SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers materials, labor and equipment required to complete the pre-engineered metal building shown and specified.

1.2 RELATED WORK

A. Concrete curbs and foundations: Section 03 30 53, CAST-IN-PLACE CONCRETE.

B. Doors and Frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.

C. Builders' Hardware: Section 08 71 00, DOOR HARDWARE.

D. Color of panels, and other components: Section 09 06 00, SCHEDULE FOR FINISHES.

E. Card readers and biometric devices: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.

F. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM.

1.3 MANUFACTURERS QUALIFICATIONS

A. Approval by Contracting Officer is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:

B. Manufacturer regularly and presently manufactures pre-engineered metal buildings as specified as one of its principal products.

C. Installer has technical qualifications, experience, trained personnel and facilities to install specified items. Approval will not be given, however, where experience record is one of unsatisfactory performance.

D. Manufacturer's product submitted has been in satisfactory and efficient operation on three installations similar and equivalent to this project for three years. Submit list of installations.

1.4 DESIGN CRITERIA

A. Design metal buildings to resist the dead load, the live load, and the combination of these loads as set forth in Metal Building Manufacturers Association (MBMA) "Recommended Design Practices Manual":

1. Roof Live Load: 122 Kg/m² (25 pounds per square foot) applied on horizontal projection of roof structure.
2. Wind Load: As required by International Building Code (IBC 2006).
3. Seismic loading as required by International Building Code (IBC 2006).

4. Auxiliary loads consisting of 10 pounds per square foot collateral load.

B. Deflection Limits (Live and Wind Loads Only):
1. Roof Framing: L/240.
2. Roof Panels: L/180.
3. Walls Panels: L/180, where L = Span length.

C. Metal Building components shall be capable of supporting design loads without permanent deformation, loss of watertightness, or disengagement of any part of installation.

D. Maximum "U" Value: Total "U" value through wall assembly shall not be greater than 0.052, and shall take infiltration and girts into account. Total "U" value through roof assembly shall not be greater than 0.035, and shall take infiltration and purlins into account.

E. Structural steel sections shall be designed in accordance with AISC, "Specification for Structural Steel Buildings". Light gage cold formed structural members shall be designed in accordance with latest edition of AISI, "Specifications for the Design of Light Gage Cold Formed Steel Structural Members". Welding shall comply with AWS Standard No. D1.1.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

B. Samples: Wall and roof panels, 600 mm (24-inch) wide by 300 mm (12 inch) high sections, with factory finish in specified colors. Fasteners for panels

C. Certificates:
1. Stating that the zinc coating on steel panels is the specified thickness.
2. Stating that the thermal values of the roof and wall panels with insulation meet the specified requirements.
3. Indicating manufacturers and installers meet qualifications specified.
4. Certificate test reports confirming compliance’s with specified bullet resistive rating.

D. Manufacturer's Literature and Data:
Metal Panels
Insulation
Sealing materials
Steel doors, door frames and hardware interlocking thresholds

E. Shop Drawings: Shop drawings, erection drawings and erection manuals showing complete erection layouts, installation instructions, and details of connections. Details and layouts shall show the steel framing location, lengths, and markings of panels and other component parts to correspond with sequence and procedure for erection. Shop drawings shall show connections with adjoining work.

F. Structural Design Analysis:

1. Furnish complete structural design analysis for all structural components of the prefabricated metal buildings.
2. Provide manufacturer load tables indicating the selected panel material, configuration and thickness meets the design requirements for the spans shown.

1.6 STORAGE AND PROTECTION

Materials stored on site before erection shall be stacked and covered with suitable weather tight covering. Store metal panels so that any accumulated water will drain off. Panels shall not be stored in contact with materials that cause staining. Materials having defects or damages that effect appearance, serviceability or use will be rejected.

1.7 WARRANTY

Prefabricated metal building shall be warranty against defects in materials and workmanship, and that after erection completed work shall be weather tight and shall be subject to the terms of the “Warranty of Construction” Article in FAR clause 52.246-21, except that the warranty period shall be two years.

1.8 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 Society for Testing and Materials (ASTM):

A36/A36M-08.....Carbon Structural Steel.

A242/A242M-04(R2009)....High-Strength Low-Alloy Structural Steel.

A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-alloy-Coated (Galvannealed) by the Hot-Dip Process

A792/A792M-10.....Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

A1008/A1008M-12.....Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy

A1011/A1011M-12.....Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy

B117-11.....Standard Practice for Operating Salt Spray (Fog)

B209/209M-10.....Aluminum and Aluminum-Alloy Sheet and Plate

C553-10.....Specifications for Mineral Fiber Blanket Thermal Insulation for Commercial and Insulation for Commercial and Industrial Applications

C1036-11.....Flat glass

C1104-00 (R2006).....Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation

D522-93(R2008).....Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings

D2244-11.....Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D2794-93(R2010).....Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation

D3359-09.....Standard Test Methods for Measuring Adhesion by Tape Test

D4214-07.....Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

G153-04(R2010).....Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

C. Metal Building Manufacturers Association (MBMA):

1. Recommended Guide Specifications for Pre-Engineered Metal Buildings.
2. Recommended Design Practices Manual.

D. American Institute of Steel Construction (AISC):

360-10.....Specifications for Structural Steel Buildings; Allowable Stress Design and Plastic Design (1989).

E. National Fire Protection Association (NFPA):

220-12.....Standard Types of Building Construction.

F. American Welding Society (AWS):
D1.1/D1.1M-10.....Structural Welding Code-Steel.

G. American Iron and Steel Institute (AISI):Cold Formed Steel Design Manual Latest Edition.

H. International Building Code, 2006 Edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Glass: ASTM C1036.

B. Steel Framing and Structural Steel Members: ASTM A36 or A242, except uncoated steel for light gage members shall conform to ASTM A1008 or A1011.

C. Panels:

1. Sheet Steel, galvanized light gage steel of specified thickness with an aluminum-zinc alloy coating conforming ASTM A653/A653M or ASTM A792/A792M.

2. Aluminum: Sheet aluminum shall conform to ASTM B209, alloy 3004.

D. Joint Sealant: Sealant shall be heat-resisting compound having low shrinkage factor; unaffected by water; with flash-point in excess of 400°C (750 degrees F). Sealant shall not migrate oil up to 120° (250 degrees F) nor exude oil under pressure. It shall not skin, sag, nor weep in panel joints under vibration up to temperature of 65°C (150 degrees F), nor become brittle at temperature down to -1°C (30 degree F).

E. Sealing Tape: Manufacturer's standard in color to match metal building panels.

F. Weatherstrips: Door manufacturer's standard approved products; closed cell neoprene or extruded vinyl.

G. Thresholds: Aluminum, interlocking type.

H. Blanket Insulation: Of thickness required to meet specified Maximum “U” value for wall and roof assemblies. Fiberglass blankets adhered to a facing sheet having an perm rating of 0.02 and consisting of 0.038 mm (0.0015 inch) thick UV-stabilized white polypropylene film laminated to 30 pound Kraft paper with an intermediate reinforcing layer of glass fiber and polyester scrim. Bearing the UL label not to exceed 25 flame spread rating.

2.2 FABRICATION

A. General: Coordinate fabrication and erection of work with related work of other trades. Provide cutouts and supplemental reinforcement as

required to accommodate materials and work specified in other sections of the specifications.

B. Protection of Dissimilar Metals: Dissimilar materials which are not compatible with adjoining materials when exposed to moisture shall be separated by means of coatings, gaskets, or other effective means.

C. Steel Framework Fabrication:

1. Framing, purlins, girts, struts and miscellaneous steel members required for attachment of pre-engineered metal building panels to building structure shall be roll formed members complying with either ASTM A1008/A1008M. Design, size, space and install members to meet job and loading conditions. Members shall have factory-punched holes and shall be furnished complete with angle clips and fastenings required for attaching to structure.
2. Bolted connections shall use either ribbed or high-tensile steel bolts as appropriate for each connection.
3. Welding shall be in accordance with AWS Standard. Operators shall be qualified as prescribed by American Welding Society. Certification shall be furnished upon request of Resident Engineer.

D. Wall Panels: Panels to be precision rolled and installed in accordance with the manufacturer’s instructions. Panels to be 3’ wide with four (4) major corrugations 1-1/4” (min.) high, 12” o.c., with two (2) minor corrugations between each of the major corrugations the entire length of the panel. Panels shall be one (1) piece from top of masonry banding to building roof line. Panels to be 26 gauge painted galvalume aluminum-zinc alloy per ASTM A792. Seal joints between panels with joint sealant as specified. Fasten panels to adjoining panels and to steel framework by method recommended by panel manufacturer and approved before work is started. Panel connections shall use painted galvanized steel, self tapping and backed with EPDM washer. Wall panels may be factory punched or field drilled.

E. Roof Panels: Panels to be precision rolled and installed in accordance with the manufacturer’s instructions. Panels to be 3’ wide with four (4) major corrugations 1-1/2” high, 12” o.c., with two (2) minor corrugations between each of the major corrugations the entire length of the panel. Panels to be 26 gauge painted galvalume aluminum-zinc alloy per ASTM A792. Sheets shall be applied with a minimum sidelap of not less than one full configuration, end laps shall be 6”. Panels shall be of maximum length to minimize end laps. End laps may be

factory punched, with top panel with a round hole and bottom panel with a slotted hole, or they may be field drilled.

F. Flashing, Trim And Closures: Same material, gage and finish as adjacent wall and roof panels. Fastenings shall be as specified for wall and roof panels. Form or mold closure strips to match configuration of the roofing or siding. Install closures wherever necessary to insure weather tight construction.

G. Hanging Gutters

1. Fabricate gutters of not less than the following:
   a. 0.6 mm (0.025 inch) thick painted galvalume aluminum-zinc alloy per ASTM A792.
2. Fabricate hanging gutters in 20 foot (min.) long sections, with expansion joints located to accommodate thermal lineal expansion of gutters.
3. Building side of gutter shall be not less than 38 mm (1 1/2 inches) higher than exterior side.
4. Gutter Bead: Stiffen outer edge of gutter by folding edge over approximately 19 mm (3/4 inch) toward roof and down approximately19 mm (3/4 inch) unless shown otherwise.
5. Gutter Spacers:
   a. Fabricate of same material and thickness as gutter.
   b. Fabricate 25 mm (one inch) wide strap and fasten to gutters not over 900 mm (36 inches) on center.
   c. Turn back edge up 25 mm (one inch) and lap front edge over gutter bead.
   d. Rivet and seal or solder to gutter.
6. Outlet Tubes:
   a. Form outlet tubes to connect gutters to conductors of same metal and thickness as gutters extend into the conductor 75 mm (3 inch). Flange upper end of outlet tube 13 mm (1/2 inch).
   b. Lock and seal or solder longitudinal seam.
   c. Seal or solder tube to gutter.
   d. Fabricate basket strainers of same material as gutters.
7. Gutter Brackets:
   a. Fabricate of same metal as gutter. Use the following:
      1) Painted galvalume aluminum-zinc alloy per ASTM A792.
   b. Fabricate to gutter profile.

c. Drill two 5 mm (3/16 inch) diameter holes in anchor leg for countersunk flat head screws.

H. Conductors (Downspouts)

1. Fabricate conductors of same metal and thickness as gutters in continuous sections [with 19 mm (3/4 inch) wide flat locked seams].
   a. Fabricate open face channel shape with hemmed longitudinal edges.
2. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.
3. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual Plate 34, Design C for rectangular shapes.

I. Snow Guards: Diamond-shaped polycarbonate; clear or colored to match roof panels color.

2.3 FACTORY FINISH AND PAINTING

A. Wall and roof panels, including related components, accessories and fastenings, shall have approved factory finish as follows:

1. Finish on the weather face of wall and roof panels, and related components shall be painted galvalume aluminum-zinc alloy per ASTM A792 with exterior colors of a full strength, 70% Kynar 500 or Hylar 5000 Fluoropolymer (PVDF) coating. Manufacturer shall warrant that coating shall not peel, crack or chip for 25 years. For a period of 25 years chalking shall not exceed ASTM D4214 #8 rating and will not fade more than 5 color difference units per ASTM D2244.

B. Steel framing members shall be given one coat of shop primer.

C. Field paint all exterior exposed fastenings to match adjacent panels.

D. Abraded surfaces shall be wire-brushed and touched up with the same materials as the shop prime or finish coat of paint.

E. For color of finish coat, see Section 09 06 00, SCHEDULE FOR FINISHES.

PART 3 - EXECUTION

3.1 ERECTION

A. Bolt settings and other dimensions shall be held to a tolerance of plus or minus 3 mm (1/8-inch). Use templates or other gaging devices to assure accurate spacing of anchor bolts. Bolt field connections unless otherwise shown or specified.

1. Set accurately bases or sill members to obtain uniform bearing and maintain established floor line elevation. Anchors and anchor bolts for securing members to concrete curb or structural steel sub-frame shall be of black steel, set accurately to templates and of proper size to adequately resist applicable design loads at the base.

B. Wall Panels: Panels shall be applied with configurations running in a vertical position. Supply panels in single lengths from base to eave with no horizontal joints, except at the junction of door units, louver panels, and similar openings. End laps for panels shall be not less than 100 mm (four inches). Walls shall be closed at base and eave, and around doors, frames, louvers, and other similar openings by flashings and/or formed closures to assure adequate weathertightness. Flashing or stops will not be required where weather-closed or approved self-flashing panels are used.

C. Roof Panels: Roof panels shall be applied with configurations running in direction of roof slope. Supply panels with no transverse joints except at junctions for roof openings and at roof ridge. Lay side laps away from prevailing winds, and seal side laps and end-laps of roof with roof joint sealant. Roof shall be flashed and/or sealed at ridge, at eaves and rakes, at projections through roof, and elsewhere as necessary to make roof weather tight. Flashing and/or caulking shall be accomplished in a manner that will assure complete weather-tightness and method to be used shall be subject to approval by Resident Engineer. Minimum end-laps for roofing and ridge caps for pre-engineered and factory-punched laps shall be 150 mm (six inches); other minimum end-laps shall be not less than 300 mm (12 inches).

1. Install insulation on interior face of roof sheets or panels as shown on approved shop drawings. Secure materials permanently in place and free of inordinate deflection. Finished work shall be neat, clean, uniform in appearance, and free of noticeable variations in color and texture.

D. Fasteners for Securing Roof and Wall Panels: Fastening method, size and spacing shall be as recommended by metal building manufacturer and as approved by Resident Engineer. Fasteners shall be non-corrosive and of design that will produce a weathertight connection. Clearly show fasteners and fastening method on shop and erection drawings. Field paint exterior exposed fastenings to match adjacent panels as specified in paragraph, FACTORY FINISH AND PAINTING.

E. Hanging Gutters

1. Hang gutters with high points equidistant from downspouts. Slope at not less than 1:200 (1/16 inch per foot).

F. Lap joints, except for expansion joints, at least 25 mm (one inch) in the direction of flow. Rivet and seal or solder lapped joints.

3. Support gutters in brackets spaced not more than 600 mm (24 inch) on centers, brackets attached to facial or wood nailer by at least two screws or nails.
   a. For copper or copper clad stainless steel gutters use brass or bronze brackets.
   b. For stainless steel gutters use stainless steel brackets.
   c. For aluminum gutters use aluminum brackets or stainless steel brackets.
   d. Use brass or stainless steel screws.
4. Secure brackets to gutters in such a manner as to allow free movement of gutter due to expansion and contraction.
5. Gutter Expansion Joint:
   a. Locate expansion joints midway between outlet tubes.
   b. Provide at least a 25 mm (one inch) expansion joint space between end baffles of gutters.
   c. Install a cover plate over the space at expansion joint.
   d. Fasten cover plates to gutter section on one side of expansion joint only.
   e. Secure loose end of cover plate to gutter section on other side of expansion joint by a loose-locked slip joint.
6. Outlet Tubes: Set bracket strainers loosely into gutter outlet tubes.

F. Conductors (Downspouts)

1. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.
2. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.

3. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

G. Snow Guards: Install in accordance with manufacturers instructions, using manufacturer’s standard gunnable adhesive or adhesive tape. Clean/prime roof surfaces with manufacturer’s recommended cleaner/primer prior to adhering snow guards to roof panels. Apply a continuous bead of clear silicone sealant around perimeter of base of each snow guard after adhering guard to roof panel surface.

H. Weatherproofing: Joints between exterior pre-engineered metal building components and other adjacent components and materials, except flashing of metal wall panels shall be designed for and shall receive sealing tapes, gaskets, sealant materials, metal flashing and other methods of sealing as required to provide weathertight joints. Workmanship for installing sealants shall comply with Section 07 92 00, JOINT SEALANTS. Joint sealing shall be installed under this section and shall be guaranteed as specified. Color of sealing materials shall match adjacent metal building components.

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