



Rombout Fire District
New Station No.2

1548 NYS Route 52
Fishkill, NY
Project Number: 18142

Notice to All Contractors:

The following amplifications, corrections, etc., to plans and specifications are hereby drawn to your notice and shall be incorporated in contract:

Addendum No. 3 (1) PDF File

Date: January 6, 2023

Att: Estimating Department

Sent By: Keith Scofield

Please sign and return that you have received this email:

Received By: _____

Date: _____

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ROMBOUT FIRE DISTRICT - NEW FIRE STATION #2

1548 N.Y.S. Route 52, Fishkill, New York

ADDENDUM NO. 3

January 6, 2023

1. **The Bid has been extended one week to January 18, 2023 @ 2:00 PM**
2. **Bid questions will be accepted up to 5:00 PM January 10, 2023**
3. **Question:** Spec book & bid papers state there is allowances for each trade, please provide that information
Answer: Disregard Section I Allowances in the Form for Bidding. There are no allowances in the bid.
4. **Question:** Please confirm the Signal Contractor is not financially responsible for purchasing the signal cabinet in accordance with NYSDOT Note #3 on Sheet TSN-01.
Answer: Correct. The applicant (RFD) will purchase the controller/cabinet as part of their highway work permit; the contractor needs only to pick it up and install.
5. **Question:** The specification for the generator does not match what is on the drawings. Drawings call for a 80kw natural gas and the specs mention 200kw natural gas with LP backup but then also mentions diesel fuel for testing and operation. Can you update the spec?
Answer: Please see the Revised Generator Specification 263213.
6. **Question:** Which contractor is responsible for the housekeeping pads related to the WH-1 water heater & the owner supplied compressor?
Answer: Housekeeping pads are contractor supplied.
7. **Question:** Will the Town/Village of Fishkill waive the building permits or will each contractor be required to pay for the permits associated with their work as per Drawing P600 Plumbing Notes #13?
Answer: Permits / Fees are the responsibility of the Fire District
8. **Question:** Sheet A-600 lists signage on the Mechanical Room, Restrooms, FE and Trusses. Are those the only rooms getting signage?
Answer: Required ADA signage shall be provided and identify all permanent interior rooms, offices, toilets and exit passages including stairs.
9. **Question:** Please provide specification for signage.
Answer: See the attached

10. **Question:** Provide specification for fire cabinets and extinguishers.
Answer: See the attached
11. **Question:** Drawing A-100 Wall type P4 calls for 6" CMU over 10" CMU. Detail shows 6" metal studs over 10" CMU. Please confirm how to construct wall type P4.
Answer: The detail requires a 6" metal stud. See the attached Wall Type 4 detail.
12. **Question:** Upon review of the specifications and drawings, it has been interpreted that the standing seam metal roof panels are to be ATAS per the drawings. However, there is no specification section for the Standing Seam Metal Roof Panels. Can a specification be provided?
Answer: See the attached Metal Roof Specification 074113
13. **Question:** Please confirm where full flange welds at moment frames are required. Are welds only required at locations that R3/S502 is indicated on plan?
Answer: See the attached plan detail. The moment connections are indicated with the black dot.
14. **Question:** The generator specs call for a dual fuel, with natural gas and LP-gas backup. Please clarify if this is needed, it is very expensive according to the generator vendors.
Answer: This option is not necessary. There will be no LP gas on site to provide as a backup.
15. **Question:** There are some wall sections that show gutters, is all standing seam roofing to receive gutters? If so, can a specification be provided for the gutters/downspouts identifying the material to be used and thickness. Please also clearly identify areas to receive gutters.
Answer: See the attach roof diagram.
16. **Question:** Can a specification for the EPDM roofing be provided?
Answer: See the attached EPDM Roofing Spec. Section 074113
17. **Question:** Is there a spec/size for oil-water separator
Answer: See Drawings C5 & C9 for information.
18. **Question:** Do you have an alternate product for Zolatone/ Polymix? My painter is telling me they no longer make this product.
Answer: MultiSpec; 1-800-792-9505 or Roxatone Multicolor Fleck Coatings; 1-888-339-1238
19. **Question:** Please provide construction schedule for the project
Answer: Construction to Begin – March 1, 2023; Construction to Complete – March 31, 2024
20. **Question:** Not able to find any division 9 in the specifications regarding "Nora" floor tile, and unable to find the pattern for RF-2 & RF-3 in Rooms 103 & 104, Dayroom & Kitchen. I did find the products specified on drawing A-600.
Answer: attached is specification section#009650 RESILIENT FLOORING that replaces 009650 Section and Stop RF-3 pattern floor tile in Hallway #105 as it runs down toward the Day Room # 103 at the outside corner of the Kitchen #104 wall.

21. **Question:** Spec Section 231123. Will stainless steel mechanical press fittings and schedule 40 pipe meet the engineer's approval for gas piping?
Answer: Gas piping Schedule 40 Black steel, press fittings for gas piping is acceptable.
22. **Question:** Spec Section 232100. Will mechanical press fittings and ACR tubing meet the engineer's approval for refrigerant piping?
Answer: Provide Brazed joints for all refrigerant piping. Type ACR piping will be acceptable for Refrigerant piping.
23. **Question:** Spec Section 232113. Above ground hydronic piping will mechanical press fitting be acceptable for hydronic piping 4" and smaller?
Answer: Press fittings for hydronic piping is acceptable.
24. **Question:** Is the Plymovent system is it being supplied and installed by the owner or just supplied by the owner?
Answer: The Plymovent system is Supplied and Installed by the Fire Districts Vendor. The Electrical Contractor shall provide an Electrical connection to the Exhaust Fan in the Attic. The Electrical connection for the Exhaust Fan is shown near the Electrical room. It should be noted that the Exhaust Fan is located in the Attic Space close to the middle of the Apparatus Bay.
25. **Question:** Interior Elevation of the Storage #116- indicated on A100 that it should be on sheet A400- but didn't see.
Answer: Storage #116 had a previous use and was omitted. It no longer has a need for elevations.
26. **Question:** The South wall of the Radio Room #101 is indicated as partition type 'P1, yet appears to be metal framed- please advise.
Answer: The partition type has been updated. See the attached sketch.
27. **Question:** On the exterior façade- do you want us to include the insulation board and hardiplank?
Answer: Provide Continuous insulation - FOAMULAR® 604 RIBBED 1.5" R-7.5 RIGID INSULATION and HardiePlank
28. **Question:** Is the HardiPlank siding- is it smooth? **Answer:** The HardiPlank is smooth.
29. **Question:** What about the insulation board that is behind the stone façade?
Answer: The entire building shall receive continuous insulation - FOAMULAR® 604 RIBBED 1.5" R-7.5 RIGID INSULATION
30. **Question:** How about the trim boards on the soffits? Include?
Answer: See Drawing A104, A302, A303
31. **Question:** As for roofing- figuring stopping at the 5/8" FR sheathing.
Answer: See Drawing A104, A302, A303

32. **Question:** Is the 5/8" type 'X' gwb to be attached to furring channels, attached to the underside of the roof trusses in the apparatus bay and mezzanine?
Answer: Provide 7/8" furring channels @ 16" o.c. perpendicular to the bottom of roof trusses in the Apparatus Bay and the Mezzanine
33. **Question:** Door 36 – for the Radio Room looks to be a hollow metal frame, with D2 solid core wood door with w/light but is listed as F3 which is an aluminum frame. Please advise if glass is required in the sidelites and if they go down to the floor or are just 3 or 4' with wall beneath. Also, 1/4" clear tempered? Please advise.
Answer: The door frame with lights shall be hollow metal and listed as frame F5. The glass for the lights shall be 1/4" clear tempered. See attached detail.
34. **Question:** Specification 233113-4 2.04 C-9 talks of securing liner with perf metal which would make all lined duct double wall, is this your intent?
35. **Response:** There is no perforated sheet metal inner duct on the project.
36. **Question:** Specification 233300-4 2.06 B. talks of standard t.v.'s but b-1 talks of acoustical t.v.'s. Which is the intent?
37. **Response:** Standard T.V.'s.
38. **Question:** The specifications make mention of duct liner, but none is shown on the plans. Is there duct liner needed on this project, if so, please advise of its locations.
39. **Response:** A. Yes, Detail #11 on Drawing (M501) calls for first (10'-0") on supply and return ducts. B. All plenum boxes shall have a duct liner.
40. **Question:** Please Confirm reinforcing at Mezzanine – See Drawing S201.
What is the length of the #4 @ 12"OC Top Hooked Bars at all formed slab edges?
#3 @ 12" OC continuous temp. reinforcing – do they run along the #4 bars or perpendicular?
Through the entire metal deck or partial?
Answer: See attached detail.

SECTION 015000 – TEMPORARY FACILITIES AND CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Section 010000 General Conditions for limitations on utility interruptions and other Work restrictions.
 - 2. Section 010000 General Conditions for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 3. Section 011000 Summary of Work for division of responsibilities for temporary facilities and controls.
 - 4. Divisions 2 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES

- A. General Note: Cost or use charges for Temporary Facilities shall be included in the Contract Sum.
 - 1. **General Contractor** shall be responsible for snow plowing of site.
 - 2. **General Contractor** shall be responsible for temporary toilets (minimum of 2).
 - 3. **Electrical Contractor** shall be responsible for temporary power and lighting.
 - 4. **HVAC Contractor** shall be responsible for temporary heat.
 - 5. **Plumbing Contractor** shall be responsible for temporary potable water.
 - 6. **Each Contractor** shall be responsible for their trash, dumpsters, etc.
- B. Contractors shall allow other entities to use Temporary Services and Facilities without cost, including, but not limited to, Owner's construction forces or other contractors, Architect/Engineer, occupants of Project, testing agencies, and authorities having jurisdiction.

1.4 SUBMITTALS

- A. Site Plan: Show Temporary Facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Contractor shall arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Each Contractor shall provide prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: GC Contractor shall provide a field office(s) of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project Site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of Twelve (12) individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack board.
 - 3. Drinking water and private toilet for use by Contractor, Subcontractors, Suppliers and all other visitors to office.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
- C. Storage and Fabrication Sheds: Each Contractor shall provide, on-Site, sheds, trailers or storage units sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building
- D. The General Contractor shall provide the necessary enclosed sanitary conveniences for the use of all workers of Contractor, Subcontractors and Suppliers, and inspection personnel. They shall be of a type approved by the Owner and the New York State

Department of Labor and shall be maintained by Contractor and kept in a clean and satisfactory manner. Facilities such as "Sani-John" or similar prefabricated units will be approved as long as they are kept in a clean condition. Each unit shall include a toilet and a urinal. These structures shall be sufficient in number for the size of the job, and their use will be required. Contractor shall notify all that no nuisances will be permitted in this regard, and any complaints shall call for stricter enforcement of these provisions.

2.2 EQUIPMENT

- A. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, Contractor shall provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Permanent HVAC System: Only if Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 11 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Contractor shall locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit Site disturbance as specified in Section 011000 Summary of Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Each Contractor as listed above, shall install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: GC Contractor shall provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Heating and Cooling: HVAC Contractor shall provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity.

Select equipment that will not have a harmful effect on completed installations or elements being installed.

- D. Electric Power Service: Electrical Contractor shall provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service underground, unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner with previous written approval.
- E. Lighting: Electrical Contractor shall provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Each Contractor shall enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Each Contractor shall maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Each Contractor shall not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Each Contractor shall remove each Temporary Facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Each Contractor shall complete or, if necessary, restore permanent construction that may have been delayed because of interference with Temporary Facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute Temporary Facilities are property of each Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with Final Cleaning requirements specified in Section 017700 Closeout Procedures.

END OF SECTION 015000

SECTION 04 22 23

ARCHITECTURAL CONCRETE MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Architectural concrete masonry exterior wall veneer facing.
- B. Architectural concrete masonry exterior single wythe walls.

1.2 RELATED SECTIONS

- A. Section 04 05 13.23 - Surface Bonding Masonry Mortaring
- B. Section 04 05 16.26 - Engineered Masonry Grouting.
- C. Section 04 05 19.29 - Stone Anchors.
- D. Section 04 05 19.19 - Masonry Cavity Drainage, Weepholes, and Vents*.
- E. Section 05 20 00 - Metal Joists.
- F. Section 05 50 00 - Metal Fabrications.
- G. Section 07 62 00 - Sheet Metal Flashing and Trim.
- H. Section 07 65 26 - Self-Adhering Sheet Flashing.
- I. Section 07 90 00 - Joint Protection.

1.3 REFERENCES

- A. ASTM C 33 - Standard Specification for Concrete Aggregates.
- B. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- C. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units.
- D. ASTM C 91 - Standard Specification for Masonry Cement.
- E. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
- F. ASTM C 140 - Standard Specification for sampling and testing Concrete Masonry Units.
- G. ASTM C 150 - Standard Specification for Portland Cement.
- H. ASTM C 331 - Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
- I. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- J. ASTM C 1019 - Standard Test Method for Sampling and Testing Grout.

- K. ASTM C 1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength.
- L. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
- M. ASTM C 1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
- N. ASTM C 1506 - Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters.
- O. ASTM D 2000 - Standard Classification System for Rubber Products in Automotive Applications.
- P. ASTM D 2287 - Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
- Q. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
- R. ASTM E 514 - Standard Test Method for Water Penetration and Leakage Through Masonry.
- S. TMS 402-13 / ACI 530-13 / ASCE 5-13 - Building Code Requirements for Masonry Structures.
- T. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Specification for Masonry Structures.
- U. NCMA TEK Bulletin 3-1C - All Weather Concrete Masonry Construction.
- V. NCMA TEK Bulletin 3-2A - Grouting for Concrete Masonry Walls.
- W. NCMA TEK Bulletin 3-3A - Reinforced Concrete Masonry Construction.
- X. NCMA TEK Bulletin 8-2A - Removal of Stains from Concrete Masonry Walls."
- Y. NCMA TEK Bulletin 10-1A - Crack Control in Concrete Masonry Walls.
- Z. NCMA TEK Bulletin 10-2B - Control Joints for Concrete Masonry Walls.
- AA. NCMA TEK Bulletin 14-4A - Strength Design of Concrete Masonry.
- BB. NCMA TEK Bulletin 19-4A - Flashing Strategies for Concrete Masonry Walls.
- CC. NCMA TEK Bulletin 19-5A - Flashing Details for Concrete Masonry Walls.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Concrete Unit Masonry Construction: Comply with the following:
 - 1. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Building Code Requirements for Masonry Structures.
 - 2. TMS 602-13 / ACI 530.1- 13 / ASCE 6-13 - Specification for Masonry Structures.
 - 3. National Concrete Masonry Association (NCMA) TEK Bulletins.
- B. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in TMS 402/ ACI 530.1/ASCE 5 and TMS 602/ ACI 530.1/ ASCE 6
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms

according to ASTM C 1314.

- C. Pre-installed two piece, interlocking, Concrete Masonry Unit Insulation.
 - 1. Description: Concrete Block Insulation Systems, Inc. expanded polystyrene Insulation Inserts made from flame-retardant treated expandable polystyrene, such as KORFIL Hi-R Insulation which are pre-installed in CMU's prior to delivery to jobsite.
 - 2. Physical Properties of EPS:
 - a. Typical Density (lbs/cu.ft.) Min.: 1.05-1.50
 - b. Thermal Resistance (R) per inch: 5.00
 - c. Water Vapor Permeance: 1.10
 - d. Water Absorption% volume: <1.00
 - e. Flame Spread Rating: <5.00
 - 3. Additional Properties of EPS Inserts:
 - a. Rot and Vermin resistance: Produced from expanded polystyrene – full resistant to rot; does not attract vermin, termites or rodents.
 - b. Components: Insulation shall contain no fluorocarbons and no formaldehyde.
 - c. Shape: Two-piece, interlocking insert shall overlap at both head & bed joints with edges of adjacent inserts of the same type. Keyway shall be provided for butt welded cross-rods of 16" o.c. ladder type horizontal wall reinforcement.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for compressive strength.
 - 2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
 - 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 - 5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
 - 6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods including written plan for cold and hot weather construction and masonry cleaning procedures.
- C. Selection Samples: Submit three full size units of each type/color of exposed architectural concrete masonry unit for review of color and texture to verify compliance with products specified. Provide the maximum color and texture variation range expected in the finished work. Production orders may be released after submittals are approved.
- D. Manufacturer's Certificates and Test Reports: Certify products meet or exceed specified requirements. Test reports should be within 12 months of bid date.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109 for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in TMS 602/ACI 530.1/ASCE 6.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum ten years documented experience and a current member in good standing of the National Concrete Masonry Association.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience with projects of similar scope and complexity.
- C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of masonry work while it is in progress.
- D. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- E. Source Limitations: Provide each type of masonry unit from a single manufacturing source to ensure uniform texture and color for continuous and visually related items.
- F. Mock-Up: Prior to starting masonry work build sample wall panel(s) for Architect's inspection and acceptance. Build panel(s) on a firm foundation, in location acceptable to the Architect. Panel(s) shall be L-shaped, with long side a minimum of 5 foot 4 inches long by 4 foot 0 inches high and with one corner return at least 2 foot 0 inches long. Construct sample panel(s) full thickness, installing wall reinforcement, anchors, ties and other required accessories. Provide special features as directed for control joints, weeps, etc. Panel(s) shall show color range and texture of masonry units, bond, mortar joints and workmanship to be expected for the project.
 1. Build sample panels for:
 - a. Each type of exposed unit masonry construction.
 - b. Typical exterior wall.
 - c. Typical interior wall.
 - d. Typical exterior and interior walls.
 2. Clean one-half of each sample panel using approved masonry cleaning materials and methods to represent final cleaning. Remaining one-half to remain without final cleaning for comparison purposes.
 3. Retain sample panels during construction as a standard for judging completed masonry work. Do not alter, move, or destroy sample panels until work is completed or removal is authorized.

1.8 PRE-INSTALLATION CONFERENCE

- A. Convene an architectural masonry conference approximately two weeks before scheduled commencement of masonry construction and associated work.
- B. Require attendance of installers of components that are to be built-into or otherwise

concerned with masonry performance, and installers of other work in and around the masonry which must precede or follow the work and including the Architect, Owner, window, door and roofing representatives and the architectural masonry manufacturer's representative.

C. Objectives include:

1. Review foreseeable methods and procedures related to masonry work, including set up and mobilization areas for stored material and work area.
2. Tour representative areas to receive masonry, inspect and discuss condition of substrate, penetrations and other preparatory work.
3. Review work of other trades and make provisions to permit installation of their work in a manner to avoid cutting and patching.
4. Review masonry requirements, Drawings, Specifications and other Contract Documents, including these topics:
 - a. Review and critique the completed Sample panel(s) under diffused light.
 - b. Demonstrate cleaning procedures on the sample panel.
 - c. Set schedule for pre-cleaning meeting and cleaning after installation.
 - d. Location of Movement (Control) Joints.
 - e. Use of compatible water repellent admixtures for mortar.
 - f. Availability of clean and potable water for project.
 - g. Installation of flashing details.
 - h. Open issues and concerns.
 - i. Cold/Hot weather procedures.
 - j. Protecting masonry during constructing, including covering walls.
 - k. Post-applied breathable sealant.
5. Review and finalize schedule related to masonry and related work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
6. Review required inspection, testing, certifying procedures.
7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver architectural concrete masonry units to the job site on wood pallets with manufacturer's recommended unit protective covers.
- B. Inspect architectural concrete masonry units upon delivery to ensure color match with required materials and accepted samples.
- C. Stack masonry units in a dry place off the ground on pallets or a prepared plank platform. Method of stacking is acceptable. Protect with non-staining waterproof tarpaulin coverings arranged to allow air circulation around and above masonry units.
- D. Exercise care in the storage, handling and installation of masonry units. Do not build soiled or damaged masonry units into the work.

1.10 SEQUENCING

- A. Ensure that locating templates and other information required from others for built-in installation of products of this section are furnished in time to prevent interruption of construction progress.

1.11 PROJECT CONDITIONS

- A. Follow hot weather and cold weather requirements in the masonry code and specifications, TMS 402 and TMS 602.
- B. Cold Weather Procedures:
 - 1. Preparation:
 - a. If ice or snow has formed on the masonry bed, remove it by carefully applying heat not to exceed 120 degrees F until the surface is dry to the touch.
 - b. Remove any brick units or mortar that is frozen or damaged.
 - c. When the clay masonry unit suction exceeds 30 grams per minute per 30 square inches, sprinkle with heated water as follows:
 - 1) When units are 32 degrees F or above, heat water to 70 degrees F or above.
 - 2) When units are below 32 degrees F, heat water to 130 degrees F or above.
 - 2. Work in Progress:
 - a. Air temperature 40 degrees F to 32 degrees F:
 - 1) Heat sand or mixing water to produce mortar temperatures that match air temperature.
 - b. Air temperature 32 degrees F to 25 degrees F:
 - 1) Heat sand and mixing water to produce mortar temperatures between 40 degrees F and 120 degrees F.
 - 2) Maintain temperature of mortar on boards above freezing.
 - 3) Installation in colder air temperatures will require heat sources on the wall and the use of windbreaks or tents to create a controlled environment suitable for proper bonding and curing.
 - 3. Completed Work and Work Not in Progress:
 - a. Mean daily air temperature of 40 degrees F to 32 degrees F: Protect masonry from rain and snow for 24 hours by covering with a weather-resistive membrane.
 - b. Mean daily air temperature of 32 degrees F to 25 degrees F: Cover masonry with a weather-resistive membrane for 24 hours.
 - c. Mean daily air temperature of 25 degrees F to 20 degrees F: Cover masonry with insulating blankets for 24 hours.
- C. Hot Weather Procedures:
 - 1. When ambient temperature exceeds 90 degrees F and wind exceeds 8 miles per hour:
 - a. Maintain temperature of mortar and grout between 70 degrees F and 120 degrees F.
 - b. Limit the spread of the mortar bed to 4 feet and place units within 1 minute of spreading mortar.
 - c. Control moisture evaporation in partially or newly completed walls by fog spraying with potable water, covering with opaque plastic or canvas or both.
 - 2. Protection of Work in Progress:
 - a. Covering:
 - 1) Cover tops of walls with a strong waterproof membrane at the end of each day or work shutdown. Extend the waterproof membrane cover a minimum of 24 inches down the side of each wall.
 - 2) Hold cover securely in place.
 - b. Load Application:
 - 1) Do not apply uniform floor or roof loading for at least 12 hours after completing columns and walls.
 - 2) Do not apply concentrated loads for at least 3 days after completing columns and walls.
 - c. Staining:
 - 1) Prevent grout and mortar from staining the face of masonry.
 - 2) Remove grout and mortar that comes in contact with masonry units

- immediately.
 - 3) Protect sills, ledges and projections from mortar droppings.
 - 4) Protect base of wall from rain-splashed mud and mortar splatter.
 - 5) Turn scaffold boards on edge when work is not in progress to lessen splattering.
- D. Coordination: Coordinate Work to ensure top of wall is covered and remains covered until properly block openings are protected with coping or finishing system indicated on the Drawings

PART 2 PRODUCTS

2.1 MANUFACTURERS

Acceptable Manufacturer: CBIS/Korfil, P.O. Box 1000, 29 Freight House Road, West Brookfield, MA 01585-1000; Contact: Jerry Puccio, The Montfort Bros., 44 Elm Street Fishkill, NY 12524. Tel: 845-896-6225; Cell: 914-474-4957; Email: jerry@montfortsales.com

- A. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

- A. Aggregate:
 - 1. ASTM C 33 normal weight aggregate.
 - 2. ASTM C 331 lightweight aggregate.
- B. Cement: ASTM C 150, Type required. Color, White/Grey as required for use with the color specified.
- C. Water Repellent Admixture: Integral polymeric water repellent admixture for concrete masonry units used in masonry exposed to the exterior.
 - 1. Performance requirements:
 - a. Water resistance: ASTM E 514
- D. Color Pigments: Lightfast, alkali-resistant, weather-resistant natural or synthetic iron oxides manufactured specifically for use in concrete masonry units.

2.3 ARCHITECTURAL CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Units: Provide unit type and size(s) indicated on the drawings
 - 1. Masonry units meeting all ASTM C 90 testing requirements and containing integral mixed color **[select applicable products]:**
 - a. Spec-Thermal Hi-R insulated Masonry Units.
 - b. Spec-Surface smooth and dense masonry units for painting.
 - 2. Unit Weight:
 - a. Normal weight units.
 - b. Lightweight units.
 - 3. Linear shrinkage: Not to exceed 0.065 percent, ASTM C 90.
 - 4. Unit Compressive Strength: Minimum net area compressive strength of 2,000 psi.
 - 5. Integral Water Repellent Concrete Masonry Units: Provide all exterior wall architectural concrete masonry units, including single wythe walls and facing units, containing the manufacturer's recommended type and amount of an integral polymeric water repellent admixture.
 - 6. Color: [choose one of:]
 - a. As selected by Architect from manufacturer's standard colors
 - b. Custom color matching Architect's sample color.
- B. Pre-installed two-piece, interlocking Concrete Masonry Unit Insulating Inserts:

1. Product: Korfil Hi-R inserts manufactured by Concrete Block Insulating Systems and distributed by members of the Concrete Products Group:
 - a. Korfil Hi-R insert (for 8" nominal height two web units)
- C. Special shapes:
 1. Provide closures, jamb units, headers, lintels, bond beams and other special shapes as indicated.
 2. Provide standard manufactured sizes or cut full size units for fractional course height and lengths.

2.4 MASONRY ACCESSORIES

- A. Mortar and grout: Comply with Sections 04060 and 04070. Provide water repellent admixture for exterior wall mortar and grout.
 1. Water Repellent Mortar Admixture: Exterior wall mortar admixture shall be compatible to the admixture used to produce the masonry units. Coordinate the selection with the masonry unit manufacturer.
 2. Comply with manufacturer's instructions for mixing and mortar preparation.
 3. When using bulk pre-blended mortar (silos, bulk bags, etc.) with dry admixture, the admixture in the pre-blended mortar MUST be from the same producer or compatible with that used in the CMU materials.
- B. Masonry Anchorage and Reinforcement: Comply with applicable portions of TMS 602 Article 2.4, and/or Section 04 05 19.29 - Stone Anchors.
- C. Fabricated Steel Lintels: Comply with Section 05 50 00 - Metal Fabrications.
- D. Sheet Metal Flashing and Trim: Comply with Section 07 62 00 - Sheet Metal Flashing and Trim.
- E. Flexible Flashing: Comply with Section 07 65 26 - Self-Adhering Sheet Flashing.
- F. Pan Flashing: BlockFlash, by MortarNet in single wythe walls.
- G. Foamed-in-place insulation materials and installation: Comply with Section 07 21 29 - Spray Foam Insulation.
- H. Control Joints:
 1. Vinyl: ASTM D 2287.
- I. Weeps: Weeps are to be used in conjunction with flashing materials for proper functioning of the masonry wall drainage system. Specified weep material is:
 1. Weep holes, weep tubes, plastic vents or cells in veneer wall systems such as from Hohmann & Barnard, or equivalent.
 2. BlockFlash, by MortarNet in single wythe walls
- J. Masonry Cleaning Materials: Standard-strength proprietary masonry cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new concrete masonry without discoloring or damaging masonry surfaces. Provide cleaning product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units.
- K. Masonry Sealing Materials: Provide cleaning material manufacturer's compatible masonry sealer coating for all single wythe concrete masonry exterior walls. Specified products include: AquaSeal ME12 from Monopole Inc., www.monopoleinc.com/beta/pdf/5200.pdf.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, structure and installation conditions. Do not proceed with architectural concrete masonry work until unsatisfactory conditions have been corrected.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that items to be built in are in proper location, and ready for roughing into masonry work.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean substrate surfaces thoroughly prior to installation.
- B. Establish lines, levels and coursing. Verify anchors and flashings are correctly located and installed.
- C. Furnish temporary bracing as required during installation of masonry work. Maintain in place until building structure provides permanent support.
- D. Do not wet concrete masonry units except as per TMS 402/602
- E. Prepare surfaces using the methods recommended by the manufacturer for achieving the

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths and to properly locate openings, movement type joints, returns and offsets. Whenever possible, avoid the use of less than half-size units at corners, jambs and other locations. Notify Design Professional when split masonry coursing at heads and sills of openings and cut concrete masonry coursing less than 4 inches in height not permitted.
- C. Lay up walls plumb and true to comply with specified tolerances. Provide square corners, except as otherwise indicated, with courses level, accurately spaced and coordinated with other work. Use double lines at multiple wythe walls.
- D. Pattern bond: Lay exposed concrete unit masonry in running bond with vertical joint in each course centered on units in courses above and below. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inches of horizontal face dimensions at corners or jambs. Install special shape units where indicated.
- E. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings, load bearing walls, all courses of piers, columns and pilasters and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. Maintain 3/8 inch nominal joint widths, except as necessary at first course bed joints, and except for minor variations required to maintain bond alignment
- F. Lay solid concrete masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints
- G. Compress and cut joints flush for masonry walls that are below grade, concealed or covered by other materials.
- H. Tool joints in all exposed masonry work to a concave joint when thumb print hard, unless

plans indicate otherwise.

- I. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- J. Step back unfinished work adjoining new work. Rack back 1/2 unit length in each course; do not tooth. Clean exposed surfaces of set masonry and remove loose masonry units and mortar before laying fresh masonry.
- K. Provide interlocking masonry bond in each course at corners and intersecting walls, unless otherwise indicated on plans such as for stack bond.
- L. Load-bearing walls: If carried up separately, provide rigid steel anchors spaced not more than 2 feet on center vertically. Embed ends in mortar filled cores. Build full height of story to underside of structure. Grout juncture with structure solid with grout.
- M. Non load-bearing walls: Build full height of story to underside of structure, except as otherwise shown. Terminate full height non load-bearing walls one joint thickness below the structure to allow for deflection of the structural element without loading the wall. Provide an open joint for application of joint sealant.
- N. [If Applicable:] Pre-installed two-piece, interlocking Concrete Masonry Unit Insulating Inserts:
 - 1. General: Inserts shall be pre-installed by CMU manufacturer prior to delivery to jobsite.
 - 2. Unless otherwise indicated on Construction Documents, inserts shall be left in place when grouting.
- O. As the work progresses, build in items specified under this and other Sections of the specifications. Fill in solidly with masonry around built-in items.
 - 1. Bed hollow metal frame anchors in mortar. Align anchors with joint coursing. Draw anchors tight and fill space between hollow metal frames and masonry solid with fine mortar grout.
 - 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath or other approved material, in the joint below and rod grout into core.
 - 3. Provide solid masonry bearing for all lintels, beams, joists, plates and load-bearing members.
 - a. Provide solid masonry units or hollow units filled solid.
 - b. Minimum one block course under steel angle lintels and steel joists not bearing on bond beams.
 - c. Minimum two block courses under steel beams and steel beam lintels. Where beams and lintels are parallel with wall, extend solid bearing to walls, extend solid bearing 16 inches each side of centerline of beam.
 - 4. Take particular care to embed all conduits and pipes within concrete masonry without fracturing exposed shells and to fit units around switch, receptacle and other boxes set in walls. Where electric conduit, outlets, switch boxes and similar items occur, grind and cut units before building in services.
 - 5. Install anchors and reglets for flashing and related work built into masonry work.
 - 6. Install reinforcing steel and grout where indicated. Comply with Drawing details for reinforcing [steel size and spacing.
- P. Cavity walls:
 - 1. General: Maintain cavity clean of mortar droppings during construction. Strike joints facing cavity flush.
 - 2. Masonry walls: Tie exterior masonry veneer wythe to masonry back-up with adjustable metal ties secured to joint reinforcement built into masonry back-up walls

- or with individual metal ties secured to concrete masonry back-up.
 - 3. Concrete walls: Tie exterior masonry veneer wythe to concrete back-up with individual metal ties secured to dovetail anchor slots cast in concrete back-up.
 - 4. Space ties 16 inches on centers vertically and horizontally.
 - 5. Install cavity wall insulation as work progresses. Bond with adhesive to exterior face of interior walls. Seal vertical and horizontal joints with adhesive.
- Q. Veneer walls:
- 1. Masonry walls: Tie exterior masonry veneer wythe to masonry back-up with individual metal ties built into masonry back-up walls.
 - 2. Concrete walls: Tie exterior masonry veneer wythe to concrete back-up with individual metal ties secured to dovetail anchor slots cast in concrete back-up.
 - 3. Wood framed walls: Tie exterior masonry veneer wythe to back-up with individual metal ties nailed to wood stud wall framing.
 - 4. Metal framed walls: Tie exterior masonry veneer wythe to back-up with individual metal ties screwed to metal wall framing.
 - 5. Space ties 16 inches on center vertically and horizontally.
 - 6. Place horizontal joint reinforcing in the masonry veneer as follows:
 - a. For nominal 4" high concrete masonry veneer units, place the horizontal joint reinforcement at no greater than 12" vertical spacing.
 - b. For nominal 8" high concrete masonry veneer units, place the horizontal joint
- R. Single Wythe walls::
- 1. Lay masonry units with full head and bead joints.
 - 2. Tool both interior and exterior mortar joints
 - 3. Install all units with "Water Control Technology" (WCT) in proper, "up" position.
- S. Horizontal joint reinforcing: Joint reinforcing is specified in Section 04 05 19.29 - Stone Anchors. Install continuous joint reinforcing at all single wythe and back-up concrete masonry walls as follows:
- 1. In every second block course, 16 inches on center vertically, full height of wall and every block course where shown on the Drawings.
 - 2. In the first two bed joints immediately above and below all openings so that it extends a minimum of 24 inches beyond opening each way.
 - 3. In the bed joints of the first and second courses below the bearing line in bearing walls when wall receives uniformly distributed floor or roof loads in bed joints 16 inches below bond beams.
 - 4. In parapet walls 8 inches on center vertically, beginning at a point not less than 12 inches below the ceiling line of the heated space below the roof slab.
 - 5. Lap reinforcement a minimum of 6 inches and full width at corners and intersections or use special fabricated sections.
 - 6. Cut or interrupt joint reinforcement at vertical movement control or expansion joints, unless otherwise indicated.
 - 7. Prefabricated metal joint reinforcement shall not be used as wall ties in multiple wythe walls, except for composite wall construction and two adjacent tiers of concrete block.
 - 8. Fully embed side rods in mortar
- T. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
- 1. Provide an open space not less than 1/2 inch width between masonry and structural member. Keep open space free of mortar or other rigid materials.
 - 2. Anchor masonry to structural members with metal ties embedded in masonry joints and attached to the structure. Provide anchors with adjustable tie sections. Space anchors not more than 24 inches on center vertically and 36 inches on center horizontally.
 - 3. Anchor veneers to concrete structural members with dovetail anchors.

- U. Control Joints: Provide control joints for exterior masonry construction.
 - 1. Provide sash blocks with premolded shear key. Rake out mortar, if any, and form continuous vertical joints in masonry construction to receive joint sealant at the locations listed below.
 - 2. Locate control joints as indicated on the Drawings.
- V. Bond Beams: Install bond beams where indicated. Comply with Drawings for reinforcing steel size and spacing. Fill bond beam masonry units solid with concrete fill or coarse mortar grout. Use smooth dowels to allow for horizontal movement at control joints unless otherwise indicated on the Drawings.
- W. Lintels:
 - 1. Install loose steel lintels furnished under Section 05 50 00 - Metal Fabrications Metal Fabrications where shown. Set lintels in full bed of mortar.
 - 2. Provide minimum bearing at each jamb of 4 inches for openings for less than 6 feet and 8 inches for wider openings
- X. Flashing and weeps: Install flashing as specified in Section 07 62 00 - Sheet Metal Flashing and Trim or Section - .
 - 1. Install concealed through wall masonry flashing at all cavity and veneer wall sills, masonry openings in exterior walls with masonry above head, over all horizontal steel members built into masonry and elsewhere as indicated. Comply with SMACNA "Architectural Sheet Metal Manual" Chapter 4 Flashing recommendations and with NCMA TEK Bulletins 19-4A and 19-5A details to ensure water resistant masonry construction.
 - 2. Install weeps in head joints of final course of exterior masonry wythe above flashing. Space weeps maximum of 24 inches on center horizontally with exterior ends and located to avoid door openings. Install weeps at head joints with outside face of weep material held 1/8 inch from the finish face of masonry unit.
 - 3. Install cavity fill on top of base flashing. Install a bed of mortar, conforming to the curve of the flashing, placed under the metal flashing.
 - 4. Install vents in head joints of final top course exterior masonry veneer wythe. Install at head joints with outside face of vent material held 1/8 inch from the finish face of masonry unit. Space vents 24 inches on center horizontally.
 - 5. Install compressible joint material at lintels and horizontal steel members. Build in joint fillers and seal with joint sealant specified in Section 07 90 00 - Joint Protection.

3.4 REINFORCED CONCRETE MASONRY

- A. Fill scheduled wall and column masonry work. Fill all cores solid with concrete fill/coarse masonry grout as specified in Section 04 05 16.26 - Engineered Masonry Grouting.
 - 1. Grouting: Comply with TMS 602 grout placement requirements. Consolidate grout at time of placement.
 - a. Low-Lift Grouting: Place concrete fill/coarse masonry grout in maximum 5 foot vertical lifts.
 - b. High-Lift Grouting (If Approved): Place concrete fill/coarse masonry grout in maximum 12 foot vertical lifts (Recommend the use of super plasticizer with hi-lift grout).
 - 2. Recess top of grout fill minimum 1-1/2 inches below top of course to form a key with following lift.
 - 3. Where vertical reinforcing is required, install reinforcing before filling operation. Wet sticking of reinforcing is not permitted. Comply with Drawing details for reinforcing steel size and spacing.
- B. Install bond beams where indicated. Install reinforcing before filling operation. Fill units solid with grout. Comply with drawing details for reinforcing steel size and spacing.

3.5 REPAIR AND POINTING

- A. Clean and point exposed architectural concrete masonry at end of each working day. Remove and re- place masonry units that are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.
- B. During the tooling of joints, enlarge any voids or holes, except weeps and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance. Remove line pins and fill all line pin holes.
- C. Wipe off excess mortar as the work progresses. Dry brush with bristle brushes exposed masonry at the end of each day's work. Remove mortar spatters and joint ridges.

3.6 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after, inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.7 CLEANING

- A. Cut out defective mortar joints and holes in exposed masonry and re-point with mortar of matching color and texture. Commence cleaning of the masonry walls as soon as the mortar is thoroughly set and cured. After mortar has cured for a period of 7 days (and no later than 14 days after completion of installation), the cleaning process can begin.
- B. Demonstrate the cleaning procedure on the sample panel at the job site prior to commencing cleaning on the building. When the sample panel is cleaned to the approval of the Architect, and the walls are complete, clean the building with the approved cleaning method.
- C. Protect adjacent and surrounding surfaces not intended to be cleaned from exposure to the cleaning chemical to prevent damage.

- D. Prevent cleaning chemical from coming into contact with people, motor vehicles, landscaping and other building materials that could be harmed by such contact. Follow Masonry cleaner Manufacturers' recommendations for personal protection.
- E. Clean the exposed masonry surfaces of stains, efflorescence, mortar, grout dropping and debris using methods that do not damage the masonry. Do not use high pressure cleaning or aggressive scrubbing after cleaner application.
- F. The results of the cleaning process shall be inspected by the project Architect or authorized owner representative for acceptance after the walls have dried. For cleaning results to be accepted, the walls must comply with the standard set for the cleaning results on the sample panel, and the walls shall be free from mortar or efflorescence stains, and the color and texture of the finished walls shall not show damage, discoloration or staining from the cleaning process. If such damage or stains are present, then the walls must be cleaned and color corrected, as needed, to remove any such stains, discoloration or damage prior to the application of Coatings
- G. After cleaning allow units to dry and when specified apply a sealer as provided in Section 3.8.

3.8 COATING:

- A. After the results of the cleaning process have been fully accepted by the Architect, apply a colorless, non-staining, non-yellowing, breathable, penetrating water repellent. It shall be applied to the exterior exposed surface of the concrete masonry walls. Water-repellents must be capable of performing over hairline cracks and small voids less than 1/16". "Film Forming" Acrylic sealers will not be allowed. The water-repellent must not alter the color or texture of the wall after the material has fully cured. Follow manufacturer's application recommendations. Acceptable products include: AquaSeal ME12 from Monopole Inc., <http://www.monopoleinc.com/beta/pdf/5200.pdf>

3.9 PROTECTION

- A. Protect installed products until completion of project.
 - 1. Protect top of wall until covered or capped to a waterproof condition by subsequent construction.
 - 2. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry
 - 3. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 4. Protect sills, ledges, and projection from mortar splatter and dropping.
 - 5. Protect surfaces of windows and door frames; as well as similar products with painted and integral finishes from mortar splatter and dropping
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 074113

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes
 - 1. Factory formed metal roof panels: Standing-seam, hidden fastener, non-insulated
 - 2. Finish must conform to the "Metal Construction Association Certified Premium Painted™" Standard.

1.3 RELATED SECTIONS

- A. Division 5 Section "Cold Formed Metal Framing"
- B. Division 6 Section "Rough Carpentry"

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide metal roof panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.
- B. Wind-Uplift Resistance: Capable of resisting design negative uplift pressures based upon maximum wind speeds of 130 mph. Provide clips, fasteners, and clip spacing of type indicated and with capability to sustain, without failure, a load equal to 2 times the design negative uplift pressure.
- C. Wind-Uplift Resistance: Capable of producing sheet metal roofing assemblies that comply with UL 580 for Class 90 wind-uplift resistance. Other performance test shall include ASTM E1592 Static Air Pressure Test for Roof Coverings.

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roof panel and accessory, including each type of underlayment product indicated:
 - 1. Concealed fastener, standing seam metal roof panels and accessories.

2. Underlayment.
- B. Shop Drawings: Show layouts of sheet metal roofing, including plans, elevations, and keyed references to termination points. All fastening patterns shall be clearly designated to meet the specified wind speed requirements.
 1. Include details for forming, joining, and securing sheet metal roofing, including pattern of seams, termination points, expansion joints, roof penetrations, edge conditions, special conditions, connections to adjoining work, and accessory items.
- C. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
 1. Roof panels and attachments.
 2. Purlins and rafters.
 3. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
- D. Samples: For each exposed finish.
- E. Field quality control inspection reports, to be submitted for warranty program level, if applicable.
- F. Product test reports. Based on evaluation of comprehensive tests performed by a qualified testing agency, for the following:
 1. Metal Roof Panels: Include reports for UL 790/ASTM E 108, UL 580, ASTM E 283, ASTM E 331, Field Tested, ASTM E 1592, UL 2218, ASTM E 84 Flame Spread Rating, Paint Performance Tests.
 2. Insulation and Vapor Retarders: Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of sheet metal roofing for a minimum of 10 years.
- B. Roll-Formed Sheet Metal Roofing Fabricator Qualifications: Minimum of 10 years factory forming experience.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type of metal roof panels through one source from a single manufacturer.
- E. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" and NRCA Waterproofing Manual and manufacturer's installation guidelines.
- F. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance that comply with ASTM E 108 in accordance with UL790.

- G. Pre-installation Conference: Conduct conference at project location with building owner, architect, installing contractor, general contractor and sheet metal roofing manufacturer a minimum of 10 days prior to start of work. All details shall be reviewed including; underlayments, substrates, fastening patterns, scheduling, trim and flashing components, accessories such as fasteners and sealants.
- H. Construction Inspection: Manufacturer shall conduct on site inspection and formal written report to architect and owner at the following intervals: 50 percent sheet metal roofing installation completion, and final inspection upon completion of roof system. Related to warranty - platinum plus level.

1.7 DELIVERY, STORAGE & HANDLING

- A. Do not deliver materials of this section to project site until suitable facilities for storage and protection are available.
- B. Protect materials from damage during transit and at project site. Store under cover, but sloped to provide positive drainage. Do not expose materials with strippable protective film to direct sunlight or extreme heat.
- C. Do not allow storage of other materials or allow staging of other work on installed metal panel system.
- D. Upon receipt of delivery of metal panel system, and prior to signing the delivery ticket, the installer is to examine each shipment for damage and for completion of the consignment.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify locations of roof framing and roof opening dimensions by field measurements before metal roof panel fabrication and indicate measurements on Shop Drawings.

1.9 SCHEDULING

- A. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in Division 7 Section "Roof Accessories."
- B. Coordinate metal panel roof assemblies with rain drainage work, flashing, trim, and construction of decks, purlins and rafters, parapets, walls, and other adjoining work to provide a leakproof, secure, and non-corrosive installation.

1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish Warranty Period: 30 years from date of Substantial Completion.
 - B. Special Installer's Warranty: Specified form in which Roofing Installer agrees to repair or replace components of custom-fabricated sheet metal roofing that fail in materials or workmanship within 5 years from date of Substantial Completion.
 - C. Special Weathertight Warranty: Manufacturer's Platinum Plus warranty in which manufacturer agrees to repair or replace roof panel assemblies that fail to remain weathertight within the specified warranty period.
1. Product Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer's Qualifications:
All panels are to be factory formed and packaged per job requirements.
- B. Manufacturer shall have a minimum of ten (10) years' experience in the factory fabrication of metal wall panels.
- C. Specification is based upon the products of ATAS International, Inc. No other manufacturer shall be accepted as an alternate product without prior written approval. These substitution requests must meet specifications and must be submitted a minimum of ten (10) days prior to date of bid.
- D. Manufacturer must be certified to ISO 9001:2008 with design.

2.2 CONCEALED-FASTENER, STANDING SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be field assembled by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips inside laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation. Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and mechanically seaming panels together with approved seaming equipment.
 1. Basis-of-Design Product: ATAS International, Inc.; Field-Lok™; FLR145 or a comparable product.
 2. Manufacturer:
 - a. ATAS International, Inc.
 3. Material: Aluminum .032
 - a. Texture: Smooth
 - b. Pan Coverage: 14-1/2"

- c. Seam Height: 2"
- d. KYNAR 5000® PDVF or HYLAR 5000® Finish
- e. Standard or Premium color to be chosen later

2.3 UNDERLAYMENT

- A. Self-Adhering, High-Temperature Sheet: 45 mil homogeneous rubberized asphalt waterproofing compound, glass fiber reinforced designed specifically for use under sheet metal roofing. Basis for design ATAS ATA-Shield as supplied by ATAS International, Inc. Thermal Stability: Resistant to 240 deg F; ASTM D 1970. Low Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970. With Asphalt free felt: Conforming to ASTM D 226, polyolefin based, 100 percent asphalt free, high strength reinforced roofing underlayment. Basis for design ATAS ATA-Guard as furnished by ATAS International, Inc.

2.4 MISCELLANEOUS MATERIAL

- A. Fasteners: Self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads. Manufacturer shall provide or authorize all fasteners utilized with the sheet metal roofing system.
 - 1. Exposed Fasteners: Heads matching color of sheet metal roofing by means of plastic caps or factory-applied coating.
 - 2. Fasteners for Flashing and Trim: Blind fasteners or screws spaced to resist wind uplift loads.
- B. Sealing Tape: Pressure-sensitive, 100 percent solid polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, non-toxic, non-staining tape.
- C. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to produce joints in sheet metal roofing that will remain weathertight.
- D. Expansion-Joint Sealant: For hooked-type expansion joints, which must be free to move, provide non-setting, non-hardening, non-migrating, heavy-bodied polyisobutylene sealant.
- E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat.

2.5 ACCESSORIES

- A. Sheet Metal Roofing Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of sheet metal roofing, unless otherwise indicated. All trim and flashing components shall be supplied in a minimum of 12'-0" lengths and shall conform to manufacturer's standard part dimensions and details.
 - 1. 16 ga. Galv. steel clip base w/22 ga. Galv. steel stem designed to withstand negative-load requirements.
 - 2. Closures: Closed-cell, expanded, cellular, rubber or cross linked, polyolefin-foam or

closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

3. Sealants as recommended by manufacturer.
 4. Fasteners as recommended by manufacturer.
- B. Flashing and Trim: Formed from matching materials as sheet metal roof panel in gauges noted. Provide flashing and trim in heavier gauge materials 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 sheet metal roofing.
- C. Snow Guards: Prefabricated, non-corrosive units designed for compatibility with metal roof panels.

2.6 EQUIPMENT

- A. Manufacturer must maintain quality control and maintenance procedures of all equipment. Verification of quality control procedures must be validated by a 3rd party entity.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ATAS International, Inc.

2.7 FABRICATION

- A. General: Fabricate sheet metal roofing and components to comply with details shown, manufacturers installation details and recommendations in SMACNA's "Architectural Sheet Metal Manual" and NRCA Waterproofing Manual that apply to the design, dimensions (pan width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the manufacturer's location to the greatest extent possible.
- B. General: Fabricate sheet metal roofing panels to comply with details shown and sheet metal roofing manufacturer's written instructions.
- C. Fabricate sheet metal roofing to allow for expansion in running work sufficient to prevent leakage, damage, and deterioration of the Work. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks, true to line and levels indicated, and with exposed edges folded back to form hems.
1. Fold and cleat eaves as required by manufacturer to insure weathertightness and wind uplift resistance.
 2. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage

arrangements shown and as required for leak proof construction and wind uplift resistance.

- D. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturers of dissimilar metals or by fabricator.
- E. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before manufacturer fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of 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.
 - 3. For the record, prepare written report for the General Contractor, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out and examine substrate before installation of sheet metal roofing. Space fasteners as required to resist design uplift, but not more than 24 inches o.c.
- B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

3.3 UNDERLAYMENT INSTALLATION

- A. Polyethylene Sheet Underlayment; ATA-GUARD™: Install polyethylene sheet on roof sheathing under metal roof panels. Use adhesive for anchorage to minimize use of mechanical fasteners under metal roof panels. Apply at locations indicated on Drawings, in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches. With

Self-Adhering Sheet Underlayment; ATA-SHIELD™: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply at locations noted on Drawings in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3.5 inches. Extend underlayment a minimum of 1.5 inches of fascia board. Roll laps with roller. Cover underlayment within 14 days.

3.4 INSTALLATION, GENERAL

- A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.
 - 1. Field cutting of sheet metal roofing by torch is not permitted.
 - 2. Rigidly fasten ridge end of sheet metal roofing and allow for positive panel attachment as per manufacturer's recommendations. All flashing details shall accommodate thermal movement.
 - 3. Provide metal closures at peaks, ridge, gable and hip caps.
 - 4. Flash and seal sheet metal roofing with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
 - 5. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.
 - 6. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.
- B. Fasteners: Use fasteners of size and length as required for compatibility with substrate.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of dissimilar metals.
 - 1. Separate sheet metal roofing from bituminous coating where roofing will contact wood, ferrous metal, or cementitious construction. Interlock and overlap shingles and stagger end joints from shingles above and below according to shingle manufacturer's written instructions.
- D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

3.5 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting

and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual" and NRCA Waterproofing 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.

B. Coordinate with installation of:

1. Cold Formed Metal Framing, as noted in Section 5
2. Rough Carpentry, as noted in Section 6
3. Sheet Metal Flashing and Trim, as noted in Section 7

C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as sheet metal roofing is installed. On completion of sheet metal roofing installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

3.7 FIELD QUALITY CONTROL

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

END OF SECTION 07 41 13

SECTION 0741133

ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (EPDM) ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project Name: Orthopedic Associates.
- B. EPDM membrane roofing system, including all components specified.
- C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- D. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at <http://manual.fsbp.com>.
- E. Commencement of work by Contractor shall constitute acknowledgement by Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

1.03 REFERENCE STANDARDS

- A. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2012.
- B. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
- D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
- F. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- G. FM DS 1-28 - Wind Design; Factory Mutual System; 2007.
- H. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.
- I. PS 1 - Structural Plywood; 2009.
- J. PS 20 - American Softwood Lumber Standard; 2010.
- K. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1)

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
 - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.

2. Notify Architect well in advance of meeting.

1.05 SUBMITTALS

- A. See Section 001300 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
- C. Samples: Submit samples of each product to be used.
- D. Shop Drawings: Provide:
 1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
 2. For tapered insulation, provide project-specific layout and dimensions for each board.
- E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- G. Executed Warranty.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Roofing installer shall have the following:
 1. Current Firestone Red Shield Licensed Contractor status.
 2. Current approval, license, or authorization as applicator by the manufacturer.
 3. Fully staffed office within 100 miles of the job site.
 4. At least five years' experience in installing specified system.
 5. Capability to provide payment and performance bond to building owner.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

1.08 WARRANTY

- A. See Section 017700 - Closeout Submittals, for additional warranty requirements.
- B. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- C. Warranty: Firestone Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
 1. Limit of Liability: No dollar limitation.
 2. Scope of Coverage: Repair leaks in the roofing system caused by:
 - a. Ordinary wear and tear of the elements.
 - b. Manufacturing defect in Firestone brand materials.
 - c. Defective workmanship used to install these materials.
 - d. Damage due to winds up to 80 mph.
 3. Not Covered:
 - a. Damage due to winds in excess of 80 mph.
 - b. Damage due hurricanes or tornadoes.
 - c. Hail.
 - d. Intentional damage.
 - e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

- D. Insulation Warranty: Separate Firestone ISO 95+ Insulation Warranty with warranty term coinciding with Red Shield Warranty.
 - 1. Limit of Liability: No dollar limitation
 - 2. Scope of Coverage: Provide replacement for insulation that warps, bows, or is on the point of causing a roof leak as a result of manufacturing defect.
- E. Metal Roof Edging: Firestone full-system warranty for roof edge system, covering blow-off from winds up to 150 mph.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer - Roofing System: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com.
 - 1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
- B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
- C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
 - 1. Metal roof edging products by other manufacturers are not acceptable.
 - 2. Field- or shop-fabricated metal roof edgings are not acceptable.

2.02 ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Ethylene-propylene-diene-monomer (EPDM) single-ply membrane.
 - 1. Membrane Attachment: Fully adhered.
 - 2. Warranty: Full system warranty; Firestone 20-year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
 - 3. Comply with applicable local building code requirements.
 - 4. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
 - 5. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and 1-29, and meeting minimum requirements of FM 1-90 wind uplift rating.
- B. Roofing System Components: Listed in order from the top of the roof down:
 - 1. Membrane: Thickness as specified.
 - 2. Base Sheet Over Insulation: Mechanically attached.
 - 3. Insulation Cover Board: Gypsum-based board, 1/4 inch thick; loose-laid, no attachment.
 - 4. Insulation:
 - a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.
 - b. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.
 - 5. Deck Cover Board: Gypsum-based board, 1/2 inch thick; mechanically fastened.

2.03 EPDM MEMBRANE MATERIALS

- A. Roofing and Flashing Membrane: White cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
 - 1. Thickness: 0.060 inch.
 - 2. Nominal Thickness Tolerance: Plus/minus 10 percent.
 - 3. Sheet Width: Provide the widest available sheets to minimize field seaming.
 - 4. Acceptable Product: Rubber Gard Eco White EPDM Membrane by Firestone
- B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- C. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D4811 Type II, and with the following properties:

1. Thickness: 0.055 inch.
 2. Acceptable Product: Rubber Gard EPDM Form Flash by Firestone.
- D. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil EPDM tape adhesive; Quick Seam Flashing by Firestone.
- E. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.
- F. Self-Adhesive Lap Splice Tape: 35 mil EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; Quick Seam Splice Tape by Firestone.
- G. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Firestone.
- H. Bonding Adhesive: Neoprene-based, formulated for compatibility with EPDM membrane and wide variety of substrate materials, including masonry, wood, and insulation facings; Bonding Adhesive BA-2004 by Firestone.
- I. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive, with VOC content less than 2.1 lb/gal; Quick Prime Plus LVOC by Firestone.
- J. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.
- K. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.
- L. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.
- M. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria.
- N. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick; Firestone Termination Bar by Firestone.
- O. Roof Walkway Pads: EPDM, 0.30 inch thick by 30 by 30 inches with EPDM tape adhesive strips laminated to the bottom; Quick Seam Walkway Pads by Firestone.

2.04 ROOF INSULATION AND COVER BOARDS

- A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
1. Thickness: As indicated elsewhere.
 2. Size: 48 inches by 96 inches, nominal.
 - a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
 3. R-Value (LTTR):
 - a. 1.0 inch Thickness: 6.0, minimum.
 - b. 1.25 inch Thickness: 7.5, minimum.
 - c. 1.5 inch Thickness: 9.0, minimum.
 - d. 1.75 inch Thickness: 10.5, minimum.
 - e. 2.0 inch Thickness: 12.1, minimum.
 - f. 3.0 inch Thickness: 18.5, minimum.
 - g. 4.0 inch Thickness: 25.0, minimum.
 4. Compressive Strength: 20 psi when tested in accordance with ASTM C1289.
 5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
 6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
 7. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.
- B. Gypsum-Based Cover Board: Non-combustible, water-resistant gypsum core with embedded glass mat facers, complying with ASTM C1177/C1177M, and with the following additional characteristics:

1. Size: 48 inches by 96 inches, nominal.
 - a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
 2. Thickness: As indicated elsewhere.
 3. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C473.
 4. Spanning Capability: Recommended by manufacturer for following minimum flute spans:
 - a. 1/2-inch Thickness: 5 inches, minimum.
 5. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E84.
 6. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
 8. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D3273 for minimum of 4 weeks.
 9. Acceptable Product: Georgia-Pacific Dens Deck Roof Guard.
- C. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

2.05 METAL ACCESSORIES

- A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
1. Wind Performance:
 - a. Membrane Pull-Off Resistance: 100 lbs/ft, minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.
 - b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition.
 - c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.
 2. Fascia Face Height: 5 inches.
 3. Edge Member Height Above Nailers: 1-1/4 inches.
 4. Fascia Material and Finish: 0.050 inch thick formed aluminum, Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
 5. Length: 144 inches.
 6. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
 7. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
 8. Anchor Bar Cleat: 20 gage, 0.036 inch G90 coated commercial type galvanized steel with pre-punched holes.
 9. Curved Applications: Factory modified.
 10. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
 11. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch long legs on corner pieces.
 12. Scuppers: Welded watertight.
 13. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

2.06 ACCESSORY MATERIALS

- A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
 - 1. Width: 3-1/2 inches, nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
 - 2. Thickness: Same as thickness of roof insulation.
- B. Cant Strips and Tapered Edge Strips: 45 degree face slope and minimum 5 inch face dimension; provide at all angle changes between vertical and horizontal planes that exceed 45 degrees.
 - 1. Type: Wood fiber, complying with ASTM C208.
 - 2. Install using hot asphalt (Type IV), roofing mastic, or mechanically fastened using fasteners and plates approved by roofing manufacturer.

PART 3 INSTALLATION

3.01 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
 - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
 - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.02 EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.

- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.
- E. Verify that wood nailers have been properly installed.

3.03 PREPARATION

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.04 INSULATION AND COVER BOARD INSTALLATION

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- C. Lay roof insulation in courses parallel to roof edges.
- D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.
- E. Cold Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

3.05 SINGLE-PLY MEMBRANE INSTALLATION

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane adhered to the substrate, with edge securement as specified.
- E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
- F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
 - 1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
 - 2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.06 FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
 - 1. Follow roofing manufacturer's instructions.
 - 2. Remove protective plastic surface film immediately before installation.
 - 3. Install water block sealant under the membrane anchorage leg.
 - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
 - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
 - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
 - 7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
- C. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.
- D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
 - 1. Use the longest practical flashing pieces.
 - 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
 - 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
 - 4. Provide termination directly to the vertical substrate as shown on roof drawings.
- E. Roof Drains:
 - 1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
 - 2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
 - 3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
 - 4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
 - 5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
 - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
 - 2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1 inch clearance from penetration, sloped to shed water.

3.07 FINISHING AND WALKWAY INSTALLATION

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
 - 1. Use specified walkway pads unless otherwise indicated.
 - 2. Do not install walkway pads within 10 feet of any roof edge or perimeter -- these areas require loose-laid pavers as walking surfaces.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.

1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.08 FIELD QUALITY CONTROL

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Perform all corrections necessary for issuance of warranty.

3.09 CLEANING

- A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

- A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION 07 5323

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, and other items indicated in Schedule.
- B. Reglets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06100 - Rough Carpentry
- B. Section 07900 - Joint Sealers.
- C. Section 09900 - Paints and Coatings.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2011.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- F. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2011e1.
- G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (0.6 mm) thick base metal, shop pre-coated with PVDF coating.
 - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As shown on drawings.
- B. Aluminum: ASTM B209 (ASTM B209M); 0.032 inch (0.8 mm) thick; anodized finish of color as selected.
- C. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch (0.4 mm) thick; smooth No. 4 finish.
- D. Copper: ASTM B370, cold rolled 16 oz/sq ft (0.5 mm) thick; natural finish.

2.02 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Sealant: Type specified in Section 07900.
- E. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: Profile as indicated. 9" K-Style Aluminum, White.
- B. Downspouts: Rectangle profile. Aluminum, White.
- C. Gutters and Downspouts: K Style / Box.
- D. Accessories: Profiled to suit gutters and downspouts.
 - 1. Anchorage Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Brackets.
- E. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Secure gutters and downspouts in place using concealed fasteners.

3.04 SCHEDULE

- A. Through-Wall Flashing in Masonry:
 - 1. Material: Asphalt Coated Copper where concealed.
 - 2. Thickness: 3 oz.
- B. Fascia and Cornices: Pre finished Galvanized Steel, unless noted otherwise.
- C. Gutters and Downspouts: Aluminum, dark bronze
- D. Scuppers: Copper, see details.
- E. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney: Prefinished Galvanized Steel, unless noted otherwise.
- F. Counterflashings at Roofing Terminations (over roofing base flashings): to be prefinished galvanized steel, unless noted otherwise.
- G. Counterflashings at Curb-Mounted Roof Items, including skylights and roof hatches: Prefinished Galvanized Steel, unless noted otherwise.
- H. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports: EPDM boot flashings minimum of 60 mil, at metal chimney provide and install stainless steel boot fully flashed.
- I. Standing Seam Roof: Atas International, Field-Lok, smooth #24 Antique Patina, prefinished Galvanized Steel. Installed over #30 felts.

END OF SECTION

SECTION 09650
RESILIENT FLOORING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Resilient tile flooring for commercial traffic.
 2. Resilient sheet flooring for commercial traffic.
 3. Resilient sheet flooring for commercial traffic with pre-applied adhesive.
 4. Resilient tile flooring for special fire requirements.
 5. Resilient tile flooring for extra heavy traffic, ice skate, and golf spike resistant.
 6. Resilient tile flooring for pre-installed raised access flooring, or releasable application.
 7. Resilient tile flooring for electrostatic dissipative protection.
 8. Resilient sheet flooring for electrostatic dissipative protection.
 9. Resilient stair treads (one-piece nosing, tread, and riser).
 10. Resilient stair accessories.
 11. Resilient wall base, sanitary base, and accessories.
 12. Substrate preparation.
- B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
- | | |
|-------------------|--|
| 1. Section 033000 | CAST-IN-PLACE CONCRETE for concrete substrate; slab surface tolerances; vapor retarder for applications on or below grade; requirement for 83/90-degree riser and tread edge angle for stair tread and nosing's. |
| 2. Section 05500 | METAL STAIRS AND RAILINGS; requirement for 83/90-degree riser and tread edge angle for stair tread and nosing's. |
| 3. Section 061000 | ROUGH CARPENTRY for plywood substrate and surface tolerances. |
- C. References (Industry Standards):
1. American Association of Textile Chemists and Colorists (AATCC):
 - a. AATCC 134 Electrostatic Propensity of Carpets
 2. American National Standards Institute (ANSI):
 - a. ANSI ESD S97.2 Floor Materials and Footwear – Voltage Measurement on a Person
 3. ASTM International (ASTM):

a. ASTM C518	Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
b. ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
c. ASTM D2047	Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
d. ASTM D2240	Standard Test Method for Rubber Property – Durometer Hardness
e. ASTM D3389	Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double Head Abrader)
f. ASTM D6499	Standard Test Method for the Immunological Measurement of Antigenic Protein in Natural Rubber and its Products
g. ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
h. ASTM E648	Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
i. ASTM E662	Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
j. ASTM E1745	Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
k. ASTM E2179	Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors
l. ASTM E2180	Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials
m. ASTM F150	Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
n. ASTM F155	Method of Test for Temper of Strip and Sheet Metals for Electronic Devices
o. ASTM F386	Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
p. ASTM F710	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
q. ASTM F925	Standard Test Method for Resistance to Chemicals of Resilient Flooring
r. ASTM F970	Standard Test Method for Static Load Limit
s. ASTM F1344	Standard Specification for Rubber Floor Tile
t. ASTM F1482	Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
u. ASTM F1514	Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change
v. ASTM F1515	Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change
w. ASTM F1859	Standard Specification for Rubber Sheet Floor Covering Without Backing
x. ASTM F1860	Standard Specification for Rubber Sheet Floor Covering with Backing
y. ASTM F1861	Standard Specification for Resilient Wall Base
z. ASTM F2055	Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method
aa. ASTM F2169	Standard Specification for Resilient Stair Treads
bb. ASTM F2170	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
cc. ASTM F2199	Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat

- dd. ASTM F2753 Standard Practice to Evaluate the Effect of Dynamic Rolling Load over Resilient Floor Covering System
- ee. ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
- ff. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- 4. European Norm (FTM):
 - a. FTM 101 C 4046 Static Decay
- 5. International Organization for Standardization (ISO):
 - a. ISO 10140-3 Measurement of sound insulation in buildings and of building elements
 - b. ISO 26987 Determination of staining and resistance to chemicals
- 6. National Fire Protection Association (NFPA):
 - a. NFPA 253 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
 - b. NFPA 258 Test Method for Specific Density of Smoke Generated by Solid Materials
- 7. Standards Council of Canada (SCC):
 - a. CAN/ULC-S102.2 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions and maintenance guidelines for each material and accessory proposed for use.
- B. Samples: Submit three representative samples of each product specified for verification.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience with resilient flooring of type equivalent to those specified.
 - 1. Manufacturer's quality management system must have ISO 9001:2000 approval.
 - 2. Provide resilient flooring products and accessories from one manufacturer to ensure compatibility.
 - 3. Manufacturer shall be capable of providing technical training and technical field service representation.
- B. Installer Qualifications: Acceptable to manufacturer of resilient flooring or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project with a minimum of 4 years' experience with resilient flooring of type equivalent to those specified.
 - 1. It is recommended to have a minimum of one installer per working party with the ability to provide proof of current credentials at request.
 - 2. Has obtained and maintained current credentials from manufacturer's training program.
 - 3. Installers shall be able to exhibit proficient skills with flash cove detailing, both hot and cold-welding techniques, adhesives, specialty adhesive systems and seam cutting.
 - 4. The installing parties shall provide a submittal of their skills in the form of mock-ups of the specified material. These mock-ups will be accepted as proof of their skills and benchmarking for the proposed project.
- C. Sustainable Design Requirements:
 - 1. ISO 14001 Environmental Management Systems certification.

2. Construction waste take back program for the purpose of reducing jobsite waste by taking back uninstalled waste flooring. Details of the nora® program are available at www.nora.com.
3. Flooring surfaces that are easily cleaned and do not require coatings, stripping, or use of chemicals that may be hazardous to human health.
4. Supply all required products that are CA 01350 compliant.
5. Flooring that contains no polyvinyl chloride or phthalate plasticizers.
6. Flooring that contains no halogenated polymers.
7. Flooring that contains no asbestos.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.
- B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature for 48-hours prior to installation.

1.6 PROJECT CONDITIONS

- A. The installation area must be fully enclosed, weather tight, and climate controlled between 63°F and 75°F and 40% to 60% ambient relative humidity (RH) for at least 48 hours prior, during and 72 hours after installation (do not use gas fueled blowers). Dew point must be avoided. The substrate must be at least 5°F above dew point to be considered acceptable.

1.7 WARRANTY

- A. Provide manufacturer's standard limited warranty for wear, defect, bond, and conductivity.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Basis-of-Design: nora systems, Inc., 9 Northeastern Blvd., Salem, NH 03079; telephone 800-332-NORA or 603-894-1021; fax 603-894-6615.

2.2 RESILIENT TILE FLOORING FOR COMMERCIAL TRAFFIC

- A. Rubber Floor Tile:

- | | |
|--|---|
| 1. Product Name: | norament castello™, Article 3167 |
| 2. ASTM Specification:
ASTM F1344 Standard Specification for
Rubber Floor Tile | Type IB and Grade 2 |
| 3. Limited Wear Warranty: | 15 years |
| 4. Material: | nora vulcanized rubber compound 926 with environmentally compatible color pigments that are free of toxic heavy metals like lead, cadmium, or mercury |
| 5. Composition: | Homogeneous rubber compound with a slightly marbled design |
| 6. Color: | 8 standard colors |
| 7. Surface: | Two-tone |

8. Back of Tile:	Double-sanded smooth
9. Material Size (ASTM F2055): ± 0.02 inches (± 0.5mm) is required	39.53 inches by 39.53 inches (1004mm by 1004mm)
10. Squareness (ASTM F2055): ± 0.010 inches (± 0.254mm) is required	Meets requirements
11. Thickness (ASTM F386): + 0.015/-0.005 inches (+ 0.381/-0.127mm) is required	0.14 inches (3.5mm)
12. Dimensional Stability (ASTM F2199): ≤ 0.15% in both directions is required	Meets requirements
13. Flammability (E648/NFPA 253): ≥ 0.45 watts/sq. cm for Class 1 is required	NBSIR 75 950, 0.92
14. Smoke Density (ASTM E662/NFPA 258): < 450 is required	NBS, 267 (flaming) and 130 (non-flaming)
15. Surface Burning (CAN/ULC-S102.2):	FSC1 of 70 and SD of 470
16. Burn Resistance:	Resistant to cigarette and solder burns
17. Slip Resistance (ASTM D2047): ≥ 0.5 is required	Static coefficient of friction, Neolite dry 0.87, Neolite wet 0.93
18. Bacteria Resistance (ASTM E2180/ASTM G21):	Resistant to bacteria, fungi, and micro-organism activity
19. Indoor Air Quality:	Greenguard Gold Certified for low VOC emissions in compliance with CDPH 01350
20. Carbon:	3rd party verified carbon neutral throughout their entire life cycle through the Interface Carbon Neutral Floors™ program. Learn more at www.interface.com/carbonneutral .
21. Latex Allergies (ASTM D6499):	Inhibition ELISA, results are below detection level
22. Sound Absorption (ASTM E2179/ISO 10140-3):	Δ IIC 11, Δ Lw 11 dB (compare only Δ values)
23. Sound Generation:	66.3 dBA, 68.5 dBC and 19.6 Sones, independently tested
24. Hardness (ASTM D2240): ≥ 70 is required	Shore type "A", 82
25. Static Load (ASTM F970): ≤ 0.005 inches with 250 lbs. is required	Residual compression of 0.005 inches with 800 lbs.
26. Rolling Load Limit (ASTM F2753):	≤ 850 lbs. / sq. inch; for forklift traffic nora polyurethane adhesive is required
27. Abrasion Resistance (ASTM D3389): ≤ 0.035 oz. (1.0g) is required	1.1 lbs. (500g) load on H-18 wheel with 1000 cycles, 0.002 oz. (0.05g) weight loss
28. Oil & Grease Resistance (EN/ISO 26987):	Yes
29. Heat Resistance (ASTM F1514): Avg. ΔE ≤ 8.0 is required	Easily achieved with all batches and regular maintenance
30. Static Generation (AATCC 134):	< 1000 Volts at 20% RH
31. Thermal Transmission (ASTM C518):	R-value of -0.90
32. Cleaning:	Cleaned and maintained effectively using water, nora pads and a suitable cleaning machine, without the use of any factory and/or field-applied coatings. Also, without using any

- chemicals that may be hazardous or containing any teratogenic, mutagenic or any other ingredients known to be carcinogenic. Refer to nora Maintenance Guidelines for product specific details.
33. Shine: Higher shine achieved by buffing without any artificial topical applied coatings.
34. Stain Removal: Samples of the product must be provided for stain removal testing by the owner. Sample size should be ~ 1 m², pre-cleaned by manufacture per published recommendations. Samples must have no coatings, sealers, floor finish or other manually or mechanically applied finish on the surface of the product. Stain testing must consist of application of common healthcare related disinfectants and chemicals to include, but not limited to, Betadine, Methylene Blue, Silver Nitrate, and alcohol-based hand sanitizer. Duration of test period must be no less than one week. Removal of chemicals must be in accordance with manufacturers published cleaning and maintenance recommendations.
35. Substrate Preparation: Per ASTM F710 and the nora Installation Instructions

PART 3 - GENERAL

3.1 GENERAL CONTRACTOR RESPONSIBILITIES

- A. Supply a safe, climate-controlled building and subfloor as detailed in the nora Installation Instructions (available at www.nora.com)
- B. A subfloor that meets the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required, or as detailed in the nora Installation Instructions or nora nTx Installation Instructions as appropriate.
- C. A secure storage area that is fully enclosed, weather tight, and climate controlled between 63°F and 75°F and 40% to 60% ambient relative humidity (RH) for at least 48-hours prior and during the installation, so the flooring contractor can acclimate all materials.
- D. An installation area that is fully enclosed, weather tight, and climate controlled between 63°F and 75° and 40% to 60% ambient relative humidity (RH) for at least 48-hours prior, during, and 72-hours after installation (do not use gas fueled blowers). If this is not possible, contact the nora Technical Department.
- E. Areas with direct prolonged exposure to sunlight should be protected with the use of Low E glass doors, windows or facades that reduce the UV transmissions to less than 1%.
- F. Areas of the flooring subjected to direct sunlight, for example through doors or windows, must be covered using blind, curtains, cardboard, or similar materials for 24-hours before, during, and for a period of 72-hours after the installation to allow nora “wet” adhesives to cure. Do not allow traffic when using wet set adhesives for a minimum of 12-hours and prohibit rolling loads for 72-hours. When using nora® nTx™ or nora dryfix™, the flooring can be trafficked immediately with no restrictions. All flooring must be protected from damage during construction operations using Masonite, plywood, or a similar product. Before laying the panels, the flooring surface must be free of all debris. Lay panels so that they are edge to edge and tape the joints to prevent movement and debris entrapment. Inspect the flooring before covering and after removal for final acceptance.
- G. Conduct post-installation cleaning after 72-hours for wet set adhesives. Conduct post-installation cleaning immediately for installations using nora dryfix or nora nTx. Refer to the appropriate nora Maintenance Guidelines for product specific details.

3.2 FLOORING CONTRACTOR RESPONSIBILITIES

- A. Provide trained installers that have at least one of the following:
 - 1. Approved by specified manufacturer (nora systems, Inc.) or INSTALL (International Standards & Training Alliance) certified for the requirements of the project.
 - 2. It is recommended to have a minimum of one installer per working party with the ability to provide proof of current credentials at request.
 - 3. An effective installation manager to manage the project, installers, and ensure that all the required procedures are followed as detailed in the nora Installation Instructions (available at www.nora.com).
- B. Follow all requirements in the appropriate nora Installation Instructions or nora nTx Installation Instructions.

END OF SECTION

**SECTION 10 14 00
SIGNAGE**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior signage for room numbers, directional signs, code required signs and temporary signs.
- B. See description at end of Specification section for interior signage requirements for this facility.

1.2 RELATED WORK

- A. Lighted EXIT signs for egress purposes are specified under Division 26, ELECTRICAL.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Provide signage that is the product of one manufacturer, who has provided signage as specified for a minimum of three (3) years. Submit manufacturer's qualifications.
- B. Installer's Qualifications: Minimum three (3) years' experience in the installation of signage of the type as specified in this Section. Submit installer's qualifications.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Interior Sign Samples: Sign panels and frames, with letters and symbols, for each sign type.
 - 1. Sign Panel, 203 x 254 mm (8 x 10 inches), with letters.
 - 2. Color samples of each color, 152 x 152 mm (6 x 6 inches). Show anticipated range of color and texture.
 - 3. Sample of typeface, arrow and symbols in a typical full size layout.
- D. Manufacturer's Literature:
 - 1. Showing the methods and procedures proposed for the anchorage of the signage system to each surface type.
 - 2. Manufacturer's printed specifications and maintenance instructions.
- E. Sign Location Plan, showing location, type and total number of signs required.
- F. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- G. Full size layout patterns for dimensional letters.
- H. Manufacturer's qualifications.
- I. Installer's qualifications.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.
- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
 - 611-14Anodized Architectural Aluminum
 - 2603-13Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
- C. American National Standards Institute (ANSI):
 - A117.1-09.....Accessible and Usable Buildings and Facilities
- D. ASTM International (ASTM):
 - A36/A36M-14Carbon Structural Steel
 - A240/A240M-15Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A666-10.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
 - A1011/A1011M-14Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - B36/B36M-13Brass Plate, Sheet, Strip, and Rolled Bar
 - B152/B152M-13Copper Sheet, Strip, Plate, and Rolled Bar
 - B209-14.....Aluminum and Aluminum-Alloy Sheet and Plate
 - B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
 - B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - C1036-11(R2012)Flat Glass
 - C1048-12Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

- C1349-10Architectural Flat Glass Clad Polycarbonate
- D1003-13Test Method for Haze and Luminous Transmittance of
Transparent Plastics
- D4802-10Poly(Methyl Methacrylate) Acrylic Plastic Sheet
- D. Code of Federal Regulation (CFR):
 - 40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density
Volume Solids, and Weight Solids of Surface Coating
- E. Federal Specifications (Fed Spec):
 - MIL-PRF-8184FPlastic Sheet, Acrylic, Modified.
 - MIL-P-46144CPlastic Sheet, Polycarbonate
- F. National Fire Protection Association (NFPA):
 - 70-14National Electrical Code

PART 2 - PRODUCTS

2.1 SIGNAGE GENERAL

- A. Provide signs of type, size and design shown on the construction documents.
- B. Provide signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale construction documents for dimensions. Verify dimensions and coordinate with field conditions.

2.2 EXTERIOR SIGNAGE PERFORMANCE REQUIREMENTS – SEE DRAWINGS

2.3 INTERIOR SIGN MATERIALS

- A. Aluminum:
 - 1. Sheet and Plate: ASTM B209M (B209).
 - 2. Extrusions and Tubing: ASTM B221M (B221).
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: Premium grade 0.1 mm (0.004 inch) thick machine cut, having a pressure sensitive adhesive and integral colors.
- E. Adhesives:
 - 1. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by signage manufacturer.
 - 2. Adhesives to have VOC content of 50 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

F. Typography:

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps, as indicated in Sign Message Schedule.
2. Arrow: Comply with graphic standards in construction documents.
3. Letter spacing: Comply with graphic standards in construction documents.
4. Letter spacing: Comply with graphic standards in construction documents.
5. Provide text, arrows, and symbols in size, colors, typefaces and letter spacing shown in construction documents. Text shall be a true, clean, accurate reproduction of typeface(s). Text shown in construction documents is for layout purposes only; final text for signs is listed in Sign Message Schedule .

2.5 INTERIOR SIGN TYPES

A. Conform to the signs shown on drawings.

B. Provide sliding rail frame insert and frame component system.

C. Component System Signs:

1. Provide interior sign system as follows:
 - a. Interchangeable system that allows for changes of graphic components of the installed sign, without changing sign in its entirety.
 - b. Provide sign system comprised of following primary components:
 - 1) Rail Back: Horizontal rails, spaced to allow for uniform, modular sizing of sign types.
 - 2) Rail Insert: Mount to back of Copy Panels to allow for attachment to Rail Back.
 - 3) Copy Panels: Fabricate of ABS phopolymer acrylic aluminum stainless steel materials to allow for different graphic needs.
 - 4) End Caps: Interlock to Rail Back to enclose and secure changeable Copy Panels.
 - 5) Joiners and Accent Joiners: To connect separate Rail Backs together.
 - 6) Top Accent Bars: To provide decorative trim cap that encloses the top of sign.
 - c. Provide rail back, rail insert and end caps in anodized extruded aluminum.
 - d. Provide signs in system that are convertible in the field to allow for enlargement from one (1) size to another in height and width through use of joiners or accent joiners, which connect rail back panels together blindly, providing a butt joint between copy panels. Connect accent joiners to rail backs with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
 - e. Provide sign configurations as indicated on construction documents that vary in width from 228 mm (9 inches) to 2032 mm (80 inches), and have height dimensions of 50 mm (2 inches), 76 mm (3 inches), 152 mm (6 inches), 228 mm (9 inches) and 305 mm (12 inches). Height that can be increased beyond 305 mm (12 inches), by repeating height module in full or in part.

2. Provide rail back functions as internal structural member of sign. Fabricate of 6063T5-extruded aluminum, anodized black.
 - a. Fabricate to accept an extruded aluminum or plastic insert on either side, depending upon sign type.
 - b. Provide components that are convertible in field to allow for connection to other rail back panels.
 - c. Provide mounting devices including wall mounting for screw-on applications, wall mounting with pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
3. Provide rail insert functions as mounting device for copy panels on to the rail back. The rail insert mounts to the back of the copy panel with adhesive suitable for attaching particular copy insert material.
 - a. Provide copy panels that slide or snap into the horizontal rail back.
4. Provide copy panels that accept various forms of copy and graphics, and attach to the rail back with the rail insert. Provide copy panels fabricated of ABS plastic with integral color or an acrylic lacquer finish photopolymer acrylic.
 - a. Provide copy panels that are interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
 - b. Provide materials that are cleanable without use of special chemicals or cleaning solutions.
 - c. Copy Panel Materials.
 - 1) ABS Inserts: 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process.
 - a) Pressure bonded to extruded rail insert with adhesive.
 - b) Background Color: Integral or painted in acrylic lacquer.
 - c) Finished: Texture pattern.
 - 2) Photopolymer Inserts: 3.2 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches), bonded to an ABS plastic or extruded aluminum insert with adhesive.
 - a) Background Color: Painted, acrylic enamel.
 - 3) Changeable Paper/ Insert Holder: Extruded insert holder with integral rail insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish.
 - a) Inserts into holder are paper with a clear 0.76 mm (.030 inches) textured cover.
 - b) Background Color: Painted, acrylic lacquer.
 - 4) Acrylic - 2 mm (.080 inches) non-glare acrylic.
 - a) Pressure bonded to extruded rail insert using adhesive.

- b) Background Color: Painted in acrylic lacquer or acrylic enamel.
- 5) Extruded 6063T5 aluminum with a black anodized finish insert holder with integral rail insert for connection with structural back panel to hold 0.76 mm (.030 inches) textured polycarbonate insert and a sliding tile which mounts in the inset holder and slides horizontally.
- 5. End Caps: Extruded using 6063T5 aluminum with a black anodized finish. End caps interlock with rail back with clips to form an integral unit, enclosing and securing the changeable copy panels, without requiring tools for assembly.
 - a. Interchangeable to each end of sign and to other signs in signage system of equal height.
 - b. Provide mechanical fasteners that can be added to the end caps that will secure it to rail back to make sign tamper resistant.
- 6. Joiners: Extruded using 6063T5 aluminum with a black anodized finish. Rail joiners connect rail backs together blindly, providing a butt joint between copy inserts.
- 7. Accent Joiners: Extruded using 6063T5 aluminum with a mirror polished finish. Connect joiner and rail backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent copy panel surfaces.
- 8. Top Accent Rail: Extruded rail using 6063T5 aluminum with a mirror polished finish that provides a 3.2 mm (.125 inches) high decorative trim cap. Cap butts flush to adjacent copy panel and encloses top of rail back and copy panel.
- 9. Typography:
 - a. Vinyl First Surface Copy (non-tactile): Applied vinyl copy.
 - b. Subsurface Copy Inserts: Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied vinyl copy.
 - 1) Spray face back with paint and laminated to extruded aluminum carrier insert.
 - c. Integral Tactile Copy Inserts: Phenolic photopolymer etched with 2.3 mm (.0937 inches) raised copy.
 - d. Silk-screened First Surface Copy (non-tactile): Injection molded or extruded ABS plastic Aluminum insert with first surface applied enamel silk-screened copy.
- D. Tactile Sign:
 - 1. Tactile sign made from a material that provides for letters, numbers and Braille to be integral with sign. Photopolymer etched metal, sandblasted phenolic or embossed material. Do not apply letters, numbers and Braille with adhesive.
 - 2. Numbers, letters and Braille to be raised 0.8 mm (1/32 inches) from the background surface. The draft of the letters, numbers and Braille to be tapered, vertical and clean.
 - 3. Braille Dots: Conform with ANSI A117.1 for Braille position and layout; (a) Dot base diameter: 1.5 mm (.059 inches) (b) Inter-dot spacing: 2.3 mm (.090 inches) (c) Horizontal separation

between cells: 6.0 mm (.241 inches) (d) Vertical separation between cells: 10.0 mm (.395 inches)

4. Paint assembly specified color. After painting, apply white or other specified color to surface of the numbers and letters. Apply protective clear coat sealant to entire sign.
5. Finish: Eggshell, 11 to 19 degree on a 60 degree glossmeter.

E. Provide cork or felt on bottom or mounting bracket when sign is mounted on counter or desk.

F. For ceiling mounted signs, provide mounting hardware on the sign that allows for sign disconnection, removal, reinstallation, and reconnection.

G. Glass Door and Side Light Graphics:

1. Provide text and graphics as first surface applied stylus cut vinyl.
2. Provide typeface, color, and spacing, with each message or message group on a single quick release backing sheet.

H. Dimensional Letters:

1. Provide dimensional letters that are mill or laser cut acrylic in size and thickness indicated in construction documents.
2. Provide draft of letters perpendicular to letters face.
3. Fabricate letters with square corners, such as where a letter stem and bar intersect.
4. Paint letters with acrylic polyurethane.

I. Specialty Signs:

5. Patient Information Holder: Provide chart, file, or binder holder constructed of 18 gauge formed. Galvanized steel or aluminum painted in specified color.
 - a. Provide polished aluminum connecting rods and buttons. Provide button covers for mounting screws that permanently attach and securely conceal screws.

J. Temporary Interior Signs:

1. Fabricated from 50 kg (110 pound) matte finished white paper cut to 101 mm (4 inch) wide by 305 mm (12 inch) long.
 - a. Punched 3.2 mm (.125 inch) hole with edge of hole spaced 13 mm (.5 inch) in from edge and centered on 101 mm (4 inch) side.
 - b. Reinforce hole on both sides with suitable material that prevents tie from pulling through hole.
 - c. Ties: Steel wire 0.3 mm (0.120 inch) thick attached to tag with twist leaving 152 mm (6 inch) long free ends.
2. Mark architectural room number on sign, with broad felt marker in clearly legible numbers or letters that identify room, corridor or space as shown on construction documents.
3. Install temporary signs to rooms that have a room, corridor or space number. Attach to door frame, door knob or door pull.

- a. Doors that do not require signs are: corridor doors in corridor with same number, folding doors or partitions, toilet doors, bathroom doors within and between rooms, closet doors within rooms, communicating doors in partitions between rooms with corridor entrance doors.
- b. Replace and missing, damaged or illegible signs.

2.7 FABRICATION

- A. Design interior signage components to allow for expansion and contraction for a minimum material temperature range of 38 degrees C (100 degrees F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Provide concealed fasteners wherever possible.
- C. Shop fabricate so far as practicable. Fasten joints flush to conceal reinforcement, or weld joints, where thickness or section permits.
- D. Level and assemble contact surfaces of connected members so joints will be tight and practically unnoticeable, without applying filling compound.
- E. Signs: Fabricate with fine, even texture to be flat and sound.
 - 1. Maintain lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern.
 - 2. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
 - 3. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.
- F. Finish extruded members to be free from extrusion marks. Fabricate square turns, sharp corners, and true curves.
- G. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Miter edge joints to give appearance of solid material.
- H. Do not manufacture signs until final sign message schedule and location review has been approved by Owner and forwarded to contractor.
- I. Drill holes for bolts and screws. Mill smooth exposed ends and edges with corners slightly rounded.
- J. Form joints exposed to weather to exclude water.
- K. Movable Parts, Including Hardware: Cleaned and adjusted to operate as designed without binding or deformation of members. Center doors and covers in opening or frame.
 - 1. Align contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. Prime painted surfaces as required. Apply finish coating of paint for complete coverage with no light or thin applications allowing substrate or primer to show.

1. Finish surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs as shown on the construction documents plans.
- B. Conform to the installation requirements.
- C. Provide inserts and anchoring devices which must be set in concrete or other material for installation of signs. Submit setting drawings, templates, instructions and directions for installation of anchorage devices, which may involve other trades.
- D. Refer to Sign Message Schedule for mounting method. Mount signs in proper alignment, level and plumb according to the Sign Location Plan and the dimensions given on elevation and Sign Location Plans. When exact position, angle, height or location is not clear, contact COR for resolution.
- E. When signs are installed on glass, provide blank glass back up to be placed on opposite side of glass exactly behind sign being installed. Provide blank glass back that is the same size as sign being installed.
- F. Touch up exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- G. At completion of sign installation, clean exposed sign surfaces. Clean and repair adjoining or adjacent surfaces that became soiled or damaged as a result of installation of signs.

Description of facility interior signage requirements:

1. The signage shall incorporate a decorative laminate face with applied graphics including all tactile requirements in adherence to ADA specifications.
2. Sign face shall be 0.035" standard grade, high pressure surface laminate. A painted sign face shall not be acceptable. The sign shall incorporate balanced construction with the core sandwiched between laminates to prevent warping. Laminate on the sign face only shall not be acceptable.
3. Tactile lettering shall be precision machined, raised 1/32" matte PETG and subsurface colored for scratch resistance.
4. Signs shall incorporate a metal accent bar. Bars shall be anodized with a brushed satin finish. Painted bars shall not be acceptable. refer to attachment and drawings.
5. Insert components shall have a .080 thickness non-glare acrylic window and shall be inlaid flush to sign face for a smooth, seamless appearance.



PLAN VIEW



FRONT VIEW

--- END OF SECTION ---

SECTION 26 32 13
ENGINE GENERATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes packaged engine-generator sets for standby power supply with the following features:
 - 1. Natural gas engine.
 - 2. Unit-mounted cooling system.
 - 3. Unit-mounted control and monitoring.
 - 4. Sound Attenuated Weatherproof Enclosure
 - 5. Critical Silencer.
- B. Related Sections include the following:
 - 1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and stopping signals for engine-generator sets.

1.03 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. 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.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
 - The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- 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.

1.04 CLOSEOUT SUBMITTALS

- A. 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.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- 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.

1.06 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 two 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. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.
- C. 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.
- D. Comply with ASME B15.1.
- E. Comply with NFPA 20.
- F. Comply with NFPA 37.
- G. Comply with NFPA 70.
- H. Comply with NFPA 99.
- I. Comply with NFPA 110 requirements for Level 2 emergency power supply system.
- J. Comply with UL 2200.

- K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.
- L. 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.

1.07 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.

1.08 COORDINATION

- A. The concrete mounting base for the generator shall be by the Electrical Contractor. Coordinate size and location of concrete base for the generator with the site contractor. Coordinate installation of power and control conduits and gas piping.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form 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.
 - 1. Warranty Period: Five years from date of Substantial Completion including parts and labor for the entire 5 year period.

1.10 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 PRODUCTS

2.01 ENGINE-GENERATOR SET

- A. Factory-assembled and -tested, 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. Output Connections: Three-phase, four wire.
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- D. Ratings:
 - 1. Capacity: 80 kW; 100 kVA @ 0.8 p.f.
 - 2. Voltage: 120/208 volts, 3 phase, 4 wire, wye configuration.
- E. 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.

2.02 ENGINE

- A. Fuel: Natural gas.
- B. Ratings and Configuration:
 1. 8 cylinder, in-line configuration.
 2. 6.2 liter displacement.
 3. 126 rated H.P. @ 1,800 rpm.
- C. Lubrication System: The following items shall be 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.
- D. Engine Fuel System:
 1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
 2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.
- E. Coolant Jacket Heater: Electric-immersion type, 1500 watts, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 2 equipment for heater capacity. Provide adjustable temperature control for coolant heater.
- F. Governor: Adjustable isochronous, with speed sensing.
- G. 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 anticorrosion 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.
 Rating: 50-psig maximum working pressure with coolant at 180 deg F and non-collapsible under vacuum.
 End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- H. 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.
 2. Sound level measured at a distance of 10 feet from exhaust discharge after installation is complete shall be 76 dBA or less.
 3. Muffler location: Inside Enclosure
- I. Starting System: 12 volt, with negative ground.
1. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
 2. Cranking Cycle: As required by NFPA 110 for system level specified
 3. 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.
 4. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
 5. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
 6. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 100 A minimum continuous rating.
 7. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
 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.
 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.
 Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 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.

Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.03 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 also shuts 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 also shuts down generator set.
- C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages 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 Level 2 system, 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. Generator overload.
 - 11. Low fuel tank level.
- 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. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals.
- G. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 2 systems. Include necessary contacts and terminals in control and monitoring panel.
 - 1. Overcrank shutdown.
 - 2. Coolant low-temperature alarm.
 - 3. Control switch not in auto position.
 - 4. Battery-charger malfunction alarm.
 - 5. Battery low-voltage alarm.
- H. Common Remote Audible Alarm: 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.

1. Engine high-temperature shutdown.
 2. Lube-oil, low-pressure shutdown.
 3. Overspeed shutdown.
 4. Remote emergency-stop shutdown.
 5. Engine high-temperature prealarm.
 6. Lube-oil, low-pressure prealarm.
 7. Fuel tank, low-fuel level.
 8. Low coolant level.
- I. 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.
 - J. Remote Emergency-Stop Switch: Supplied in a break-glass type enclosure unless otherwise indicated; and labeled. Button shall be protected from accidental operation.

2.04 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Primary Generator Circuit Breaker: Molded-case, adjustable electronic-trip type; 100 percent rated; complying with UL 489.
 1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
 2. Trip Settings: Selected to coordinate with generator thermal damage curve.
 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.
- B. 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.
- C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.05 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: Dripproof.
- 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.

2.06 OUTDOOR GENERATOR-SET ENCLOSURE: LEVEL 1 SOUND ATTENUATED

- A. Description: Vandal-resistant, level 1 sound attenuated, weather protective steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
- B. Description: Prefabricated or pre-engineered enclosure with the following features:
 - 1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
 - 2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
 - 3. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
 - 4. Hinged Doors: With padlocking provisions.
 - 5. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
 - 6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
- C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within 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.
- D. Convenience Outlets: Factory wired GFCI. Arrange for external electrical connection.

2.07 FUEL OIL STORAGE

- A. Comply with NFPA 30.
- B. Base-Mounted Fuel Oil Tank: Factory installed and piped, double-walled sub-base steel tank, complying with UL 142 fuel oil tank. Features include the following:
 - 1. Tank level indicator.
 - 2. Capacity: Fuel for 37 hours (minimum) continuous operation at 100 percent rated power output. Minimum 693 usable gallon capacity.
 - 3. Vandal-resistant fill cap.
 - 4. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.08 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.
- B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
 1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
 2. Full load run.
 3. Maximum power.
 4. Voltage regulation.
 5. Transient and steady-state governing.
 6. Single-step load pickup.
 7. Safety shutdown.
 8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
 9. Report factory test results within 10 days of completion of test.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Owner and Engineer 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.

3.02 INSTALLATION

- A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 37 & 110.
- B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- C. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.03 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

3.04 IDENTIFICATION

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

3.05 FIELD QUALITY CONTROL

- A. 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.
- B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection (except those indicated to be optional) 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, single-step full-load pickup test.
 3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

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.
Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
Verify acceptance of charge for each element of the battery after discharge.
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. 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 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.

3.06 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

**SECTION 10 44 13
FIRE EXTINGUISHER CABINETS**

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed fire extinguisher cabinets.

1.2 RELATED WORK

- A. Section 06 10 00, Rough Carpentry.
- B. Section 06 20 00, Finish Carpentry.

1.3 SUBMITTALS

- A. Submit in accordance with Section 00 13 00, SUBMITTALS, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

1.4 APPLICATION PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
D4802-15 Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

Semi - Recessed type with flat trim of size and design shown.

Surface Mounted with flat trim of size and design shown.

2.2 FABRICATION

- A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.
- B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.
 - 1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1.
 - 2. Design doors to open 180 degrees.
 - 3. Provide continuous hinge, pull handle, and adjustable roller catch.

2.3 FINISH

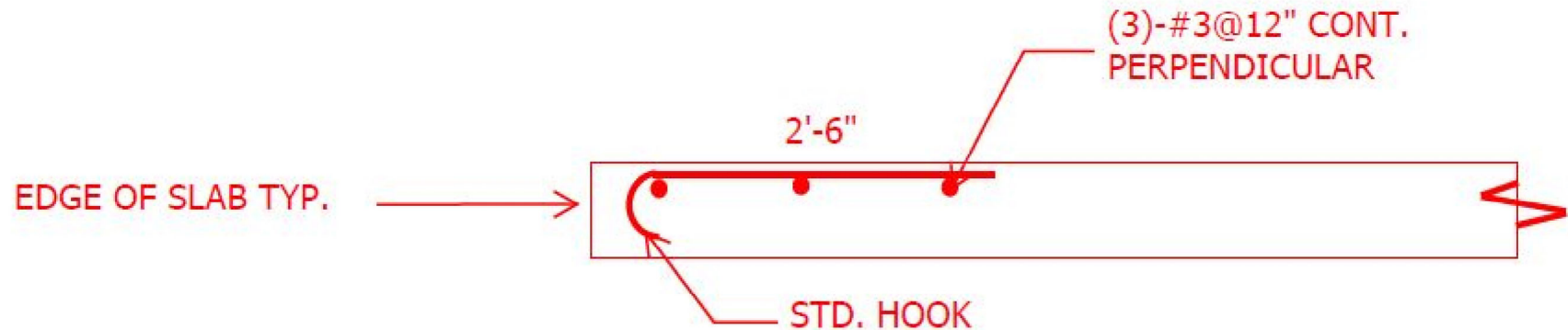
- A. Finish interior of cabinet body with baked-on semigloss white enamel.
- B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.

PART 3 - EXECUTION

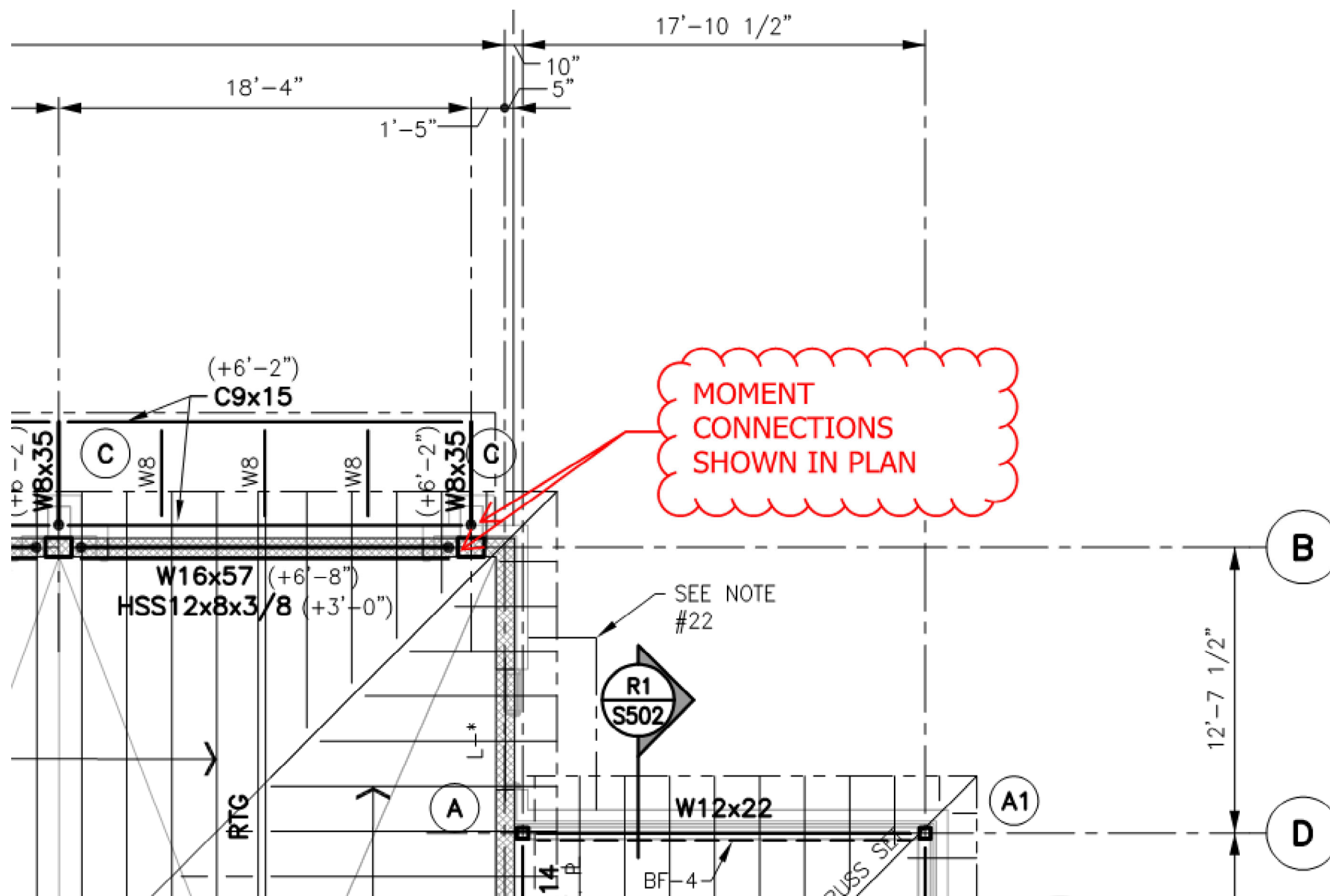
- A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.
- B. Install cabinet so that the extinguisher height within meets the requirements of NFPA 10

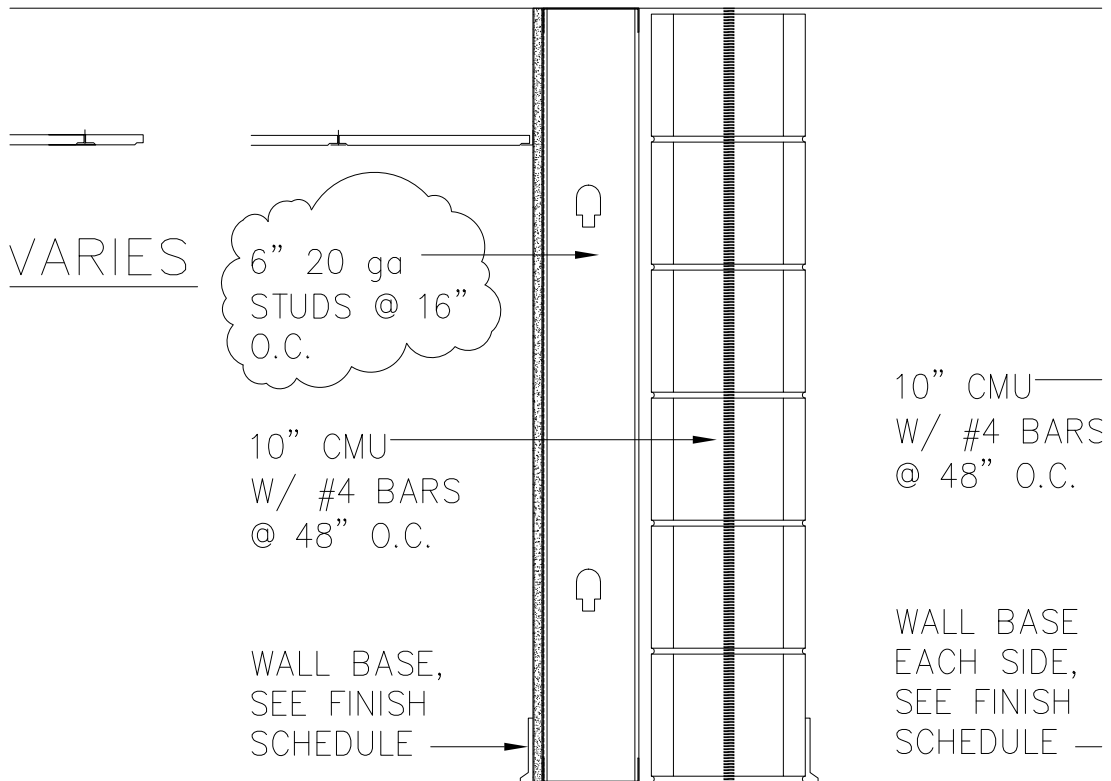
- - - E N D O F SECTION - - -

1. Please Confirm reinforcing at Mezzanine – See Drawing S201.
 - What is the length of the #4 @ 12" OC Top Hooked Bars at all formed slab edges?
 - #3 @ 12" OC continuous temp. reinforcing – do they run along the #4 bars or perpendicular? Through the entire metal deck or partial?



TYPICAL SLAB PERIMETER REINFORCEMENT

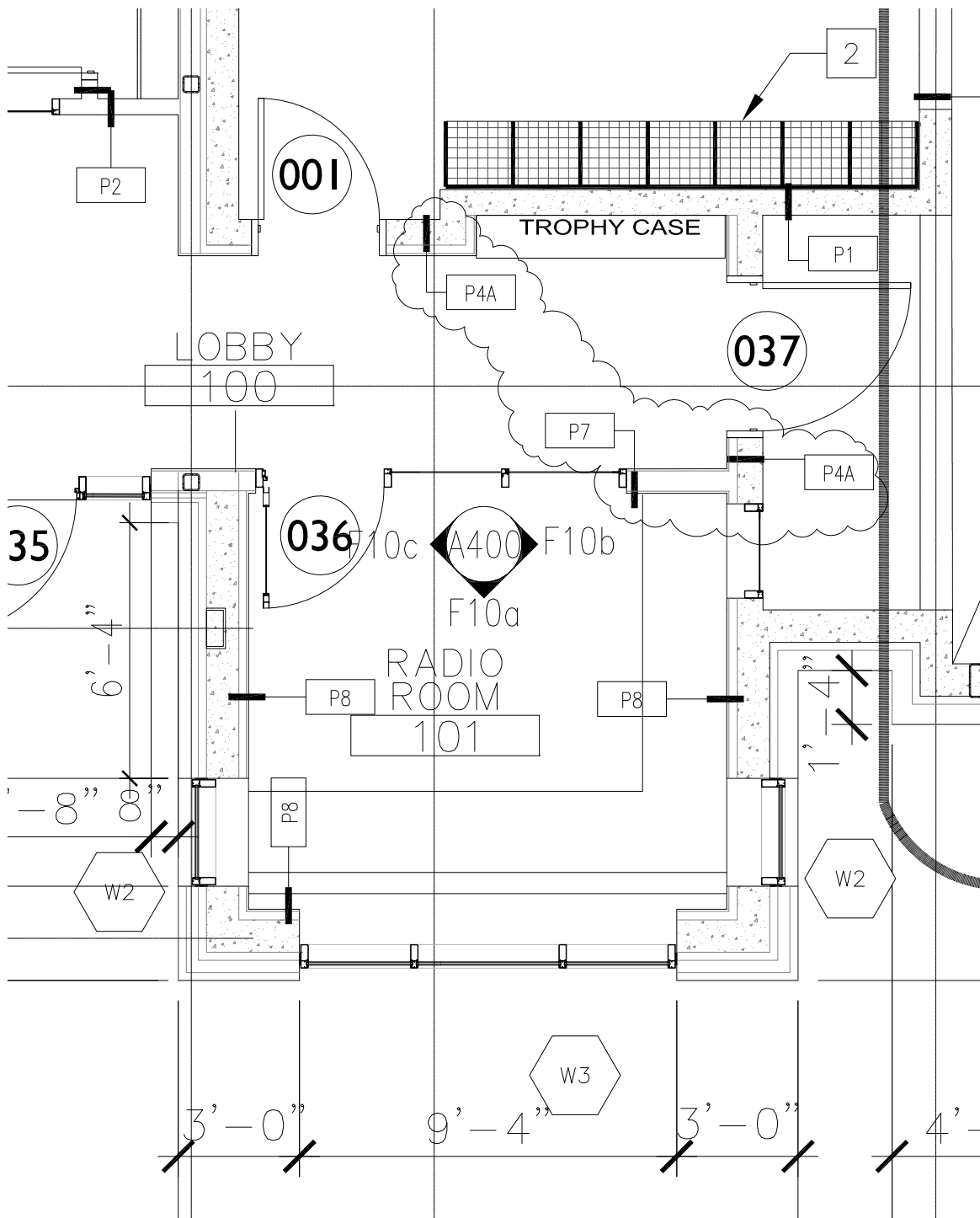


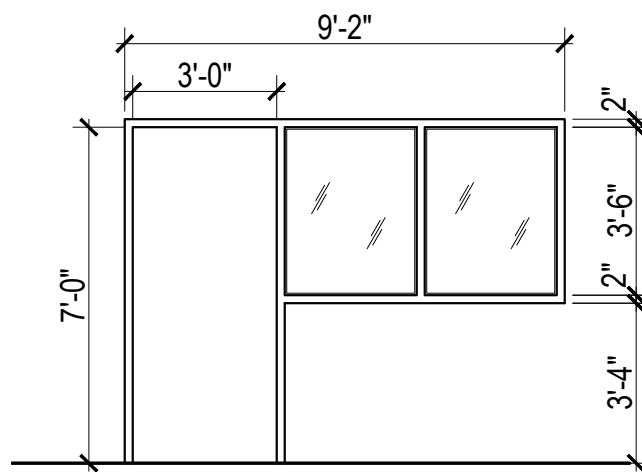


P-4

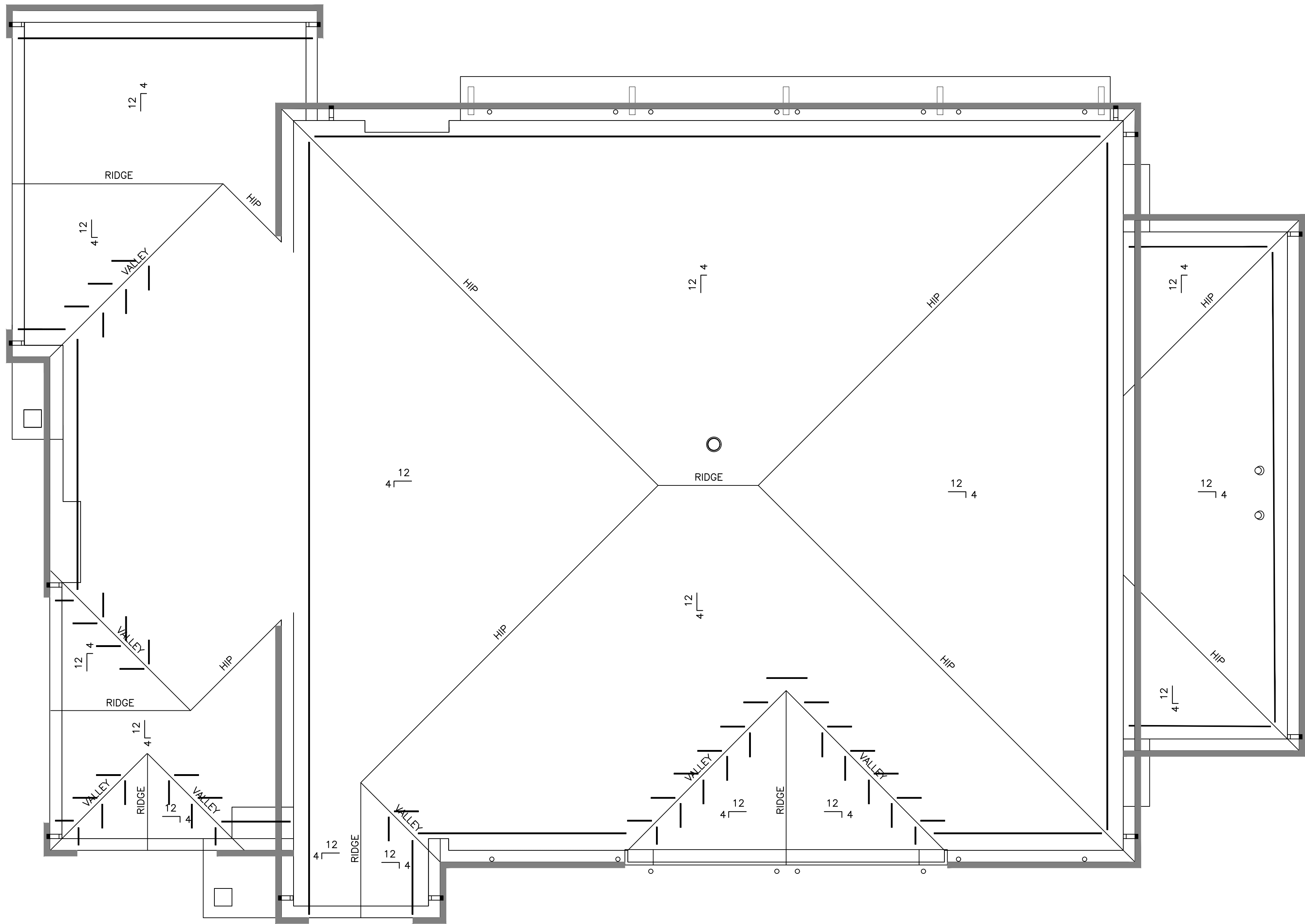
*FIRE RATED WALL

P-4A USE 2 1/2" 20 GA. METAL STUD IN
LIEU OF 6" & 8" CMU IN LIEU OF 10"





F5
SINGLE HINGED
DOOR FRAME
w/SIDELIGHT



- LEGEND
- ALIPNE 2 PIPE SNOW GAIRD
 - GUTTER
 - DOWNSPOUT LOCATION

ROOF PLAN

1/8"=1'-0"