

Metal Roofing Systems Performance Guide Specification



This guide specification is intended for use on projects where the Structural Standing Seam Roof System (SSSRS) is supplied as an item separate from the building's structural system. There are a number of provisions in the specification which are not appropriate for roofing systems supplied as part of a complete building system. For roof systems supplied with a metal building system, the user is referred to the Metal Building Manufacturers Association *Metal Building Systems Performance Guide Specification*. *The user is also cautioned that some provisions may not be applicable for all projects.*

DISCLAIMER: Use of this Specification is voluntary. Each roof system designer retains the prerogative to choose their own design and commercial practices and the responsibility to design and specify a roofing system to comply with applicable state and local codes, end user specifications, local conditions, and safety considerations.

Although every effort has been made to present accurate and sound information, MBMA assumes no responsibility whatsoever for the application of this information to the design, specification or construction of any specific roof system. *MBMA expressly disclaims all liability for damages of any sort whether direct, indirect or consequential arising out of the use, reference to or reliance on this Specification or any of its contents. MBMA makes no warranty, express or implied, as to any particular roof system or this Specification. MBMA specifically disclaims any warranties of merchantability or fitness for a particular purpose.*

Specifier: The Notation [**Specifier Note:**] means that the following text is a specifier's note or sample.

PART 1 – GENERAL

1.01 DESCRIPTION

A. General

1. Furnish all labor, material, tools, equipment and services for all preformed roofing as indicated, in accord with the provisions of the Contract Documents. The Metal Roofing Manufacturer will provide all components required for a complete metal roofing system to include panels, panel clips, trim/flashing, fascias, ridge, closures, sealants, fillers and any other required items.
2. Completely coordinate with work of all other trades.
3. See Division 1 for General Requirements.

B. Related work specified elsewhere

1. Structural steel: Section 05 10 00.
2. Metal joists and metal framing: Section 05 20 00 or 05 40 00.
3. Flashing and sheet metal: Section 07 60 00.

[Specifier Note: Applicable standards listed below are based in part on those used in the International Building Code - 2012 Edition. Delete standards not used, based on the building code chosen in Section 1.04B and add any standards that become pertinent.]

1.02 QUALITY ASSURANCE

A. Applicable standards

1. AISC 360, *Specification for Structural Steel Buildings*, American Institute of Steel Construction, Chicago, IL, 2010.
2. AISI D111, *Design Guide for Cold-Formed Steel Purlin Roof Framing Systems*, American Iron and Steel Institute, Washington, D.C., 2009.
3. AISI S100, *North American Specification for the Design of Cold-Formed Steel Structural Members*, Washington, D.C., 2007, with Supplement 1, dated 2010.
4. ADM1, *Aluminum Design Manual*, Aluminum Association, Arlington, VA, 2010.
5. ASTM A653, *Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*, American Society for Testing and Materials, West Conshohocken, PA, 2008.
6. ASTM A792, *Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process*, American Society for Testing and Materials, West Conshohocken, PA, 2008.
7. ASTM E1514, *Standard Specification for Structural Standing Seam Steel Roof Panel Systems*, American Society for Testing and Materials, West Conshohocken, PA, 1998(2003).
8. ASTM E1592, *Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference*, American Society for Testing and Materials, West Conshohocken, PA, 2005.
9. ASTM E1646, *Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference*, American Society for

- Testing and Materials, West Conshohocken, PA, 1995(2003).
10. ASTM E1680, *Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems*, American Society for Testing and Materials, West Conshohocken, PA, 1995(2003).
 11. MBMA, *Metal Building Systems Manual*, Metal Building Manufacturers Association, Inc., Cleveland, OH, 2006 with 2010 Supplement (updated expected in 2012).
 12. MBMA, *Metal Roofing Systems Design Manual*, Metal Building Manufacturers Association, Inc., Cleveland, OH, 2000 (update expected in 2012).
 13. SJI K-1.0, *Standard Specification for Open Web Steel Joists, K-series*, Steel Joist Institute, Forest, VA, 2010.
 14. UL 580, *Tests for Uplift Resistance of Roof Assemblies*, Underwriters Laboratories, Inc., Northbrook, IL, 2006, with Revisions through July, 2009.

B. Manufacturer's qualifications

1. Manufacturer shall have a minimum of three years experience in manufacturing metal roofing systems [and shall be accredited under the International Accreditation Service, "Accreditation Criteria for Inspection Programs for Manufacturers of Cold-Formed Steel Structural and Nonstructural Components Not Requiring Welding (AC473)" or "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (AC472)"]. Panels specified in this section shall be produced in a permanent factory environment with fixed-base roll-forming equipment. A letter from the manufacturer certifying the manufacturer's qualifications shall accompany the product material submittals.

C. The Installer shall meet the following minimum criteria

- a. Maintain a minimum \$250,000 general liability coverage for each loss.
- b. Maintain worker's compensation coverage, as mandated by law.
- c. Have no viable claims pending regarding negligent acts or defective workmanship on previously or current projects.
- d. Have not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.
- e. Have received specific training in the proper installation of the specified system and will be present to supervise whenever material is being installed.
- f. Have installed 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.

D. Installation quality control

1. The general contractor shall provide a third party metal roof consultant, working for the general contractor and approved by the SSSRS Manufacturer, to approve the metal roofing system installation drawings and inspect the installation of the metal roofing system at the following progress stages of installation:
 - a. Initial inspection prior to installation of roof panels will include the review of the final approved installation drawings, verification of substrate installation, review of the installation procedures, and agreement upon the scheduling of the intermediate inspections.

- b. Intermediate inspections will include the review of the installed product in compliance with the final approved installation drawings and manufacturer's installation procedures.
 - c. Final inspection at the completion of all metal roofing system work in accordance to the manufacturer's installation drawings. [**Specifier Note:** These inspections may not necessarily satisfy each manufacturer's particular requirements for issuance of a warranty.]
2. The third party metal roof consultant shall provide written and photographic reports, to be submitted to the architect (owner), metal roofing system installation contractor and general contractor, appraising the installation of the metal roofing system at each of the project progress stages. The installation contractor shall make all necessary corrections, additions or remedial actions to resolve issues raised in the reports.
 3. The third party metal roof consultant shall have the authority to have any and all roofing work corrected, as required, to insure the proper installation and weathertightness of the metal roofing system, in accordance with the manufacturer's specifications and installation procedures.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Performance Testing

1. Metal roofing systems shall be tested in accordance with UL580, Class 90 rating. [**Specifier Note:** The Metal Roofing System must be installed in accordance with an applicable UL construction method from the current *UL Roofing Materials and Roofing Systems Directory*. Specifier is responsible for insuring that the bid documents comply with the approved UL assemblies.]
2. Metal roof panel systems shall be tested in accordance with ASTM E1592 for negative loading. Capacity for gauge, span or loading other than those tested is permitted to be determined by interpolating between test values only.
3. Metal roof panel systems shall have a maximum air infiltration rate of 0.007 cfm/ft² at a pressure differential of 6.24 psf. when tested in accordance with ASTM E1680.
4. Metal roof panel systems shall have no water leakage at a pressure differential of 6.24 psf when tested in accordance with ASTM E1646.
5. The panels and concealed anchor clips shall be capable of supporting a 300-pound 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 SSSRS.

1.04 DESIGN REQUIREMENTS

A. General

1. The SSSRS 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 or specified by the same manufacturer.

B. Design Loads

1. Design load application shall be in accordance with [**Specifier Note:** (Choose one and specify year or edition) IBC, MBMA, SBCCI, UBC, BOCA, ASCE-7 or an applicable national or local building code].
2. Dead Loads
 - a. The dead load shall be the weight of the SSSRS. Collateral Loads shall be as shown on the contract drawings. Collateral Loads shall not be applied to the roof panels. [**Specifier Note:** Collateral Loads consist of Sprinklers, Mechanical and Electrical Systems, and Ceilings, and shall not be attached to the roof panels.]
3. Live Loads
 - a. The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20 psf.
4. Snow Loads
 - a. The design ground snow loads shall be as defined on the contract drawings. [**Specifier Note:** All sources of snow drifting should be identified in the contract documents, i.e. adjacent structures, roof height changes, etc.]
5. Wind Loads
 - a. The design wind speed for the metal roofing system shall be as defined on the contract documents. [**Specifier Note:** The design wind speed must be identified as either “fastest mile” or 3-second gust as appropriate to the applicable code.]
6. Thermal Effects
 - a. 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*.
7. Rainfall Intensity
 - a. All exterior gutters and downspouts shall be designed for rainfall intensity based upon a 5-year recurrence interval for a five-minute duration. All interior gutters, valleys and downspouts shall be designed for rainfall intensity based upon a 25-year recurrence interval based on a five-minute duration. [**Specifier Note:** Rainfall intensity can be found in the *Metal Roofing Systems Design Manual*.]

C. Framing Members Supporting the SSSRS

1. Any additions/revisions to framing members supporting the SSSRS 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. New or revised framing members and their connections shall be designed in accordance with [AISC 360] [AISI S100] [SJI K1.1] design specifications. Deflection requirements shall be in accordance with the applicable building code, or as a minimum, the provisions of the AISC Steel Guide Series 3 – *Serviceability Design Considerations for Steel Buildings, 2nd Edition*.

[**Specifier Note:** Select design specification for paragraph C.1.]

D. Roof Panels

1. Steel panels shall be designed in accordance with the AISI S100.
2. 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).

E. Accessories and Their Fasteners

1. Accessories and their 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.

1.05 SUBMITTALS

A. Installation Drawings

1. Submit completed installation drawings and installation details by the manufacturer, to the architect (owner) for review. Do not proceed with manufacture prior to review and architectural approval of installation drawings. Do not use drawings prepared by the architect (owner) for installation drawings.
2. Installation drawings shall show 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 roofing system manufacturer, and proposed identification of component parts and their finishes.

B. Calculations (All calculations noted below shall be reviewed and sealed by a Licensed Professional Engineer.)

1. Submit engineering calculations defining cladding loads for all roof areas based on specified building codes, allowable clip loads, and required number of fasteners to secure the panel clips to the designated substructure.
2. Compute uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading.
3. Calculate holding strength of fasteners in accordance with submitted test data provided by Fastener Manufacturer based on length of embedment and properties of materials.
4. Submit drainage calculations for valley, gutter, and downspout design.
5. Submit thermal calculations and details of floating clip, flashing attachments, and accessories, indicating the free movement in response to the expansion/contraction effects.

C. Physical Samples

1. Submit samples and color chips for all proposed finishes.
 - a. Submit one 12-inch long sample of panel, including clips.
 - b. Submit two 3-inch x 5-inch color chip samples in color selected by the architect (owner).

D. Test Reports

1. Submit test report showing that metal panels have been tested in accordance with ASTM E1592.

2. Submit test report showing that metal panels meet the water penetration requirements of ASTM E1646.
3. Submit test report showing that metal panels meet the air infiltration requirements of ASTM E1680.

E. Metal Roofing System Fabrication Certification

1. Submit a letter from the SSSRS manufacturer verifying that the SSSRS has been produced in a plant that is accredited under the IAS AC472 or AC473 program.

F. Third Party Metal Roof Consultant Approval

1. Submit a letter from the Metal Roofing System manufacturer, indicating acceptance of the general contractor's third party metal roof consultant, for use on this specific project.

G. Installation contractor's qualifications

1. Submit a letter from the manufacturer identifying the installer of the metal roofing system as an authorized installer, approved by the manufacturer [within the last ____ year(s)] prior to the start of the installation of the metal roofing system.

H. Metal roofing system installation inspection reports

1. Submit written and photographic SSSRS installation inspection reports from the general contractor's third party metal roof consultant appraising the installation of the metal roofing system. The written and photographic inspection reports shall be submitted to the architect (owner), metal roofing system installation contractor and general contractor.
2. A separate report shall be submitted for each of the following stages of the metal roofing system installation
 - a. Prior to the installation of the metal roofing panels to verify the proper installation of the substrate. The roof consultant shall be only responsible for assuring that the substrate is in suitable condition for the installation of the SSSRS.
 - b. [] Intermediate inspections to ensure proper installation of the SSSRS. [**Specifier Note:** It is up to the Specifier to determine the number of Intermediate Inspections based on the scope of the project.]
 - c. At final completion of all metal roofing system work.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Deliver metal roofing system to job site properly packaged to provide protection against transportation damage.

B. Handling

1. Exercise care in unloading, storing and installing metal roofing system to prevent bending, warping, twisting and surface damage.

C. Storage

1. Store all material and accessories above ground on well supported platforms. Store under waterproof covering. Provide proper ventilation of metal roofing system to prevent condensation build-up between each panel or trim/flashing component.

PART 2 – PRODUCTS; [Vertical Rib Structural Standing Seam] [Trapezoidal Rib Structural Standing Seam] (Panel rib height not less than 2 inches) [**Specifier Note:** Minimum roof slope is 1/4 on 12, however, some manufacturers' products have other minimum slope requirements.]

2.01 MATERIALS

A. Metal roof panel

1. Profile: [] inch high rib x [] inch wide panel. [**Specifier Note:** Provide nominal dimensions.]
2. Seam Type: [Interlocking / Snap Connection] [Mechanically Seamed]
3. Minimum Thickness: Panel to meet all specified design loads, but not less than 0.023 inches (24 Gauge).
4. Panel Base Material
 - a. Galvanized steel sheet, G90, conforming to ASTM A653
 - b. Galvalume® steel sheet, AZ50, conforming to ASTM A792 for painted and unpainted panels.
 - c. Galvalume® steel sheet, AZ55, conforming to ASTM A792 for unpainted panels.
5. Texture: [**Specifier Note:** Choose one.]
 - a. Smooth.
 - b. Embossed [**Specifier Note:** Minimum recommended slope of 3:12 for embossed panels.]
6. Finish
 - a. Selected from manufacturer's standard offering.
 - b. Factory Color Finish: [**Specifier Note:** Choose one.]
 1. Thermoset silicone polyester.
 2. Fluoropolymer coating produced with minimum 70% PVDF resin.
 3. Clear acrylic-coated Galvalume®. [**Specifier Note:** The acrylic coating is applied for fabrication and installation purposes only, and may add additional cost to the project.]
 4. Bare, uncoated Galvalume®.

B. Concealed Anchor Clips

1. Concealed anchor clips shall be the same as those used during the testing of the roof system. Clip bases shall have factory punched or drilled holes for attachment. Clips shall be made from multiple pieces with the allowance for the total thermal movement required within the clip. Fixed clips are permitted when the manufacturer can substantiate that the system can accommodate the thermal cyclic movement under sustained live or snow loads.

2.02 Miscellaneous 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 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 for structural connections; and gasket portion of fasteners or washers shall be neoprene or other equally durable elastomeric material. [**Specifier Note:** If exposed fastener color must match panel, trim or accessories, fastener color must be specified.]

B. Components

1. Components shall be compatible with the roof 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 SSSRS 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 SSSRS Manufacturer.

C. Sealants

1. All tape sealant shall 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 SSSRS Manufacturer.
2. The SSSRS Manufacturer shall approve all joint sealant that will come into contact with the SSSRS.

2.03 FABRICATION

- A. Panels shall be produced by a SSSRS Manufacturer meeting the requirements of section 1.02B.
- B. Fabricate trim, flashing and accessories to Manufacturer's specified profiles.

2.04 PREFABRICATED CURBS AND EQUIPMENT SUPPORTS

- A. General: Provide the SSSRS Manufacturer with the dimensions, weights and model number of the units to be supported by the curb(s).
- B. Fabricate curbs of structural quality aluminum, Galvalume®, or hot-dipped galvanized sheet. Curbs shall have welded joints unless a two-piece curb is required. Provide integral base plates and water diverters/crickets. Front base plate shall be extended up-

slope from the beginning of the water diverter. Curbs shall be designed for a compatible installation with the panel system. [**Specifier Note:** If curb finish is to match roof panel finish, the finish must be specified.]

- C. Curbs shall be constructed to match the roof slope and provide a mounting surface as required by the rooftop unit manufacturer.
- D. Submit roof curb manufacturer's shop drawings to SSSRS Manufacturer for approval before fabrication of curbs.
- E. Any curb structural support system shall allow thermal movement of the curb with the roofing system.

2.05 PREFABRICATED PIPE FLASHINGS

- A. Pipe flashings shall provide a weathertight 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.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Examination
 - 1. The Contractor shall verify installed work of other trades that such work is complete to a point where the roofing system installation may commence.
 - 2. Verify that the substructure installation is in accordance with the approved shop drawings and SSSRS Manufacturer's requirements. This specifically includes verifying that secondary structural members and/or decking are installed to meet performance requirements. Coordinate with SSSRS Manufacturer to ensure that the substructure is installed to accommodate the appropriate clip spacing.
- B. Discrepancies
 - 1. In event of discrepancy, notify the architect (owner).
 - 2. Do not proceed with installation until discrepancies have been resolved.

3.02 INSTALLATION

- A. Install the SSSRS in accordance with manufacturer's instructions and approved installation drawings.
- B. Install the SSSRS so that it is weathertight and allows for thermal movements.
- C. Locate and space all exposed fasteners in accordance with the SSSRS Manufacturer's recommendations. Use torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.

- D. Avoid placing pipe penetrations through the panel seams.
- E. 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.
- F. Comply with SSSRS Manufacturer's approved installation drawings, instructions and recommendations for installation of roof curbs. Refer to SSSRS Manufacturer's standard installation details. Anchor curbs securely in place with provisions for thermal and structural movement.

3.03 CLEANING, PROTECTION

- A. Dispose of excess roofing materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions per the SSSRS Manufacturer's recommendations.

END OF SECTION

To ensure you have the latest information available, please
visit our web site at <http://www.mbma.com>.