington Mills, Inc.; Google Skyway or a comparable product by one of the following:
 1. Or equal.
- B. Colors and Patterns: As indicated on Drawings by manufacturer's designations.
- C. Fiber Content and Type: 100 percent nylon 6, 6.
- D. Pile Characteristic: Patterned loop pile.
- E. Pile Thickness: 0.094 inches (2.39mm) minimum for finished carpet tile according to ASTM D 6859.
- F. Stitches: 10 stitches per inch (39.37 per 10 cm) minimum.
- G. Gage: 5/64 (50.39 per 10 cm) minimum.
- H. Surface Pile Weight: 20 oz./sq. yd. (678 g/sq. m).
- I. Primary Backing/Backcoating: Manufacturer's standard composite materials.
- J. Secondary Backing: Manufacturer's standard material.
- K. Size: As indicated on Drawings.
- L. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

M. Performance Characteristics:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Class 1, not less than 0.45 W/sq. cm according to NFPA 253.
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than 6.2 lbf (28 N) according to ASTM D 1335.
5. Delamination: Not less than 3.5 lbf/in. (0.6 N/mm) according to ASTM D 3936.
6. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
7. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
8. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) according to AATCC 16, Option E.
9. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Manufacturer's recommended low-VOC, water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.

- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction and layout patterns indicated on Drawings.

- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders unless otherwise indicate on Drawings.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 84 33

SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

This Section includes the following:

- 1. Back-mounted sound-absorbing acoustical wall panels.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for acoustical wall panels, including plans, elevations, sections, details, and attachments to other Work.
 - 1. Show orientation of fabric application, pattern matching, and seams.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for facing materials for each type of acoustical wall panel indicated. Include samples of installation devices and accessories.
- D. Samples for Verification: 8-by-11-inch(200-by-280-mm) units of each type of acoustical wall panel indicated; in sets for each color, texture, and pattern specified for facing materials, showing the full range of variations expected in these characteristics. Include samples of installation devices and accessories.
- E. Product Certificates: Signed by manufacturers of acoustical wall panels certifying that products furnished comply with requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Product Test Reports: From a qualified testing agency indicating acoustical wall panels comply with requirements, based on comprehensive testing of current products.
- H. Maintenance Data: For acoustical wall panels and facings to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing acoustical wall panels similar to those indicated for this Project and with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations for Acoustical Wall Panels: Obtain acoustical wall panels from one source with resources to provide products of consistent quality in appearance and physical properties.
- D. Fire-Test-Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical wall panels with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- E. Mockups: Before installing acoustical wall panels, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting acoustical wall panel fabrication.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed.
 - 7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect acoustical wall panels from excessive moisture when shipping, storing, and handling. Deliver in unopened bundles and store in a dry place with adequate air circulation. Do not deliver material to building until wet-work, such as concrete and plaster, has been completed and cured to a condition of equilibrium. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

- B. Lighting: Do not install units until a permanent level of lighting is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify wall surface dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish surface dimensions and proceed with fabricating acoustical wall panels without field measurements. Coordinate wall construction to ensure that actual surface dimensions correspond to established dimensions.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace components of acoustical wall panel system that fail in performance, materials, or workmanship within specified warranty period. Failure in performance includes, but is not limited to, acoustical performance. Failure in materials includes, but is not limited to, sagging or distortion of facing or warping of core.
 - 1. Warranty Period: 2 (Two) years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Wall Panels: Full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall units specified in this Section from single source manufacturer.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Acoustical Wall Panel Schedule at the end of Part 3.

2.2 ACOUSTICAL WALL PANELS, GENERAL

- A. Fabricate panels to sizes and configurations indicated; attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sags, blisters, seams, adhesive, or other foreign matter.
 - 1. Fabricate back-mounted panels in factory to exact sizes required to fit wall surfaces, based on field measurements of completed substrates indicated to receive acoustical wall panels.
 - 2. Where square corners are indicated, tailor corners.
 - 3. Where radius corners are indicated, attach facing material so there are no seams or gathering of material.
 - 4. Where fabrics with directional or repeating patterns, or directional weave, are indicated, mark fabric top and attach fabric in same direction.
 - 5. Where fabric facings with seams are indicated, fabricate invisible seams and comply with Shop Drawings for location.
- B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch (1.6 mm) for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.
- C. Sound-Absorption Performance: Provide acoustical wall panels with minimum noise reduction coefficients indicated, as determined by testing per ASTM C 423 for mounting type specified under individual product requirements in the Acoustical Wall Panel Schedule at the end of Part 3.
- D. Panel Characteristics: Comply with requirements indicated in the Acoustical Wall Panel Schedule at the end of Part 3.
- E. Back-Mounting Accessories: Manufacturer's standard or recommended accessories for securely mounting panels, of type and size indicated, to substrates provided; and complying with the following requirements:
 - 1. Mechanically Mounted Wood-Framed Panels: Z-clip hanger and magnet system with magnets recessed into frame and designed to engage steel mounting plates that are secured to wall with leveling mastic.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and blocking, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical wall panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, and scribed to fit adjoining work accurately at borders and at penetrations. Comply with panel manufacturer's written instructions for

installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.

1. Cut units to be at least 50 percent of unit width, with facing material extended over cut edge to match uncut edge. Scribe acoustical wall panels to fit adjacent work. Butt joints tightly.

B. Construction Tolerances: As follows:

1. Variation from Plumb and Level: Plus or minus 1/16 inch (1.6 mm).
2. Variation of Joints from Hairline: Not more than 1/16 inch (1.6 mm).

3.3 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.
- C. Remove surplus materials, rubbish, and debris resulting from acoustical wall panel installation, on completion of the Work, and leave areas of installation in a neat and clean condition.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure acoustical wall panels are without damage or deterioration at time of Substantial Completion.
- B. Replace panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 ACOUSTICAL WALL PANEL SCHEDULE

- A. Back-Mounted, Edge-Framed Sound Absorbing Acoustical Wall Panels: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed, dimensionally stable, rigid glass-fiber board core and bonded or attached to edges and back of frame; and complying with the following requirements:
 1. Products: Basis-of-Design Product: Subject to compliance with requirements, provide Golterman & Sabo – Resolute (R) high impact, fabric covered sound-absorbing wall panel or comparable product by one of the following:
 - a. Acoustic Solutions
 - b. Acoustical Solutions
 - c. Acoustical Surfaces Inc.
 - d. Essi Acoustical Products
 - e. Kinetics Noise Control, Inc.
 - f. Or equal.

2. Facing Material: Woven fabric from same dye lot; color and pattern as indicated on drawings. Two Colors selected from complete line of manufacturer's Guilford of Maine Standard Fabrics. See finish plan legend.
3. Nominal Core Density: 6 to 7 lb/cu. ft.(96 to 112 kg/cu. m).
4. Framing: Extruded-aluminum or zinc-coated, rolled-steel shape.
5. Nominal Overall Panel Thickness and Noise Reduction Coefficient: 2-1/16 inches - 2-1/8" (52.6mm - 54.2mm) and not less than NRC 0.90 for Type A mounting per ASTM E 795.
6. Panel Width: As indicated on drawings.
7. Panel Height: As indicated on drawings.
8. Edge Detail: Square
9. Impact-Resistant, Acoustically Transparent, Copolymer Face-Sheet Layer for High-Abuse Applications: 1/16- to 1/8-inch- (1.6- to 3.2-mm-) thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.

END OF SECTION 09 84 33

DIVISION 26 SECTION 26 11 20
UTILITY INCOMING SERVICE PROVISIONS
TABLE OF CONTENTS

PART 1. GENERAL	3
1.1. RELATED DOCUMENTS.....	3
1.2. DESCRIPTION OF WORK.....	3
1.3. RELATED WORK SPECIFIED ELSEWHERE IN DIVISION 26.....	3
1.4. UTILITY COMPANY COORDINATION.....	3
1.5. SUBMITTALS	4
1.6. QUALITY ASSURANCE	4
PART 2. PRODUCTS.....	5
2.1. ELECTRIC UTILITY COMPANY PROVISIONS	5
2.2. TELECOMMUNICATIONS COMPANY PROVISIONS.....	5
2.3. CABLE TELEVISION COMPANY PROVISIONS	6
2.4. TYPICAL INCOMING SERVICE PROVISIONS.....	7
PART 3. EXECUTION.....	7
3.1. INSTALLATION	7
3.2. UTILITY COMPANY ELECTRIC-METERING EQUIPMENT	7
3.3. PREPARATION	8
END OF SECTION	8

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 26 11 20 - UTILITY INCOMING SERVICE PROVISIONS

PART 1. GENERAL

1.1. RELATED DOCUMENTS

- A. The general provisions of the Contract, including the General Requirements, apply to the work specified in this Section.
- B. Division 26 Section “Common Work Results for Electrical” sections apply to work of this section.

1.2. DESCRIPTION OF WORK

- A. The Contractor shall provide all materials and labor required by the utility for service provisions.
- B. The Contractor shall provide all materials and labor for complete empty conduit power, telephone and CATV distribution systems as shown on the drawings and as specified herein.

1.3. RELATED WORK SPECIFIED ELSEWHERE IN DIVISION 26

- A. Division 26 Section 260500, “Common Work Results for Electrical”.
- B. Division 26 Section 260573, “Power System Studies”.
- C. Division 26 Section 260533, “Raceways and Boxes for Electrical Systems”.
- D. Division 26 Section 262726, “Wiring Devices”.
- E. Division 26 Section 260543, “Underground Ducts and Raceways for Electrical Systems”.
- F. Division 26 Section 260526, “Grounding and Bonding for Electrical Systems”.

1.4. UTILITY COMPANY COORDINATION

- A. Contact Miss Utility (1-800-257-7777) prior to any excavation or underground work. The Contractor shall verify the location and depth of all utilities. Provide test pits to verify location and depth of all existing utilities crossing new incoming services.
- B. Contact serving utility companies immediately upon award of Contract. Do not install related equipment until fully coordinated with appropriate utilities.
- C. Provide all Construction Schedules, dates of requested services, outage windows, equipment locations, etc., necessary for utility work.
- D. The Contractor shall ascertain, from the utility companies, the exact amount of work required in connection of the utilities. Work required which is not provided by the utility companies shall be provided by the Contractor.

- E. Provide and coordinate all temporary services with utility companies.
- F. The Contractor shall coordinate the required separation distances for all utilities.
- G. The Contractor shall obtain all permits and permissions required.

1.5. SUBMITTALS

- A. Certificate of Compliance: Contractor shall submit a document certifying that work complies with all utility company requirements including the following:
 - 1. Construction Standards of each Utility Company.
 - 2. Trench and cover Depth.
 - 3. Spacing and Support of Utilities.
 - 4. Installation of underground marking tape.
 - 5. Pull cords and Mandrels.
- B. Photographs: Contractor shall submit photographs of each utility installation at each of the above described levels of completion and attach photographs to Certificate of Compliance for verification. Submit a minimum of six (6) color 4-inch x 6-inch photographs for each utility service.
- C. Submit Certificate of Compliance (and photographs if required) to each utility company for verification and approval.
- D. Include Certificate of Compliance, photographs, and utility company approvals in O&M Manual.
- E. The Contractor shall provide and submit all required documentation to each utility company, including service application, site plan and coordination drawings.

1.6. QUALITY ASSURANCE

- A. Comply with the requirements of Delaware Municipal Electric Corporation (DEMEC).
- B. Comply with the requirements of NFPA 70, National Electrical Code.
- C. Comply with the NECA Standard of Installation.
- D. Comply with NFPA 70E, National Electrical Safety Code.
- E. Contractor shall have experience with not less than 5 comparable projects for which the Contractor completed service provisions with each utility. Contractor shall be familiar with all current utility requirements and guidelines.
- F. Obtain utility company inspector's approval for all work.

PART 2. PRODUCTS

2.1. ELECTRIC UTILITY COMPANY PROVISIONS

- A. The electric utility company is Delaware Municipal Electric Corporation (DEMEC).
- B. The point of contact at the electric utility company is:
 - 1. Name: Josh Little
 - 2. Email: jlittle@smyrna.delaware.gov
 - 3. Phone Number: (302) 389-2332
- C. Coordinate service entrance equipment and layout with power company prior to ordering or installing any service entrance equipment.
- D. Furnish and install all incoming raceway.
- E. Coordinate cable, conduit, lug sizes, etc., for proper interface between utility-owned/installed equipment and Contractor-installed equipment.
- F. Provide grounding and clearances as required by the Utility.
- G. Contractor shall furnish and install all incoming raceway and service entrance cables. If the power company plans to install cable and/or conduit, the Contractor is responsible for proper coordination of cable, conduit, lug sizes, etc., for proper interface between utility-owned/installed equipment and Contractor-installed equipment.
- H. The Contractor shall ascertain from the utility companies, the available short circuit fault current.
- I. Equipment for Utility Company's Electric Metering:
 - 1. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
 - 2. Meter Sockets: Comply with requirements of electrical power utility company.
 - 3. Housing: NEMA 250, Type 3R enclosure.

2.2. TELECOMMUNICATIONS COMPANY PROVISIONS

- A. Refer to Technology Contract Drawings.
- B. Telecommunications Service Wall Space: Provide a wall-mounted ¾-inch fire-retardant painted plywood backboard, 8 feet high x 4 feet wide, as shown at location indicated on the drawings.
- C. Provide adjacent to backboard two duplex convenience NEMA 5-20R receptacles connected to the emergency power system. Provide (2) 12 AWG and (1) 12 AWG grounding conductor in ¾-inch conduit from receptacles to nearest 120 volt emergency power panel.
- D. Provide adjacent to the backboard, one 4 AWG copper grounding conductor extended from

the building's service ground point.

- E. Provide conduit sleeves where cable is extended through partitions, walls, or floor slabs. Fire seal all openings after cable is installed.
- F. Incoming Telecommunications service:
 - 1. Coordinate incoming telecommunications service requirements with area public telecommunications system utility. Provide two (2) 4-inch Schedule 40 PVC underground conduits with pull cords from the telecommunications service equipment backboard to the vicinity of the pad-mounted transformer unless otherwise indicated on the Drawings. Terminate conduits in the exact location and manner as directed by the telecommunications company.
 - 2. Provide pre-cast pulling handholes in duct run in location(s) as directed if deemed necessary by the telecommunications utility. Size of handholes (L x W x H) shall be as required by the utility. Handholes installed in roadways shall be H20 roadway type.
 - 3. Extend two (2) 4-inch PVC Schedule 40 underground service conduits along with primary electrical feeder from pad-mounted transformer location to 5'-0-inches beyond property line, or as indicated on the Drawings, then capped and stubbed.
 - 4. In addition to the above requirements, install raceways in maximum lengths as required by telecommunications company and a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- G. Coordinate incoming raceway with telecommunications utility company. Provide required conduit sizes and quantities as determined by the telecommunications company.
- H. Contractor shall be responsible for contacting and coordinating with the telecommunications utility company prior to ordering or installing any telephone entrance equipment and provisions.

2.3. CABLE TELEVISION COMPANY PROVISIONS

- A. The Cable Television Company is Comcast.
- B. Incoming CATV Service:
 - 1. Coordinate incoming CATV service requirements with the cable television company. Provide one (1) 4-inch Schedule 40 PVC conduit underground from the CATV service equipment backboard to the CATV pedestal in the vicinity of the power company's pad-mounted transformers unless otherwise indicated on the Drawings.
 - 2. Extend one (1) 4-inch Schedule 40 underground service conduit to 5'-0" beyond the property line, then cap and stub. Terminate conduits in the exact location and manner as directed by the CATV company.
 - a. Extend one 4-inch empty EMT conduit run concealed, from main CATV demarcation equipment to MDF Room and terminate at MATV/CATV head-end equipment in exact location and manner as required.

2.4. TYPICAL INCOMING SERVICE PROVISIONS

- A. Pull Cords: ¼-inch nylon pull cord with 500 lb. minimum tensile strength in each conduit.
- B. Conduit, Elbows, and Couplings: UL Schedule 40, EB-35, DB-60, DB-120, or ANSI/ASTM F-512 as required by utility for the specific application.
- C. Spacers: Every 4 feet of conduit.
- D. Splice Boxes: Purchase from utility company. Provide as required.
- E. Utility Holes: Purchase from utility company. Provide as required.
- F. Underground Marking: Provide detectable warning tape over all conduits.
- G. Bends: Minimum 5 foot radius (horizontal) and 36-inch radius (vertical).
- H. Concrete for encasement: As specified in Division 26 Section 260543, “Underground Ducts and Raceways for Electrical Systems”, unless otherwise noted on the Drawings, with air entrainment and pea gravel.
- I. Backfill: Virgin soil/select backfill only. Backfill shall be stone dust, rock-free earth, or top soil with no stones larger than 1-1/2-inches in diameter permitted.
- J. Miscellaneous Materials: Provide bushings, bell ends, conduit plugs and other miscellaneous materials as required by utility companies.

PART 3. EXECUTION

3.1. INSTALLATION

- A. Mandrel: Contractor shall pull a mandrel (1/2-inch smaller in diameter than the conduit, and six inches long) through each conduit.
- B. Pull Cords: Pull cords shall be left in all conduits, after mandrel pull.
- C. Coordination: Coordinate location of telephone and CATV wall spaces, raceways, and boxes, as necessary, to interface installation of telephone and CATV systems with other work.
- D. Bushings: Provide conduit bushing at each end of all conduits.
- E. Bell Ends & Plugs: Provide bell ends and plugs for each conduit.
- F. Sealing Conduits: Provide duct sealant in each conduit after utility cable is installed.

3.2. UTILITY COMPANY ELECTRIC-METERING EQUIPMENT

- A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company. Provide lugs as required by utility.

3.3. PREPARATION

- A. Contractor shall provide conduits at all street or road crossings for all utility facilities.
- B. Provide a level area at final grade for all transformer, pedestal, and utility equipment locations.
- C. Coordinate utility line separation requirements between electric, water, sewer, gas, telephone and CATV.
- D. Contractor shall clear area for all utility cables of rubble, debris, stumps, and other obstructions.

END OF SECTION

DIVISION 26 SECTION 263213
ENGINE GENERATORS
TABLE OF CONTENTS

PART 1. GENERAL	3
1.1. RELATED DOCUMENTS	3
1.2. SUMMARY	3
1.3. DEFINITIONS	3
1.4. SUBMITTALS	4
1.5. EXTRA MATERIALS	5
1.6. QUALITY ASSURANCE	5
1.7. PROJECT CONDITIONS	6
1.8. COORDINATION.....	7
1.9. WARRANTY	7
1.10. MAINTENANCE SERVICE	7
PART 2. PRODUCTS.....	8
2.1. MANUFACTURERS	8
2.2. ENGINE GENERATOR SET	8
2.3. ENGINE	9
2.4. CONTROL AND MONITORING	11
2.5. ENGINE START MONITORING SYSTEM.....	12
2.6. GENERATOR OVERCURRENT AND FAULT PROTECTION	13
2.7. GENERATOR, EXCITER, AND VOLTAGE REGULATOR	14
2.8. OUTDOOR GENERATOR-SET ENCLOSURE	14
2.9. VIBRATION ISOLATION DEVICES	15
2.10. FINISHES.....	15
2.11. SOURCE QUALITY CONTROL	16
PART 3. EXECUTION.....	16
3.1. EXAMINATION.....	16
3.2. INSTALLATION	16
3.3. CONNECTIONS.....	17
3.4. IDENTIFICATION	17
3.5. FIELD QUALITY CONTROL.....	18
3.6. DEMONSTRATION.....	19
END OF SECTION	20

INTENTIONALLY LEFT BLANK

SECTION 26 32 13 - ENGINE GENERATORS

PART 1. GENERAL

1.1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 01 Section 012300, "Alternates", for description of work in this section affected by alternates.
 - 2. Division 26 Section 260500, "Common Work Results for Electrical", for requirements for concrete equipment pads for engine generators.
 - 3. Division 26 Section 262418, "Load Centers", for requirements for load centers in engine-generator sets.
 - 4. Division 26 Section 263600, "Transfer Switches", for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2. SUMMARY

- A. This Section includes packaged engine-generator sets for a Class 48, Type 10, Level 1 emergency power supply system with the following features:
 - 1. Gas engine.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Starting battery and battery charger.
 - 5. Muffler and exhaust piping.
 - 6. Remote annunciator.
 - 7. Outdoor enclosure.

1.3. DEFINITIONS

- A. Class: The minimum amount of hours that the EPSS can operate at its rated load without being re-fueled. For example, a Class 48 system must operate for a minimum of 48 hours.
- B. Emergency Systems: Systems legally required and classed as emergency by municipal, state, federal or other codes, or by any governmental agency having jurisdiction, which are intended to automatically supply illumination, power, or both, to designated areas and equipment in event of failure of the normal power supply.
- C. EPSS: Emergency power supply system.
- D. Level: There are two Levels defined by NFPA 110 for an EPSS. Level 1 is more stringent and is imposed when failure of EPSS equipment could result in loss of human life

or serious injuries. Level 2 is used when failure of the EPSS is less critical to human life and safety.

- E. NFPA: National Fire Protection Association.
- F. Operational Bandwidth: The total variation from the lowest to the highest value of a parameter over a range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- G. SPSS: Standby power supply system
- H. Standby Rating: Power output rating equal to the power the generator set delivers continuously under normally varying load factors for the duration of a power outage.
- I. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in hertz (Hz) or cycles per second.
- J. Type: The maximum amount of seconds that the load terminals of the EPSS transfer switch can be without acceptable electrical power. For example, a Type 10 EPSS must provide electrical power within 10 seconds.

1.4. SUBMITTALS

- A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
 - 1. Thermal damage curve for generator.
 - 2. Time-current characteristic curves for generator protective device.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
 - 2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
 - 4. Wiring Diagrams: Power, signal, and control wiring. Differentiate between factory-installed and field-installed wiring.
- C. Qualification Data: For manufacturer and testing agency.
- D. Source quality-control test reports.
 - 1. Certified summary of prototype-unit test report.

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
 3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
 4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
 5. Report of sound generation.
 6. Report of exhaust emissions showing compliance with applicable regulations.
 7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.
- E. Field quality-control test reports.
- F. Warranty: Special warranty specified in this Section.
- G. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section, "Operation and Maintenance Data," include the following:
1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

1.5. EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fuses: One for every 10 of each type and rating, but no less than one of each.
 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 4. Belts: Two sets of each type.

1.6. QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
 2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

- C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3 of this Section.
- D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Comply with ASME B15.1.
- G. Comply with NFPA 37.
- H. Comply with NFPA 70.
- I. Comply with NFPA 110 requirements for emergency power supply system level specified.
- J. Comply with UL 2200.
- K. Comply with ISO 8528.
- L. Engine Exhaust Emissions:
 - 1. Comply with EPA Tier 3 requirements and all applicable state and local government requirements.
 - 2. Generators shall be factory certified to meet Environmental Protection Agency (EPA) New Source Performance Standards (NSPS).
 - 3. Obtain DENREC air quality permit-to-construct for generator equipment, as required.
- M. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
 - 1. Refer to generator schedule on the Contract Drawings for maximum noise level (dBA value).

1.7. PROJECT CONDITIONS

- A. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 15 to plus 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

1.8. COORDINATION

- A. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and form-work requirements are specified in Division 03 Section, "Cast-in-Place Concrete".

1.9. WARRANTY

- A. Special Warranty: Manufacturer's comprehensive warranty in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period, including but not limited to materials, labor, travel, fuel, lodging, etc.

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

1.10. MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 60 months' full maintenance by skilled employees of manufacturer's designated service organization.

1. Provide quarterly multi-point operational inspection including the following at a minimum:
 - a. Check all belts, adjust as needed.
 - b. Check rubber hoses, replace as needed.
 - c. Inspect cooling system and test antifreeze.
 - d. Inspect air filters.
 - e. Inspect block heater for proper operation.
 - f. Check lube oil level and top off all fluids.
 - g. Inspect/test fuel system.
 - h. Inspect spark plugs.
 - i. Inspect battery/cables/connections.
 - j. Inspect exhaust system.
 - k. Check engine ignition components.
 - l. Test run system and check voltage and frequency.
 - m. Exercise generator to check for proper starting, load transfer, and running under load.
2. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation, including but not limited to the following:
 - a. Replace belts and hoses as needed.
 - b. Replace air filters as needed.

- c. Replace oil and oil filter annually.
 - d. Replace spark plugs annually.
 - e. Replace fuel filter annually.
 - f. Perform load bank test per NFPA 110 annually.
3. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2. PRODUCTS

2.1. MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Caterpillar; Engine Div.
 2. Generac Power Systems, Inc.
 3. Kohler Power Systems; Generator Division. (Basis of Design)
 4. MTU Onsite Energy Corp.; Rolls-Royce
 5. Onan/Cummins Power Generation; Industrial Business Group.

2.2. ENGINE GENERATOR SET

- A. Factory-assembled engine-generator set.
- B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- C. Capacities and Characteristics:
 1. Power Output Ratings: Nominal ratings as indicated on the Contract Drawings.
 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- D. Generator Set Performance:
 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-

- state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 8. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3. ENGINE

- A. Fuel: Natural gas.
- B. Rated Engine Speed: 1800 rpm.
- C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).
- D. Lubrication System: The following items are mounted on engine or skid:
 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- E. Engine Fuel System:
 1. Natural gas
 - a. Carburetor.
 - b. Secondary Gas Regulator.
 - c. Fuel-Shutoff Solenoid Valve.
 - d. Flexible Fuel Connector.
 - e. Minimum and maximum operating pressures as indicated on the Contract Drawings.
- F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for heater capacity.
- G. Governor: Adjustable isochronous, with speed sensing.
- H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anti-corrosion additives as recommended by engine manufacturer.
 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- I. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
1. Minimum sound attenuation of 25 dB at 500 Hz.
- J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- K. Starting System: 12 or 24-V electric, with negative ground.
1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
 2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 3. Cranking Cycle: As required by NFPA 110 for system level specified.
 4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
 5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation.
 7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
 8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically

- switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
- b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 4X, wall-mounted cabinet.

2.4. CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch shall also shut down generator set.
- B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch shall also shut down generator set.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.
- D. Indicating and Protective Devices and Controls: As required by NFPA 110 for system level specified, and the following:
 - 1. AC voltmeter.
 - 2. AC ammeter.
 - 3. AC frequency meter.
 - 4. DC voltmeter (alternator battery charging).
 - 5. Engine-coolant temperature gage.
 - 6. Engine lubricating-oil pressure gage.
 - 7. Running-time meter.

8. Ammeter-voltmeter, phase-selector switch(es).
 9. Generator-voltage adjusting rheostat.
 10. Start-stop switch.
 11. Overspeed shutdown device.
 12. Coolant high-temperature shutdown device.
 13. Coolant low-level shutdown device.
 14. Oil low-pressure shutdown device.
 15. Generator overload.
- E. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.
- F. Common Remote Audible Alarm:
1. Comply with NFPA 110 requirements for system level specified. Include necessary contacts and terminals in control and monitoring panel.
 - a. Overcrank shutdown.
 - b. Coolant low-temperature alarm.
 - c. Control switch not in auto position.
 - d. Battery charger malfunction alarm.
 - e. Battery low-voltage alarm.
 2. Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.
 - a. Engine high-temperature shutdown.
 - b. Lube-oil, low-pressure shutdown.
 - c. Overspeed shutdown.
 - d. Remote emergency-stop shutdown.
 - e. Engine high-temperature pre-alarm.
 - f. Lube-oil, low-pressure pre-alarm.
 - g. Low coolant level.
- G. Remote Alarm Annunciator: Comply with NFPA 99. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.
- H. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.5. ENGINE START MONITORING SYSTEM

- A. Description: Engine start monitoring system that monitors the integrity/operability of engine start circuits from automatic transfer switches, and automatically starts engine-

generator(s) when faults occur, with the following features:

1. System shall be capable of monitoring up to eight (8) automatic transfer switches, including fire pump controllers with automatic transfer switches provided under Division 21.
 2. Modules shall utilize standard engine control wiring.
 3. Generator module shall provide two (2) Form “C” contacts, one (1) for engine start and one (1) for alarming.
 4. Generator module shall be equipped with status LEDs for each channel to determine system status (e.g. channel disabled, wiring fault, engine start inactive, engine start active).
 5. Transfer switch modules shall be compatible with and wire into any contact-based engine start signal.
 6. System shall provide visual and audible notification of circuit faults at the generator and remote annunciator(s).
- B. Provide ATS Engine Start Module 5101-ATS as manufactured by ASCO, or approved equal, at each automatic transfer switch including fire pump controllers with automatic transfer switches.
- C. Provide Generator Engine Start Module 5101-GEN as manufactured by ASCO, or approved equal by listed manufacturer, at each engine-generator.

2.6. GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:
1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator set malfunction alarms.
 2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- B. Generator Circuit Breaker: Molded-case, electronic-trip type; 80 percent rated; complying with NEMA AB 1 and UL 489.
1. Tripping Characteristic: Designed specifically for generator protection.
 2. Trip Rating: As indicated on the Contract Drawings.
 3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.

4. Mounting: Adjacent to or integrated with control and monitoring panel.
- C. Ground-Fault Indication: Comply with NFPA 70, "Emergency Systems" requirements for signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.7. GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H or Class F.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.
- E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- F. Enclosure: Drip-proof.
- G. Instrument Transformers: Mounted within generator enclosure.
- H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.
 1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.
- I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
- J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
- K. Sub-transient Reactance: 12 percent, maximum.

2.8. OUTDOOR GENERATOR-SET ENCLOSURE

- A. Description: Vandal-resistant, weatherproof aluminum housing, wind resistant up to 100 mph (160 km/h). Instruments and control shall be mounted within enclosure.
 1. Enclosure shall have a pitched roof to prevent standing water.
 2. Lockable latching, hinged access panels/doors on each side and end of the enclosure shall be provided for ease of inspection, maintenance, repair, etc. Routine inspection points for fluids shall be easily accessible by means of lockable latching, hinged door/panel. Minimum of two (2) doors per side. Lockable latches shall be keyed alike.

3. Lockable latching, hinged access panels/doors shall be secured in the open position with hardware integral to the enclosure.
 4. Access panels shall be removable by one person without tools.
 5. Stainless steel hardware shall be used to provide corrosion protection for all hinges, latches, screws, etc.
 6. External drains standards for fluids requiring routine replacement. External drains shall be capable of accepting NPT plug or other means to prevent accidental leaks or spills. Valves internal to the enclosure shall provide means of flow controls.
 7. Enclosure shall achieve a Level 2 sound attenuation.
- B. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components with-in required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
- C. Basic Electrical Package: Pre-wired AC power distribution of all factory-installed features including block heater, two (2) GFCI protected internal 120-volt service receptacles, internal lighting, and commercial grade wall switch.
1. Load center powered by building source power with the following features:
 - a. 208Y/120V, three-phase, four-wire with 80-ampere main circuit breaker.
 - b. Refer to Division 26 Section 262418, "Load Centers", for requirements.
 2. Surge protective device rated 120kA minimum.
 3. AC power distribution installed in accordance with NEC and all wiring within EMT conduit.
 4. DC Light Package: Prewired internal DC light package with four (4) vapor-proof LED fixtures within housing, arranged to illuminate controls and accessible interior. Battery drain limited with fuse protection and controlled through a 0-60 minute spring-wound, no-hold timer.
 5. Convenience Outlets: Factory wired, GFCI.
 6. Battery Charger: Mounting and pre-wiring of DC output and AC input. Battery charger located inside the enclosure and accessible through an access door.
 7. Block Heater: Prewired AC input, 208-240 volt, single phase.

2.9. VIBRATION ISOLATION DEVICES

- A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

2.10. FINISHES

- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.11. SOURCE QUALITY CONTROL

- A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
 - 1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

PART 3. EXECUTION

3.1. EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.
- B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- A. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Install packaged engine generator with elastomeric isolator pads on concrete equipment pad. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 26 Section "Hangers and Supports".
- D. Install packaged engine generator on cast-in-place concrete equipment base. Comply with requirements for equipment bases and foundations specified in Division 03 Section, "Cast-in-Place Concrete."
 - 1. Comply with requirements for seismic control devices.
 - 2. Comply with requirements for vibration isolation devices specified in this section.
- E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.
- F. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions including in the listing or labeling of UL listed products.
- G. Provide feeder circuit for integral load center, from the emergency/standby power supply system for the generator set auxiliaries.

- H. Provide and install emergency system conductors in a raceways system completely separate from other wiring. Control interconnection wiring shall be properly sized and run in a raceway separate from power cables.

3.3. CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.
- C. Connect engine exhaust pipe to engine with flexible connector.
- D. Connect fuel piping to engines with a gate valve and union and flexible connector.
- E. Connect wiring according to Division 26 Section 2605219, "Low-Voltage Electrical Power Conductors and Cables."
- F. Ground equipment according to Division 26 Section 260526, "Grounding and Bonding for Electrical Systems."
- G. Verify that neutral-ground bonds do not exist at any point within engine generators connected to three-pole transfer switches.
- H. Connect generator controller and/or remote annunciator to the fire alarm system as required to indicate the following signals:
 - 1. Generator Running
 - 2. Generator Fault.
 - 3. Generator switch in non-automatic position.
- I. Connect generator controller and/or remote annunciator to the building automation system as required to indicate the following signals:
 - 1. Generator Running
 - 2. Generator Fault.
 - 3. Generator switch in non-automatic position.
 - 4. Coordinate requirements with Division 23 Contractor.
- J. Connect generator engine start monitoring system to modules in transfer switches and to generator and remote annunciators per manufacturer's instructions to indicate faults in start wiring system. Refer to Division 26 Section 263600, "Transfer Switches", for additional information.

3.4. IDENTIFICATION

- A. Identify system components according to Division 26 Section "Identification for Electrical Systems."

3.5. FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- C. Tests and Inspections:
 - 1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to the following:
 - a. "Cold Start" test.
 - b. Single-step full-load pick-up test.
 - c. Four hour full-load test.
 - 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
 - a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
 - b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
 - c. Verify acceptance of charge for each element of the battery after discharge.
 - d. Verify that measurements are within manufacturer's specifications.
 - 4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
 - 5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
 - 6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
 - 7. Exhaust Emissions Test: Comply with applicable government test criteria.
 - 8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
 - 9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
 - 10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-

set installation, including engine exhaust and cooling-air intake and discharge, at four locations on the property line, and compare measured levels with required values.

- D. Coordinate tests with tests for transfer switches and run them concurrently.
- E. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.
- F. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- G. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
- H. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- I. Remove and replace malfunctioning units and reinspect and retest as specified above.
- J. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- K. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- L. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.
 - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
 - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6. DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section, "Demonstration and Training."
 - 1. Train Owner's maintenance personnel on procedures and schedules for starting and

- stopping, troubleshooting, servicing, and maintaining equipment.
 2. Review data in maintenance manuals. Refer to Division 01 Section “Contract Closeout”.
 3. Review data in maintenance manuals. Refer to Division 01 Section “Operation and Maintenance Data”.
 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.
 5. Provide a minimum of four hours of instruction.
- B. Coordinate this training with that for transfer switches specified in Division 26 Section 263600, “Transfer Switches”.

END OF SECTION