

SECTION 13 34 19

METAL BUILDING SYSTEMS

01/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- AISC 325 (2005) Manual of Steel Construction
- AISC 341 (2005; Supp 2005) Seismic Provisions for Structural Steel Buildings
- AISC 350 (2005) Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings
- AISC 360 (2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN IRON AND STEEL INSTITUTE (AISI)

- AISC/AISI 121 (2004) Standard Definitions for Use in the Design of Steel Structures
- AISI SG03-3 (2002) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

- ASCE/SEI 7-05 (2006) Minimum Design Loads for Buildings and Other Structures, Including Supplement No. 1

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.1/A5.1M (2004; Errata 2004) Carbon Steel Electrodes for Shielded Metal Arc Welding
- AWS D1.1/D1.1M (2008) Structural Welding Code - Steel
- AWS D1.3/D1.3M (2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

- ASTM A 1008/A 1008M (2008a) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened

ASTM A 1011/A 1011M	(2008) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
ASTM A 123/A 123M	(2008) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2007) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325	(2007a) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 463/A 463M	(2006) Standard Specification for Steel Sheet, Aluminum-Coated
ASTM A 500/A 500M	(2007) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(2007) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 529/A 529M	(2005) Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A 53/A 53M	(2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 563	(2007a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 572/A 572M	(2007) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 606	(2004) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A 653/A 653M	(2007) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or

	Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 755/A 755M	(2003; R 2008) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A 780	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 792/A 792M	(2008) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A 992/A 992M	(2006a) Standard Specification for Structural Steel Shapes
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 221M	(2007) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C 920	(2005) Standard Specification for Elastomeric Joint Sealants
ASTM DEF	(2005) ASTM Dictionary of Engineering Science and Technology, 10th Edition
ASTM E 119	(2007a) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM F 436	(2009) Hardened Steel Washers
ASTM F 844	(2007a) Washers, Steel, Plain (Flat), Unhardened for General Use
	METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
MBMA MBSM	(2002) Metal Building Systems Manual
	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
NAAMM AMP 500	(2006) Metal Finishes Manual
	NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
NRCA RWM	(2003) Roofing and Waterproofing Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION
(SMACNA)

SMACNA 1793 (2006) Architectural Sheet Metal Manual,
Sixth Edition, Second Printing

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC A (2000) Good Painting Practice Steel
Structures Painting Manual, Volume 1

SSPC Paint 15 (1999; R 2004) Steel Joist Shop
Primer/Metal Building Primer

SSPC SP 2 (1982; E 2004) Hand Tool Cleaning

1.2 GENERAL REQUIREMENTS

1.2.1 Structural Performance

Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within the limits and conditions indicated.

1.2.1.1 Engineering

Design metal building systems conforming to procedures described in MBMA MBSM.

1.2.1.2 Design Loads

Conform to the requirements of MBMA MBSM, ASCE/SEI 7-05, and the building code applicable to the project geographical location.

Include all loads induced by the building occupancy indicated on the drawing, Structural General Notes, as well as loads induced by maintenance workers, and materials.

1.2.1.3 Collateral Loads

Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings. Collateral load is 10 pounds per square foot.

1.2.1.4 Load Combinations

Design metal building systems to withstand the most critical effects of load factors and load combinations as required by MBMA MBSM, ASCE/SEI 7-05, and the building code applicable to the project location.

1.2.1.5 Deflection Limits

Engineer assemblies to withstand design loads with deflections no greater than the following:

- a. Purlins and Rafters: vertical deflection of 1/180 of the span.
- c. Metal Roof Panels: vertical deflection of 1/180 of the span.

Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings. Provide metal panel assemblies capable of withstanding the effects of loads and stresses indicated.

1.2.2 Seismic Performance

Design and engineer metal building system capable of withstanding the effects of earthquake motions determined according to [ASCE/SEI 7-05](#), [AISC 341](#), and the applicable portions of the building code in the geographic area where the construction will take place, as noted on the Drawing Structural General Notes.

1.2.3 Thermal Movements

Provide metal panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

1.2.4 Wind-Uplift Resistance

Provide metal roof panel assemblies that comply with the building code in the geographic area where the construction will take place.

1.3 DEFINITIONS

[ASTM DEF](#) applies to this definition paragraph.

- a. Bay: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured normal to end wall (outside face of end-wall) for end bays.
- b. Building Length: Dimension of the building measured perpendicular to main framing from end wall to end wall (outside face of girt to outside face of girt).
- c. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).
- d. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame or knee).
- e. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).
- f. Clear Height under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, not including crane supports, located within clear span.
- g. Terminology Standard: Refer to MBMA "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in

referenced standards.

1.4 SYSTEM DESCRIPTION

Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, metal roof panels, and accessories complying with requirements indicated.

Provide metal building system of size and with spacing, slopes, and spans indicated.

1.4.1 Primary Frame Type

Rigid Clear Span: Solid-member, structural-framing system without interior columns.

1.4.2 Secondary Frame Type

Provide manufacturer's standard purlins or joists.

1.4.3 Eave Height

Eave height shall be as indicated on the Drawings.

1.4.4 Bay Spacing

Bay Spacing shall be as indicated on the Drawings.

1.4.5 Roof Slope

Roof slope shall be as indicated on the Drawings.

1.4.6 Roof System

Provide manufacturer's standard metal roof panels.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G, AE

SD-02 Shop Drawings

Detail Drawings; G, AE

SD-03 Product Data

Manufacturer's catalog data; G, AE

SD-04 Samples

Manufacturer's standard color charts and chips, 4 by 4 inches; G, AE

SD-05 Design Data

Manufacturer's descriptive and technical literature; G, AE

Manufacturer's building design analysis; G, AE

SD-06 Test Reports

Test reports; G, AE

Coatings and base metals; G, AE

Factory Color Finish Performance Requirements; G, AE

SD-07 Certificates

System components ; G, AE

SD-08 Manufacturer's Instructions

Installation of Roof panels; G, AE

Shipping, handling, and storage; G, AE

SD-11 Closeout Submittals

Manufacturer's Warranty; G, AE

Contractor's Warranty for Installation; G, AE

1.6 QUALITY ASSURANCE

1.6.1 Pre-Erection Conference

After submittals are received and approved but before metal building system work, including associated work, is performed, the Contracting Officer will hold a pre-erection conference to review the following:

- a. The detail drawings, specifications, and manufacturer's descriptive and technical literature.
- b. Finalize construction schedule and verify availability of materials, erector's personnel, equipment, and facilities needed to make progress and avoid delays.
- c. Methods and procedures related to metal building system erection, including, but not limited to: qualification of manufacturer, qualification of erector, manufacturer's catalog data, building design analysis, written instructions and test reports.
- d. Support conditions for compliance with requirements, including alignment between and erection of structural members.
- e. Flashing, special roofing and siding details, roof penetrations,

openings, and condition of other construction that will affect metal building system, including [coatings and base metals](#), [factory color finish performance requirements](#), and [system components](#).

- f. Governing regulations and requirements for, certificates, insurance, tests and inspections, if applicable.
- g. Temporary protection requirements for metal panel assembly during and after installation.

1.6.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products, erection of structural framing and [installation of roof panels](#) in the geographical area where construction will take place.

1.6.3 [Manufacturer's Qualifications](#)

Metal building system manufacturer must have a minimum of five (5) years experience as a qualified manufacturer of metal building systems and accessory products.

Provide engineering services by an authorized currently licensed engineer in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in building design analysis, protocols and procedures for the "Metal Building Systems Manual" the building code in the geographic area where the construction will take place.

Provide engineering calculations, to be stamped and signed by a registered Civil or Structural Engineer currently licensed in the State of California, using the products submitted for:

- a. Roof Dead and Live Loads per drawing Structural Construction Notes.
- b. Collateral Loads (10 psf).
- c. Wind Loads per drawing Structural Construction Notes.
- d. Seismic Loads per drawing Structural Construction Notes.

1.6.4 Qualification of Erection Contractor

An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and must be approved and certified by the metal building system manufacturer.

1.6.5 Single Source

Obtain primary and secondary components and structural framing members, each type of metal roof, clips, closures and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.6.6 Welding

Qualify procedures and personnel according to [AWS A5.1/A5.1M](#), [AWS D1.1/D1.1M](#),

and AWS D1.3/D1.3M.

1.6.7 Structural Steel

Comply with AISC 325, AISC 350, and AISC 360, for design requirements and allowable stresses.

1.6.8 Cold-Formed Steel

Comply with AISC/AISI 121 and AISI SG03-3 for design requirements and allowable stresses.

1.6.9 Fire-Resistance Ratings

Where indicated, provide metal panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6.10 Fabrication

Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles with dimensional and structural requirements

Provide metal panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Aluminum and aluminum-alloy sheet and plate must conform to ASTM B 209.

Fabricate metal panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

- a. 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.
- b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
- c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
- e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA or by metal building system manufacturer for application, but not less than thickness of metal being secured.

1.6.11 Finishes

Comply with **NAAMM AMP 500** for recommendations for applying and designating finishes.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1.7 SHIPPING, HANDLING AND STORAGE

1.7.1 Delivery

Package and deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed and protected during transportation and handling.

Stack and store metal panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Store in a manner to prevent bending, warping, twisting, and surface damage. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage. Retain strippable protective covering on metal panel for entire period up to metal panel installation.

1.8 PROJECT CONDITIONS

1.8.1 Weather Limitations

Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing panel system or building.

1.8.2 Field Measurements

1.8.2.1 Established Dimensions for Foundations

Comply with established dimensions on approved anchor-bolt plans, established foundation dimensions, and proceed with fabricating structural framing. Do not proceed without verifying that column anchor bolt templates are coordinated with the foundation so they fit. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.

1.8.2.2 Established Dimensions for Metal Panels

Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.8.2.3 Verification Record

Verify locations of all framing and opening dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03 31 00.00 10 CAST-IN-PLACE STRUCTURAL CONCRETE.

Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak-proof, secure, and non-corrosive installation.

1.10 WARRANTY

1.10.1 Building System Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal building system. The warranty period is to be no less than 5 years from the date of acceptance of the work and be issued directly to the Government. The warranty must provide that if within the warranty period, the metal building system shows evidence of deterioration resulting from defective materials and/or workmanship, correcting of any defects is the responsibility of the metal building system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal building system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and will not void the warranty.

1.10.2 Roof System Weather-Tightness Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel system. The warranty period is to be no less than 10 years from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the roof panel system shows evidence of corrosion, perforation, rupture, lost of weather-tightness or excess weathering due to deterioration of the panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Repairs that become necessary because of defective materials and workmanship while roof panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

1.10.3 Roof Panel Finish Warranty

Furnish manufacturer's no-dollar-limit warranty for the metal panel system. The warranty period is to be no less than 10 years from the date of acceptance of the work and be issued directly to the Government.

The warranty is to provide that if within the warranty period the metal panel system shows evidence of checking, delaminating cracking, peeling or excess weathering due to deterioration of the panel system resulting from

defective materials and finish or correction of the defective workmanship is to be the responsibility of the metal building system manufacturer.

Liability under this warranty is exclusively limited to replacing the defective coated materials.

Repairs that become necessary because of defective materials and workmanship while roof and wall panel system is under warranty are to be performed within 32 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 32 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 STRUCTURAL FRAMING MATERIALS

2.1.1 W-Shapes

ASTM A 992/A 992M; ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.2 Channel, Angles, M-Shapes and S-Shapes

ASTM A 36/A 36M; ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.3 Plate and Bar

ASTM A 36/A 36M, ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.4 Steel Pipe

ASTM A 36/A 36M, ASTM A 53/A 53M, ASTM A 572/A 572M or ASTM A 529/A 529M.

2.1.5 Cold-Formed and Hot Formed Hollow Structural Sections

Cold formed: ASTM A 500/A 500M or ASTM B 221, ASTM B 221M.

Hot-formed: ASTM A 501.

2.1.6 Structural-Steel Sheet

Hot-rolled, ASTM A 1011/A 1011M or cold-rolled, ASTM A 1008/A 1008M.

2.1.7 Metallic-Coated Steel Sheet

ASTM A 653/A 653M, ASTM A 606.

2.1.8 Metallic-Coated Steel Sheet Pre-painted with Coil Stock Coating

Steel sheet metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, and ASTM A 123/A 123M.

b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, and ASTM A 463/A 463M.

2.1.9 High-Strength Bolts, Nuts, and Washers

ASTM A 325, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

Finish: Hot-dip zinc coating, ASTM A 153/A 153M.

2.1.10 Non-High-Strength Bolts, Nuts, and Washers

ASTM A 307, ASTM A 563, and ASTM F 844.

Finish: ASTM A 153/A 153M.

2.1.11 Anchor Rods

ASTM A 307.

- a. Configuration: Straight.
- b. Nuts: ASTM A 563 hex carbon steel.
- c. Plate Washers: ASTM A 36/A 36M carbon steel.
- d. Washers: ASTM F 436 hardened carbon steel.
- e. Finish: Plain.

2.1.12 Primer

SSPC-Paint 15, Type I, red oxide.

2.2 FABRICATION

2.2.1 General

Comply with MBMA MBSM - "Metal Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

2.3 STRUCTURAL FRAMING

2.3.1 General

Clean all framing members to remove loose rust and mill scale. Provide 1 shop coat of primer to an average dry film thickness of 1 mil according to SSPC SP 2. Balance of painting and coating procedures must conform to SSPC Paint 15 and SSPC A.

2.3.2 Primary Framing

Manufacturer's standard structural primary framing system includes transverse and lean-to frames; rafter, rakes, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing designed to withstand required loads and specified requirements. Provide frames with attachment plates, bearing plates, and splice members. Provide frame span and spacing indicated.

Shop fabricate framing components by welding or by using high-strength bolts to the indicated size and section with base-plates, bearing plates, stiffeners, and other items required. Cut, form, punch, drill, and weld framing for bolted field erection.

Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

2.3.3 Secondary Framing

Manufacturer's standard secondary framing members, including purlins, headers, jambs, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet pre-painted with coil coating, unless otherwise indicated.

Shop fabricate framing components by roll-forming or break-forming to the indicated size and section with base-plates, bearing plates, stiffeners, and other plates required for erection. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

- a. Purlins: C or Z-shaped sections; fabricated from steel sheet, built-up steel plates, or structural-steel shapes; minimum depth as required to comply with system performance requirements.
- b. Eave Struts: Unequal-flange, C-shaped sections; fabricated from steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for metal panels.
- c. Flange Bracing: Structural-steel angles or cold-formed structural tubing to stiffen primary frame flanges.
- d. Sag Bracing: Structural-steel angles.
- e. Base or Sill Angles: Zinc-coated (galvanized) steel sheet.
- f. Purlin Clips: Steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
- g. Framing for Openings: Channel shapes; fabricated cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
- h. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

2.3.4 Bracing

Provide adjustable wind bracing as follows:

- a. Bracing: Provide wind bracing using any method specified below, at manufacturer's option. No bracing will be allowed in walls
- b. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- c. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
- d. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

2.4 PANEL MATERIALS

2.4.1 Steel Sheet

Roll-form steel roof panels. Material must be plumb and true, and within the tolerances listed:

- a. Galvanized Steel Sheet conforming to [ASTM A 653/A 653M](#) and [AISI SG03-3](#).
- c. Individual panels to have continuous length to cover the entire length of any unbroken roof slope with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.
- d. Provide panels with thermal expansion and contraction consistent with the type of system specified;

Profile and coverage shall be a minimum height and width from manufacturer's standard for the indicated roof slope and canopy layout.

2.4.2 Finish

All panels are to receive a factory-applied finish consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

- a. Metal Preparation: All metal is to have the surfaces carefully prepared for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.
- b. Prime Coating: A base coat of epoxy paint, specifically formulated to interact with the top-coat, is to be applied to the prepared surfaces by roll coating to a dry film thickness of 0.20 + 0.05 mils. This prime coat must be oven cured prior to application of finish coat.
- c. Exterior Finish Coating: Apply the finish coating over the primer by roll coating to dry film thickness of 0.80 + 5 mils (3.80 + 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 + 0.10 mils (4.00 + 0.10 mils for Vinyl Plastisol). This finish coat must be oven-cured.
- d. Interior Finish Coating: Apply a wash-coat on the reverse side over the primer by roll coating to a dry film thickness of 0.30 + 0.05 mils for a total dry film thickness of 0.50 + 0.10 mils. The wash-coat must be oven-cured.
- e. Color: The exterior finish chosen from the [manufacturer's standard color charts and chips](#).

2.4.3 Repair Of Finish Protection

Repair paint for color finish enameled metal panel must be compatible paint of the same formula and color as the specified finish furnished by the metal panel manufacturer, conforming to [ASTM A 780](#).

2.5 MISCELLANEOUS METAL FRAMING

2.5.1 General

Cold-formed metallic-coated steel sheet conforming to [ASTM A 653/A 653M](#).

2.6 FASTENERS

2.6.1 General

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to substrates in accordance with the metal panel manufacturer's and [ASCE/SEI 7-05](#) requirements.

2.6.2 Exposed Fasteners

Fasteners for metal panels to be corrosion resistant coated steel, aluminum, stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories to be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick.

2.6.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.6.4 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with [ASTM A 653/A 653M](#) or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.7 ACCESSORIES

2.7.1 General

All accessories to be compatible with the metal panels; sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the metal panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips to be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.7.2 Roof Accessories and Specialties

Roof curbs, equipment supports, roof hatches, dropout-type heat and smoke vents, hatch-type heat and smoke vents, gravity and roof ridge ventilators, wall louvers and other miscellaneous roof and wall equipment or penetrations conforming to AAMA, ASTM, and UL.

2.7.3 Joint Sealants

2.7.3.1 Sealants

Sealants are to be an approved gun type for use in hand or air-pressure caulking guns at temperatures above 40 degrees F 4 degrees C (or frost-free application at temperatures above 10 degrees F minus 12 degrees C) with minimum solid content of 85 percent of the total volume. Sealant is to dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the metal panel manufacturer.

2.7.3.2 Shop-Applied

Sealant for shop-applied caulking must be an approved gun grade, non-sag one component polysulfide or silicone conforming to [ASTM C 920](#), Type II, and with a curing time to ensure the sealant's plasticity at the time of field erection.

2.7.3.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to [ASTM C 920](#), Type II. Color to match panel colors.

2.7.3.4 Tape Sealant

Pressure sensitive, 100% solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the metal panel manufacturer.

2.8 SHEET METAL FLASHING AND TRIM

2.8.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in [SMACNA 1793](#) that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.9 FINISHES

2.9.1 General

Comply with [NAAMM AMP 500](#) for recommendations for applying and designating finishes.

2.9.2 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 the 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.

PART 3 EXECUTION

3.1 EXAMINATION

Before erection proceeds examine with the erector present the concrete foundation dimensions, concrete and/or masonry bearing surfaces, anchor bolt size and placement, survey slab elevation, locations of bearing plates, and other embedment's to receive structural framing with the metal building manufacturer's templates and drawings before erecting any steel components for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine primary and secondary framing to verify that rafters, purlins, angles, channels, and other structural and metal panel support members and anchorages have been installed within alignment tolerances required by metal building manufacturer, UL, ASTM, ASCE/SEI 7-05 and as required by the building code for the geographical area where construction will take place.

Examine roughing-in for components and systems penetrating metal roof or wall panels to verify actual locations of penetrations relative to seam locations of metal panels before metal roof or wall panel installation.

Submit to the Contracting Officer a written report, endorsed by Erector, listing conditions detrimental to performance of the Work.

Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Provide temporary shoring, guys, braces, and other supports during erection to keep the structural framing secure, plumb, and in alignment against temporary construction loading or loads equal in intensity of the building design loads. Remove temporary support systems when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment and performance.

Miscellaneous Framing: Install sub-purlins, angles, furring, and other miscellaneous support members or anchorage for the metal roof panels, doors, windows, roof curbs, ventilators and louvers according to metal building manufacturer's written instructions.

3.3 ERECTION OF STRUCTURAL FRAMING

Erect metal building system according to manufacturer's written erection instructions, approved shop drawings and other erection documents in accordance with MBMA MBSM - "Metal Building Systems Manual".

Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer and the Contracting Officer.

Set structural framing accurately in locations and to elevations indicated and according to [AISC 325](#) specifications. Maintain structural stability of frame during erection.

Clean and roughen concrete and masonry bearing surfaces prior to setting plates. Clean bottom surface of plates.

Align and adjust structural framing before permanent bolt-up and connections. Perform necessary adjustments and alignment to compensate for changes or discrepancies in elevations.

Maintain erection tolerances of structural framing in accordance with [AISC 360](#).

3.4 ROOF PANEL INSTALLATION

Provide metal roof panels of full length from eave to ridge or eave to wall as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels and other components of the Work securely in place in accordance with [NRCA RWM](#) and [MBMA MBSM](#).

Erect roofing system in accordance with the approved erection drawings, the printed instructions and safety precautions of the metal building manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Do not install bent, chipped, or defective sheets.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated rake and eave overhang.

Work must allow for thermal movement of the roofing, movement of the building structure, and provide permanent freedom from noise due to wind pressure.

Field cutting metal roof panels by torch is not permitted.

Roofing sheets must be laid with corrugations in the direction of the roof slope. End laps of exterior roofing must not be less than 8 inches; the side laps of standard exterior corrugated sheets must not be not less than 2-1/2 corrugations.

Do not permit storage, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials, and to distribute weight to conform to the indicated live load limits of roof construction.

3.5 METAL PANEL FASTENER INSTALLATION

Anchor metal panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.6 FLASHING, TRIM AND CLOSURE INSTALLATION

Comply with performance requirements, manufacturer's written installation instructions, and [SMACNA 1793](#). Provide concealed fasteners where possible,

and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

Sheet metalwork is to be accomplished to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.7 ACCESSORY INSTALLATION

3.7.1 General

Install accessories with positive anchorage to building and weather-tight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

3.7.2 Dissimilar Metals

Where dissimilar metals contact one another or corrosive substrates are present, protect against galvanic action by painting dissimilar metal surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each surface, or by other permanent separation techniques as recommended by the metal building manufacturer.

3.7.3 Gutters and Downspouts

Comply with performance requirements, manufacturer's written installation instructions, and install sheet metal roof drainage items to produce complete roof drainage system according to [SMACNA 1793](#) recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.7.4 Roof Accessories and Specialties

Install roof and wall accessories and specialties complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports.

3.8 CLEAN-UP AND PROTECTION

3.8.1 Structural Framing

Clean all exposed structural framing at completion of installation. Remove metal shavings, filings, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

3.8.2 Metal Panels

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove protective coverings/films, grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

3.8.3 Touch-Up Painting

After erection, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted structural framing and accessories. Clean and touch-up paint with manufacturer's touch-up paint.

3.9 WARRANTY

3.9.1 [MANUFACTURER'S WARRANTY](#)

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.9.2 CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING SYSTEM

FACILITY DESCRIPTION: _____

BUILDING NUMBER: _____

CORPS OF ENGINEERS CONTRACT NUMBER: _____

CONTRACTOR

CONTRACTOR: _____

ADDRESS: _____

POINT OF CONTACT: _____

TELEPHONE NUMBER: _____

OWNER

OWNER: _____

ADDRESS: _____

POINT OF CONTACT: _____

TELEPHONE NUMBER: _____

CONSTRUCTION AGENT

CONSTRUCTION AGENT: _____

ADDRESS: _____

POINT OF CONTACT: _____

TELEPHONE NUMBER: _____

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING SYSTEM
(continued)

THE METAL BUILDING SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY _____ FOR A PERIOD OF FIVE 5 YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE AND STRUCTURAL FAILURE WITHIN PROJECT SPECIFIED DESIGN LOADS, AND LEAKAGE. THE METAL BUILDING SYSTEM COVERED UNDER THIS WARRANTY INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

FRAMING AND STRUCTURAL MEMBERS, ROOFING AND SIDING PANELS AND SEAMS, INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS, ACCESSORIES, TRIM, FLASHINGS AND MISCELLANEOUS BUILDING CLOSURE ITEMS SUCH AS DOORS AND WINDOWS (WHEN FURNISHED BY THE MANUFACTURER), CONNECTORS, COMPONENTS, AND FASTENERS, AND OTHER SYSTEM COMPONENTS AND ASSEMBLIES INSTALLED TO PROVIDE A WEATHERTIGHT SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THESE SPECIFICATIONS THAT BECOME PART OF THE METAL BUILDING SYSTEM.

ALL MATERIAL AND WORKMANSHIP DEFICIENCIES, SYSTEM DETERIORATION CAUSED BY EXPOSURE TO THE ELEMENTS AND/OR INADEQUATE RESISTANCE TO SPECIFIED SERVICE DESIGN LOADS, WATER LEAKS AND WIND UPLIFT DAMAGE MUST BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE AND LEAKAGE ASSOCIATED WITH THE METAL BUILDING SYSTEM COVERED UNDER THIS WARRANTY MUST BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER.

THIS WARRANTY COVERS THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON _____ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

(Company President)

(Date)

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING SYSTEM
(continued)

THE CONTRACTOR HEREBY SUPPLEMENTS THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE METAL BUILDING SYSTEM, WHICH IS SUBMITTED ALONG WITH THE **CONTRACTOR'S WARRANTY**. HOWEVER, THE CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.
4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
5. FAILURE OF ANY PART OF THE BUILDING SYSTEM DUE TO ACTIONS BY THE OWNER WHICH INHIBIT FREE DRAINAGE FROM THE ROOF, GUTTERS AND DOWNSPOUTS; OR CONDITIONS WHICH CREATE PONDING WATER ON THE ROOF OR AGAINST THE BUILDING SIDING.
6. THIS WARRANTY APPLIES TO THE METAL BUILDING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
7. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR AND THIS WARRANTY AND THE CONTRACT PROVISIONS TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES. REPORTS OF LEAKS AND BUILDING SYSTEM DEFICIENCIES MUST BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE BY TELEPHONE OR IN WRITING FROM EITHER THE OWNER, OR CONTRACTING OFFICER. EMERGENCY REPAIRS, TO PREVENT FURTHER ROOF LEAKS, MUST BE INITIATED IMMEDIATELY; A WRITTEN PLAN MUST BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS SSSMR SYSTEM WITHIN SEVEN CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT MUST BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED

CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
METAL BUILDING SYSTEM
(Exclusions from Coverage Continued)

IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE METAL BUILDING SYSTEM REPLACED OR REPAIRED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR. IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION, UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED THE PARTIES MUST, WITHIN 10 DAYS JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES MUST CONFER WITHIN 10 DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE NAME REMAINS. THE REMAINING PERSON WILL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED ETC., MUST BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT MUST PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

POST A FRAMED COPY OF THIS WARRANTY IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

-- End of Section --