

SECTION 07 41 00
PRE-FINISHED METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural standing seam roof system.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - ROUGH CARPENTRY: Installation of Framing and Miscellaneous Wood Members.
- B. Section 07 21 00 - BUILDING INSULATION: Rigid insulation at insulated walls and roof decks.
- C. Section 07 60 00 - SHEET METAL FLASHING AND TRIM: Installation requirements.
- D. Section 07 92 00 - JOINT SEALANTS: Installation requirements.

1.3 REFERENCES

- A. 1996 Low Rise Building Systems Manual, Metal Building Manufacturers Association, Inc., Cleveland, OH, 1996.
- B. AISI CF00-01, "A Design Guide for Standing Seam Roof Panels", American Iron and Steel Institute, 2000.
- C. AISI CF97-01, "A Guide for Designing with Standing Seam Roof Panels", American Iron and Steel Institute, 1997.
- D. Aluminum Design Manual - 2000 Edition, Aluminum Association, Washington, D.C., 2000.
- E. ASTM A 653, "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," American Society for Testing and Materials, 1998.
- F. ASTM A 792a, "Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process," American Society for Testing and Materials, 1997.
- G. ASTM E 1514, "Specification for Structural Standing Seam Steel Roof Panel Systems," American Society for Testing and Materials, 1993.
- H. ASTM E 1592, "Test Method for Structural Performance of Sheet Metal Roof and Wall Systems by Uniform Static Air Pressure Difference," American Society for Testing and Materials, 1995.
- I. ASTM E 1646, "Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference," American Society for Testing and Materials, 1995.
- J. ASTM E 1680, "Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems." American Society for Testing and

Materials, 1995.

- K. Cold-Formed Steel Design Manual, American Iron and Steel Institute, Washington, D.C., 2002.
- L. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design, American Institute of Steel Construction, Chicago, IL, 1989.
- M. UL 580, "Tests for Uplift Resistance of Roof Assemblies", Underwriter's Laboratories, Inc., 1994.

1.4 ROOF SYSTEM REQUIREMENTS

A. Design Requirements:

1. The metal roof system shall be designed by the manufacturer as a complete system. Members and connections not indicated on the drawings shall be the responsibility of the Contractor. All components of the system shall be supplied by the same manufacturer.
2. Roof Panels: Steel panels shall be designed in accordance with the AISI Cold-Formed Steel Design Manual. Aluminum panels shall be designed in accordance with the Aluminum Design Manual.
3. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, $L/180$ for roof snow load (but not less than 20 psf (98 kg/sq m)).
4. Accessories and Fasteners: Accessories and fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity.
5. Design Loads: Design load application shall be in accordance with local building code and as indicated on Structural Contract Documents.
6. Dead Loads: The dead load shall be the weight of the metal roof system.
 - a. Collateral Loads shall not be applied to the roof panels. Collateral Loads consist of Sprinklers, Mechanical and Electrical Systems, and Ceiling, and shall not be attached to the roof panels.
7. Live Loads: The panels and concealed anchor clips shall be

capable of supporting a minimum uniform live load of 20 psf (98 kg/sq m).

8. Snow Loads: The design ground snow loads shall be as defined on the Contract Documents.
9. Wind Loads: The design wind loads shall be based on the wind criteria defined in the Structural Contract Documents.
10. Thermal Effects: Roof panels shall be free to move in response to the expansion and contraction forces resulting from temperature variation, as specified in the MBMA Metal Roofing Systems Design Manual.

B. Performance Requirements:

1. Uplift Resistance: Metal roof systems shall be tested in accordance with Underwriters Laboratories, Inc. (UL) Test Method 580 "Tests for Uplift Resistance of Roof Assemblies", Class 90 rating.
2. Negative Loading: Metal roof panel systems shall be tested in accordance with ASTM E 1592-95 for negative loading. Capacity for gauge, span or loading other than those tested may be determined by interpolating between test values only.
3. Water Leakage: Metal roof panel systems shall have no uncontrollable water leakage at a pressure differential of 6.24 psf (30.5 kg/sq m) when tested in accordance with ASTM E 1646-95.
4. Temporary Concentrated Loads: The panels and concealed anchor clips shall be capable of supporting a 250-pound (113.5 kg) temporary concentrated load at the panel mid-span in the installed condition. The load shall be applied over the entire panel width. The panels shall support this concentrated load without displaying permanent distortions that would affect the weathertightness of the metal roof system.

C. Framing Members Supporting the Metal Roof System:

1. Any additions/revisions to framing members supporting the metal roof system to accommodate the manufacturer/fabricator's design shall be the Contractor's responsibility, and shall be submitted for review and approval by the Engineer of Record.
2. Framing members and their connections shall be designed in accordance with AISC, AISI and LGSI design specifications

applicable. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, the provisions of the AISC Steel Design Guide Series 3 - Serviceability Design Considerations for Low-Rise Buildings.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 23.
- B. Product Data: Manufacturer's data sheets on each product to be used, including preparation recommendations, storage and handling requirements, and installation methods.
- C. Shop Drawings: Submit shop drawings showing methods of installation, elevations and plans of roof and wall panels, sections and details, specified loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied by the metal panel system manufacturer, and proposed identification of component parts and their finishes. Do not proceed with fabrication prior to approval of shop drawings. Shop drawings shall be prepared and sealed a professional engineer licensed in the jurisdiction of the project, and include the following:
 - 1. Submit engineering calculations defining cladding loads for zones based on specified building codes, allowable clip loads, and required number of fasteners to secure the panel clips to the designated substructure.
 - a. Compute suction loads on clip fasteners with full recognition of prying forces and eccentric clip loading.
 - b. Calculate holding strength of fasteners in accordance with submitted test data provided by fastener manufacturer based on length of embedment and properties of materials.
 - 2. Submit thermal calculations and details of floating clip, flashing attachments, and accessories, indicating the free movement in response to the expansion/contraction effects.
- D. Test Reports: Submit manufacturer's test reports for each system specified.
- E. Installer Certification: Submit a letter from the manufacturer certifying the installer of the metal panel system as an authorized installer, approved by the manufacturer within the last year prior to the start of the installation of the metal panel system.
- F. Selection Samples: For each finish product specified, two complete

sets of color chips representing manufacturer's full range of available colors and patterns.

1. Submit samples and color chips for all proposed finishes.
 2. Submit one 12-inch (305 mm) long sample of panel, including clips.
 3. Submit two 3 inch by 5 inch (76 mm by 127 mm) color chip samples of selected color.
- G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
1. Submit samples and color chips for all proposed finishes.
 2. Submit one 12 inch (305 mm) long sample of panel, including clips.
 3. Submit two 3 inches by 5 inches (76 mm by 127 mm) color chip samples in color selected.
- H. Roof Inspection for Weathertightness Warranty: Submit with documentation as specified in this Section.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a minimum of ten years experience in manufacturing metal roof systems. Panels specified in this section shall be produced in a permanent factory environment with fixed-base roll-forming equipment.
- B. Installer Qualifications: Installer shall have completed five projects of similar scope and magnitude that have been in service for a minimum of two years with satisfactory performance of the roof system. Installer's foreman shall be trained in the proper installation of the specified system, and present at all times when material is being installed.
- C. Regulatory Requirements: Comply with specified performance and local building code requirements. In the event of conflict, comply with the higher performing or more restrictive requirement.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.

Mock-up may become part of the finished installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to job site properly packaged to provide protection against transportation damage.
- B. Exercise extreme care in unloading, storing and installing metal panel system to prevent bending, warping, twisting and surface damage.
- C. Store all material and accessories above ground on well supported platforms. Store under waterproof covering. Provide proper ventilation of metal panel system to prevent condensation build-up between each panel or trim/flashing component.
- D. Store products in manufacturer's unopened packaging until ready for installation.

1.8 WARRANTY

- A. Finish Warranty: Manufacturer warrants that under normal outdoor atmospheric conditions the roof and wall panels will meet the following requirements:
 - 1. Fluorocarbon (PVDF):
 - a. The paint film will not crack, flake, chip or peel for a period of 45 years.
 - b. The paint will not chalk in excess of number 8 rating for a period of 35 years.
 - c. The paint will not fade in excess of 5 NBS Units for a period of 35 years.
- B. Roofing Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weather tight, including leaks, within specified warranty period
 - 1. 20 years from date of substantial completion.
 - 2. Full system warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: AEP SPAN - Texas, which is located at 5100 E. Grand Avenue, Dallas, TX 75223; Toll Free Tel: 800-527-2503; Tel 214-827-1740; Fax 214-828-1394; Tech Support: 800-527-2503.
- B. Acceptable Manufacturer: Metal Sales Mfg. Corp., which is located at: 7800 St. Rd. 60 ; Sellersburg, IN 47172; Toll Free Tel: 800-

406-7387; Tel: 812-246-1935; Fax: 812-246-0829; Email:

info@metalsales.us.com; Web: www.metalsales.us.com

1. Metal Sales - Temple, TX, 3838 North General Bruce Drive,
Temple, TX 76501-6505 Toll Free Tel: 800-543-4415, Tel: 254-
791-6650, Toll Free Fax: 800-543-4473 Fax: 254-791-6655

- C. Substitutions: Items of same function and performance acceptable in conformance with instructions to Bidders.

2.2 STRUCTURAL STANDING SEAM ROOF SYSTEM

- A. Design and engineering is based on AEP SPAN or the Magna-Loc roof panel system as manufactured by Metal Sales Manufacturing Corporation.

1. Profile: 18 inch (457 mm) width with a 2 inch (51 mm) rib height.
2. Seam Type: Mechanically seamed, 90 degree.
3. Texture: Pencil rib.
4. Clip Type: Low, fixed, 2-3/8 inches (60 mm) tall.
5. Minimum Thickness: Panel to meet all specified design loads, but not less than 24 gauge (0.024 inches, 0.607 mm).
6. Fastening System: Concealed, floating or fixed clip.
7. Panel Base Material: Steel grade 50, per ASTM A 792.
8. Finish: Custom, multi-pass Kynar. Primer is 0.8 mil, topcoat is 0.8 mil, clear coat is 0.8 mil, total dry film thickness is 2.4 mil.
9. Color: as indicated on Color Finish Schedule.

2.3 MATERIALS

- A. Fasteners:

1. Fasteners for steel roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon-capped steel, type and size specified below, or as otherwise, approved for the applicable requirements. Fasteners for aluminum roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear ultimate strengths of not less than 750 pounds (340 kg) per fastener. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be sealed or have sealed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with

the screw head; have a minimum diameter of 3/8-inch (9.5 mm) for structural connections; and gasket portion of fasteners or washers shall be neoprene or other equally durable elastomeric material.

2. Exposed fastener color shall match panel, trim or accessories.
3. Screws: as determined by manufacturer to suit specified performance requirements.
4. Blind Rivets: Solid-threaded, sealed stem type with EPDM washer under head.
5. Exposed rivets shall match color finish of panel.

B. Components:

1. Components shall be compatible with the metal panel furnished. Flashing, trim, metal closure strips, caps, gutters, downspouts, roof curbs, and similar metal components shall not be less than the minimum thickness specified by the metal panel system manufacturer. Exposed metal components shall be finished to match the panels or trim, as furnished. Molded closure strips shall be closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride pre-molded to match configuration of the covering and shall not absorb or retain water. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the Manufacturer.

C. Sealants:

1. All tape sealant is to be a pressure sensitive, 100 percent solid, sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape sealant approved by the metal panel system manufacturer.
2. The metal panel system manufacturer shall approve all joint sealant that will come into contact with the metal panel system.

D. Prefabricated Pipe Flashing:

1. Pipe flashings provided by metal roof manufacturer shall provide a weather tight joint at projections through the roof, taking into account the thermal movement of the roof and the service temperature of the projection. Pipe flashings shall have an aluminum-flanged base ring.

E. Accessories:

1. Provide manufacturer's standard accessories and other items essential to completeness of roof installation including anchor clips, trim, ridge and hip caps, closures, flashing, and fascia.
2. Form flashings from same gauge and finish as metal panels.

F. Closures:

1. Precut profile closure from cross-linked, closed cell polyethylene composition foam.
2. Protect and support ridge and hip foam closures by a formed metal closure manufactured from same material, with same color and finish as metal panels.
3. Ridge closures: Factory-fabricated and hip closures field cut.
4. Closures, Flashing and Trim: Shall be of same material, gauge, finish and panels.

G. Round Penetrations: Premolded EPDM boot with metal collar.

1. Dektite by Buildex or approved substitute.

H. Vapor Retarder: Permeance of 0.05 or less as determined by ASTM E 96.

I. Slip - Sheeting: Red Rosin Paper at areas where roof system contacts weather treated wood blocking.

J. Felt underlayment (solid substrate) 30 lb (13.6 kg), asphalt saturated fiberglass felt, non-perforated.

2.4 FABRICATION FOR SHEET METAL ROOF COMPONENTS

A. All steel to be correctively leveled and handled to minimize stress and waviness of sheet steel.

B. Form and fabricate sheets, seams, strips, clips, valleys, ridges, edge treatments, integral flashings, and other components of the metal roof to the profiles, patterns, and drainage arrangements as determined by Architect, to provide permanent leakproof construction, with no oil canning or panel distortion.

1. Fabricate exposed items of prefinished sheet metal, color to match panels.
2. Hem exposed edges on underside 3/8 inch (10mm) to 1/2 inch (12 mm) miter and seam corners.
3. Provide for thermal expansion and contraction of the Work.
4. Seal joints to achieve leakproof construction per

manufacturer's detail.

- C. Provide factory eave notch for eave termination (to be utilized with joggle cleat detail).
- D. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- E. Unless otherwise shown on drawings or specified herein, panels shall be full length. Fabricate flashings and accessories in longest practical lengths.
- F. Metal panels shall be factory formed. Field formed panels are not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. The Contractor shall verify installed work of other trades that such work is complete to a point where the metal panel system installation may commence.
- C. Verify that the substructure installation is in accordance with the approved shop drawings and metal panel system manufacturer's requirements.
- D. This specifically includes verifying that secondary structural members and/or decking are installed to meet performance requirements. Coordinate with metal panel system manufacturer to ensure that the substructure is installed to accommodate the appropriate clip spacing.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Roof deck substrate specified in Section 06100.
 - 1. Solid 5/8 inch (16 mm) minimum thickness plywood substrate.
 - a. Provide one layer of felt with horizontal overlaps and end laps staggered between layers.
 - b. Lay parallel to ridgeline with 2 1/2 inch (64 mm)

horizontal laps and 6 inch (152 mm) vertical laps.

c. Start application at low point; work up roof laying plies in shingle fashion.

2. Insulated metal deck with 5/8 inch (16 mm) minimum thickness nailable substrate.

D. Clean surfaces thoroughly prior to installation.

3.3 INSTALLATION

A. Install the metal panel system plumb, true and in correct alignment with support, in accordance with manufacturer's instructions and approved installation drawings.

B. Installer must be a Metal Panel Manufacturer's Approved Installer.

C. Install the metal panel system so that it is weathertight and allows for thermal movements.

D. Locate and space all exposed fasteners in accordance with the metal panel system manufacturer's recommendations. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

E. Avoid placing pipe penetrations through the panel seams.

F. Do not allow panels or trim to come into contact with dissimilar materials (i.e. Copper, lead, graphite, treated lumber, mortar, etc.). Water run-off from these materials is also prohibited.

G. Comply with metal panel system manufacturer's approved installation drawings, instructions and recommendations for installation of curbs. Refer to metal panel system manufacturer's standard installation details.

3.4 WEATHERTIGHTNESS INSPECTION

A. The metal roof manufacturer shall provide inspection by their approved technical inspectors to approve the metal roof system installation drawings and inspect the installation of the metal roof system at the following stages of installation:

1. Initial inspection prior to installation of roof panels. The purpose of this inspection is to review the final approved installation drawings, verify substrate installation, review installation procedures, and agree upon the scheduling of the intermediate inspections.

2. Intermediate inspections will include the review of the installed product in compliance with the final approved

installation drawings and manufacturer's installation procedures.

3. Final inspection at the completion of all metal roof system work.
- B. The metal roof component manufacturer's inspector shall provide written and photographic reports. The certified installation contractor shall make all necessary corrections, additions or remedial actions to resolve any issues identified in the reports.
- C. The metal roof component manufacturer's inspector shall have the authority to have roof work corrected, as required, to insure the proper installation and weathertightness of the metal roof system, in accordance with the manufacturer's specifications.

3.5 PROTECTION

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

- - - END - - -