SECTION  – insulated metal wall panels

1. General
   1. SUMMARY
      1. Section Includes:
         1. Laminated-insulation-core metal wall panels.
      2. Related Requirements:

Retain subparagraph below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

* + - 1. Section 04 20 00 – Unit Masonry.
      2. Section 05 40 00 – Cold-Formed Metal Framing.
      3. Section 06 10 00 – Rough Carpentry.
      4. Section 07 62 00 – Sheet Metal Flashing and Trim.
      5. Section 07 92 00 – Joint Sealants.
      6. Section 08 44 13 – Glazed Aluminum Curtain Walls.
      7. Section 09 29 00 – Gypsum Board.
  1. reference standards
     1. American Architectural Manufacturers Association (AAMA):
        1. AAMA 501.2: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
     2. American Society of Civil Engineers (ASCE):
        1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
     3. ASTM International:
        1. ASTM A755: Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
        2. ASTM A792: Standard Specification for Steel Sheet, 55 percent Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
        3. ASTM A924: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
        4. ASTM B117: Standard Practice for Operating Salt Spray (Fog) Apparatus
        5. ASTM C273: Standard Test Method for Shear Properties of Sandwich Core Materials.
        6. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
        7. ASTM D522: Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
        8. ASTM D523: Standard Test Method for Specular Gloss
        9. ASTM D714: Standard Test Method for Evaluating Degree of Blistering of Paints
        10. ASTM D968: Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
        11. ASTM D1308: Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
        12. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics
        13. ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics
        14. ASTM D1623: Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
        15. ASTM D1654: Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
        16. ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics
        17. ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
        18. ASTM D2244: Standard practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
        19. ASTM D2247: Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity
        20. ASTM D2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
        21. ASTM D3359: Standard Test Methods for Measuring Adhesion by Tape Test
        22. ASTM D3363: Standard Test Method for Film Hardness by Pencil Test
        23. ASTM D4145: Standard Test Method for Coating Flexibility of Prepainted Sheet
        24. ASTM D4214: Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
        25. ASTM D5894: Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV Condensation Cabinet)
        26. ASTM D6226: Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
        27. ASTM E72: Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
        28. ASTM E90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
        29. ASTM E283: Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
        30. ASTM E331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
        31. ASTM E413: Classification for Rating Sound Insulation
        32. ASTM G153: Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
        33. ASTM G154: Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
     4. National Fire Protection Agency (NFPA):
        1. NFPA 259: Standard Test Method for Potential Heat of Building Materials.
        2. NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
     5. UL Canada (ULC) Approvals:
        1. ULC-S102: Standard Method of Test for Surface Building Characteristics of Building Materials and Assemblies
  2. PREINSTALLATION MEETING

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

* + 1. Preinstallation Conference: Conduct conference at Project site.

If needed, insert list of conference participants not mentioned in Section 13100 "Project Management and Coordination."

Retain subparagraphs below if additional requirements are necessary; revise to include more specific information about conference.

* + - 1. Meet with Owner, Consultant, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
      2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
      3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
      4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
      5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
      6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
      7. Review temporary protection requirements for metal panel assembly during and after installation.
      8. Review procedures for repair of metal panels damaged after installation.
      9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
  1. action SUBMITTALS
     1. Product Data: For each type of product.
        1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
     2. Sustainable Design Submittals:
        1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.
     3. Shop Drawings:
        1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
        2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs below for two-stage Samples.

* + 1. Samples for Initial Selection: For each type of metal panel indicated with factory-applied colour finishes.
       1. Include similar Samples of trim and accessories involving colour selection.
    2. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
       1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.
    3. Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding L/180. Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout.
  1. informational submittals

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 01 45 00 – Quality Control and as may be supplemented in "Quality Assurance" Article.

* + 1. Qualification Data: For Installer.
    2. Product Test Reports: For each product, tests performed by a qualified testing agency.

Retain "Field quality-control reports" Paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + 1. Field quality-control reports.
    2. Sample Warranties: For special warranties.
  1. closeout submittals
     1. Maintenance Data: For metal panels to include in maintenance manuals.
  2. quality assurance
     1. Manufacturer Qualifications:
        1. Manufacturer shall have a minimum of five (5) years experience in the production of insulated wall panels. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.
        2. Manufacturer to be registered with a Program Operator with a Certified, Environmental Product Declaration, in conformance with ISO 14025, for Insulated Metal Panels.
     2. Installer Qualifications: Authorized by the manufacturer and the work shall be supervised by a person having a minimum of five (5) years experience installing insulated wall panels on similar type and size projects.
     3. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

Retain first subparagraph below for large-scale mock-up. Indicate portion of building represented by mock-up on Drawings or draw mock-up as separate element. Revise to suit Project or if larger mock-up is needed for field performance testing.

* + - 1. Build mock-up of typical metal panel assembly as shown on Drawings, including corner, supports, attachments, and accessories.
      2. Water-Spray Test: Conduct water-spray test of metal panel assembly mock-up, testing for water penetration according to AAMA 501.2.

Retain first subparagraph below if mockups are not only for establishing appearance factors.

* + - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Consultant specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 01 40 00 – Quality Requirements for demolishing and removing mockups.

* + - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  1. delivery, storage, and handling
     1. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
     2. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
     3. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
     4. Retain strippable protective covering on metal panels during installation.
  2. field conditions
     1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.
  3. COORDINATION
     1. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
  4. WARRANTY

When warranties are required, verify with Owner's counsel that special warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + 1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
       1. Failures include, but are not limited to, the following:
          1. Structural failures including rupturing, cracking, or puncturing.
          2. Deterioration of metals and other materials beyond normal weathering.

Verify available warranties and warranty periods for metal panels.

* + - 1. Warranty Period: Two (2) years from date of Substantial Completion.
    1. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

Usually retain "Exposed Panel Finish" Subparagraph below for fluoropolymer or siliconized-polyester finishes; verify availability with manufacturer.

* + - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
         1. Colour fading more than 5 Hunter units when tested according to ASTM D 2244.
         2. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
         3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
      2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

1. Products
   1. performance requirements
      1. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
         1. Wind Loads: As indicated on Drawings.
         2. Other Design Loads: As indicated on Drawings.
         3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
      2. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
      3. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
      4. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
         1. Temperature Change (Range): 180 deg F (100 deg C), material surfaces.
      5. Panels shall have a minimum sound transmission coefficient (STC) of 22 when tested in accordance with ASTM E90 and rated in accordance with ASTM E413.
      6. Humidity Test: Panels shall exhibit no delamination or metal interface corrosion when subjected to +140 deg. F temperature and 100 percent relative humidity for a total of 1200 hours (50 days).
      7. Autoclave Test: Panels shall exhibit no delamination or shrinkage/melting of the foam core from the metal skins after being subjected in an autoclave to a pressure of 2psig (13.8kPa) at a temperature of +218 deg. F (+103 deg. C) for a period of 2-1/2 hours.
      8. Thermal Properties: The panel shall provide a nominal R-value of 7.5 per inch thickness when tested in accordance with ASTM C518 at a mean temperature of 75 deg. F.
      9. Flame Spread and Smoke Developed Tests on exposed Insulating Core:
         1. Flame Spread: Less than 25.
         2. Smoke Developed: Less than 250.
         3. Tests performed in accordance with ULC-S102.
   2. LAMINATED-INSULATION-CORE METAL WALL PANELS
      1. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and core material laminated or otherwise securely bonded to facing sheets during fabrication without use of contact adhesives, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
      2. Shiplap-Edge, Laminated-Insulation-Core Metal Wall Panels **<Insert drawing designation>**: Formed with flush exterior panel facing and with shiplap edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips and fasteners; with factory-applied sealant inside laps.
         1. Basis-of-Design Materials - Non-Rated Panels:
            1. Norex-L Architectural Panel by Norex Architectural.
            2. Shadowline Insulated Metal Wall Panels by Kingspan Insulated Panels.
         2. Basis-of-Design Materials - Rated Panels:
            1. Norex Architectural Panel with Stone Fiber Core by Norex Architectural.
            2. MR Fire Rated Wall Panels by Kingspan Insulated Panels.
         3. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
            1. Nominal Thickness: **[0.028 inch (0.71 mm)] [0.034 inch (0.86 mm)] [0.040 inch (1.02 mm)] [0.052 inch (1.32 mm)]**.
            2. Exterior Finish: **[Two-coat fluoropolymer] [Three-coat fluoropolymer]**.

Adjust the following three paragraphs to reflect the exterior panel finish, colour and texture.

Colour: **[As indicated by manufacturer's designations] [Match Consultant's samples] [As selected by Consultant from manufacturer's full range] <Insert colour>**.

Profile description - Shadow Line: Linear striations nominal 0.094 inches deep "V" grooves at 2 -/2 inches on center.

Texture: Non-directional stucco embossed.

* + - * 1. Interior Finish: **[Siliconized polyester] <Insert finish>**.

Adjust the following three paragraphs to reflect the interior panel finish, colour and texture.

Colour: **[As indicated by manufacturer's designations] [Match Consultant's samples] [As selected by Consultant from manufacturer's full range] <Insert colour>**.

Profile description - Shadow Line: Linear striations nominal 0.094 inches deep "V" grooves at 2-1/2 inches on center.

Texture: Non-directional stucco embossed.

* + - 1. Core Material:

Retain "Polyisocyanurate Insulation," "Extruded-Polystyrene Board Insulation," or "Molded-Polystyrene Board Insulation" Subparagraph below.

* + - * 1. Polyisocyanurate Insulation: Closed cell, modified polyisocyanurate foam using a non-CFC blowing agent, board type, with a maximum flame-spread index of 25 and a smoke-developed index of 450.

Closed-Cell Content: 90 percent when tested according to ASTM D 6226.

Retain steel clips in "Clips" Subparagraph below for steel wall panels; retain stainless-steel clips for aluminum panels.

* + - 1. Clips: Manufacturer's standard one piece, formed from zinc-coated (galvanized) or stainless steel.
      2. Gaskets: Extruded, dry seal silicone.
      3. Sealant: Manufacturer's standard silicone.
      4. Panel Thickness: [1.0 inch (25 mm)] [2.0 inches (51 mm)] [3.0 inches (76 mm)] [4.0 inches (102 mm)] [5.0 inches (127 mm)] [6.0 inches (152 mm)] **<Insert dimension>**.

Coordinate R-value in "Thermal-Resistance Value (R-Value)" Subparagraph below with thickness retained in "Panel Thickness" Subparagraph above.

* + - 1. Thermal-Resistance Value (R-Value): <Insert R-value> according to ASTM C 1363.
  1. MISCELLANEOUS MATERIALS
     1. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

Retain panel accessories, flashing, and trim as required and coordinate with those specified in Section 07 62 00 – Sheet Metal Flashing and Trim.

* + 1. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
       1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
       2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
       3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
    2. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

Insert requirements for explosion-relief panels, including special fasteners, cables, and supports, if required. Verify availability with manufacturers.

* + 1. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching colour of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
    2. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
       1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
       2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
       3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
  1. FABRICATION
     1. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
     2. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

Retain first paragraph below if gaskets or sealants are factory installed.

* + 1. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
    2. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
       1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
       2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
       3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
       4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
       5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
       6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
          1. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.
  1. FINISHES
     1. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
     2. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
     3. Steel Panels and Accessories:

Retain one pof the following finishes from subparagraphs below.

* + - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in colour coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      2. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both colour coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-coloured acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).
    1. Paint Finish Characteristics:
       1. Gloss: 15 plus or minus 5 measured at 60-degree angle tested in accordance with ASTM D523.
       2. Pencil Hardness: HB-H minimum tested in accordance with ASTM D3363.
       3. Flexibility, T-Bend: 1-2T bend with no adhesion loss when tested in accordance with ASTM D4145.
       4. Flexibility, Mandrel: No cracking when bent 180 degree around a 1/8 mandrel as tested in accordance with ASTM D522.
       5. Adhesion: No adhesion loss tested in accordance with ASTM D3359.
       6. Reverse Impact: No cracking or adhesion loss when impacted 3000 x inches of metal thickness (lb-in), tested in accordance with ASTM D2794.
       7. Abrasion Resistance: Nominal 65 liters of falling sand to expose 5/32 inch diameter of metal substrate when tested in accordance with ASTM D968.
       8. Graffiti Resistance: Minimal effect.
       9. Acid Pollutant Resistance: No effect when subjected to 30 percent sulfuric acid for 18 hours, or 10 percent muriatic acid for 15 minutes when tested in accordance with ASTM D1308.
       10. Salt Fog Resistance: Passes 1000 hours, when tested in accordance with ASTM B117 (5 percent salt fog @ 95 deg. F).
       11. Cyclic Salt Fog and UV Exposure: Passes 2016 hours when tested in accordance with ASTM D5894.
       12. Humidity Resistance: Passes 1500 hours at 100 percent relative humidity and 95 deg. F, with a test rating of 10 when tested in accordance with ASTM D2247, and D714.
       13. Colour Retention: Passes 5000 hours when tested in accordance with ASTM G153 and G154.
       14. Chalk Resistance: Maximum chalk is a rating of 8 when tested in accordance with ASTM D4214, Method A.
       15. Colour Tolerances: Maximum of 5∆E Hunter units on panels when tested in accordance with ASTM D2244.
  1. WALL PANEL ASSEMBLY
     1. Panel thickness: 4Ø thick.
     2. Panel width: 42 Ø.
     3. Panel Lengths: Minimum 10 feet, maximum 48 feet.
        1. Panel Attachment: Shall consist of exposed fasteners and saddle clips.
        2. Exterior Face of Panel:
           1. Material:

Steel coil material shall be in accordance with ASTM A755: [AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.

Gauge: 26 gauge

* + - * 1. Profile description - Shadow Line: Linear striations nominal 0.094 inches deep ÓV Ø grooves at 2 1/2 inches on center.
        2. Texture: Non-directional stucco embossed.
        3. Exterior Paint Finish Colour: As selected from the manufacturers standard product line.

Finish System: 1.0 mil. Fluropolymer (PVDF) Two Coat system: 0.2 mil primer with 0.8 mil Kynar 500 (70 percent) SOLID colour coat.

* + - 1. Interior Face of Panel:
         1. Material:

Steel coil material shall be in accordance with ASTM A755: [AZ50 Galvalume®/ Zincalume® (55 percent aluminum, 45 percent zinc) in accordance with ASTM A792.

* + - * 1. Profile description - Shadow Line: Linear striations nominal 0.094 inches deep ÓV Ø grooves at 2 1/2 inches on center.
        2. Texture: Non-directional stucco embossed.
        3. Gauge: 26 gauge.
        4. Interior Paint Finish: Modified polyester, dry film thickness of 1.0 mil including primer; Colour: White.
      1. Insulation:
         1. Non-Rated Wall Panels: Spray-in expanding polyisocyanurate foam; Thickness: 4 Ø.

Basis of Design Material: Norex-L Architectural Panel by Norex Architectural or Shadowline Insulated Metal Wall Panels by Kingspan Insulated Panels.

* + - * 1. Rated Wall Panel Assemblies: Mineral Wool Insulation; Thickness: 4 Ø.

Basis of Design Material: Norex Architectural Panel with Stone Fiber Core by Norex Architectural or MR Fire Rated Wall Panels by Kingspan Insulated Panels.

1. Execution
   1. examination
      1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

Retain one or both subparagraphs below.

* + - 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
      2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking, and that installation is within flatness tolerances required by metal wall panel manufacturer.
         1. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
    1. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
    2. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. PREPARATION
     1. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
  2. METAL PANEL INSTALLATION
     1. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
        1. Shim or otherwise plumb substrates receiving metal panels.
        2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
        3. Install screw fasteners in predrilled holes.
        4. Locate and space fastenings in uniform vertical and horizontal alignment.
        5. Install flashing and trim as metal panel work proceeds.
        6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
        7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
        8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
     2. Fasteners:
        1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
        2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
     3. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
     4. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
        1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
        2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
  3. INSULATED METAL WALL PANEL INSTALLATION
     1. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
        1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
        2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
        3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
        4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
        5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
        6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
     2. Laminated-Insulation-Core Metal Wall Panels:
        1. Framed-Edge Panels: Mechanically attach wall panels through integral, extruded edge members to supports using self-tapping fasteners. Seal joints with manufacturer's standard gaskets.
     3. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
        1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
     4. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.
        1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
        2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
  4. FIELD QUALITY CONTROL

Retain "Testing Agency" Paragraph below to identify who shall perform tests and inspections. If retaining second option below, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

* + 1. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

Retain "Water-Spray Test" Paragraph below to check system's resistance to water penetration. Revise indicated test-area requirements to suit Project.

* + 1. Water-Spray Test: After installation, test area of assembly as directed by Consultant for water penetration according to AAMA 501.2.

Retain "Manufacturer's Field Service" Paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + 1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

See Section 01 40 00 – Quality Requirements for retesting and reinspecting requirements and Section 01 73 00 – Execution for requirements for correcting the Work.

* + 1. Metal wall panels will be considered defective if they do not pass test and inspections.
    2. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
    3. Prepare test and inspection reports.
  1. CLEANING AND PROTECTION
     1. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
     2. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
     3. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

END OF SECTION