

SECTION 13000
METAL BUILDING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Design, fabricate and erect the metal building, including:
 - 1. Structural steel main building frames
 - 2. Secondary framing including purlins and girts
 - 3. Roof panels and trims
 - 4. Anchor bolts

1.2 RELATED SECTIONS

1.3 REFERENCES

- A. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
 - 1. AISC 325 Steel Construction Manual
 - 2. AISC 341 Seismic Provisions for Structural Steel Buildings
 - 3. AISC 360 Specification for Structural Steel Buildings
- B. AMERICAN IRON AND STEEL INSTITUTE (AISI)
 - 1. AISC/AISI 121 Standard Definitions for Use in the Design of Steel Structures
 - 2. AISI SG03-3 Cold-Formed Steel Design Manual Set
- C. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
 - 1. ASCE 7 Minimum Design Loads for Buildings and Other Structures
- D. AMERICAN WELDING SOCIETY (AWS)
 - 1. AWS D1.1/D1.1M Structural Welding Code – Steel
 - 2. AWS D1.3/D1.3M Structural Welding Code – Sheet Steel
- E. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A1008/A1008M 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
 - 2. ASTM A1011/A1011M Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
 - 3. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

5. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
6. ASTM A36/A36M Standard Specification for Carbon Structural Steel
7. ASTM A463/A463M Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
8. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
9. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
10. ASTM A529/A529M Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
11. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
12. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts
13. ASTM A563M Standard Specification for Carbon and Alloy Steel Nuts (Metric)
14. ASTM A572/A572M Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
15. ASTM A606/A606M Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
16. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
17. ASTM A755/A755M Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
18. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
19. ASTM A992/A992M Standard Specifications for Structural Steel Shapes
20. ASTM E1592 Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
21. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Air Pressure Difference
22. ASTM E168 General Techniques of Infrared Quantitative Analysis
23. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
24. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
25. ASTM F436 Hardened Steel Washers
26. ASTM F844 Washers, Steel, Plain (Flat), Unhardened for General Use

- 27. ASTM G152 Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
- 28. ASTM G153 Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
- F. METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)
 - 1. MBMA MBSM Metal Building Systems Manual
- G. NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)
 - 1. NAAMM AMP 500 Metal Finishes Manual
- H. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)
 - 1. NRCA RoofMan The NRCA Roofing Manual
- I. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
 - 1. SMACNA 1793 Architectural Sheet Metal Manual, 7th Edition
- J. SOCIETY FOR PROTECTIVE COATINGS (SSPC)
 - 1. SSPC Paint 15 Steel Joist Shop Primer
 - 2. SSPC Painting Manual Good Painting Practice, Steel Structures Painting Manual, Volume 1
 - 3. SSPC SP 2 Tool Cleaning
- K. UNDERWRITERS LABORATORIES (UL)
 - 1. UL 580 Tests for Uplift Resistance Of Roof Assemblies
 - 2. UL Bld Mat Dir Building Materials Directory

1.4 SYSTEM DESCRIPTION

The building shall include all primary and secondary structural framing members, connection bolts, roof covering, trim, fasteners, closures, sealer, and other miscellaneous items as stated in the specifications and/or shown or called for on the drawings.

- A. Primary framing shall consist of transverse rigid frames of rafters and columns with solid webs. The rigid frame shall be fabricated of shop-welded steel plate and designed for erection by field bolting. Frames shall be:
 - 1. clear span or modular with intermediate columns
 - 2. gabled or single sloped
 - 3. with tapered or uniform depth exterior columns.
- B. Secondary framing shall consist of purlins, girts, eave struts, flange braces and sag angles as required by design.
- C. Horizontal loads not resisted by main frame action shall be resisted by standard cable or rod x-bracing in the roof.

- D. Roof System consists of preformed steel panels, trim, and accessories as required for a complete installation.
- E. Building overall dimensions, bay spacing, post spacing, eave height, clear dimensions and roof pitch shall be as indicated on the drawings and as defined here.
 - 1. The building "Width" shall be the measurement from outside face to outside face of the sidewall girts.
 - 2. The building "Length" shall be the measurement from outside face to outside face of the endwall girts.
 - 3. "Eave" to be determined as the line along the sidewall formed by the intersection of the planes of the roof and sidewall.
 - 4. "Eave Height" is defined as the vertical dimensions as measured from the finished floor to the top of the eave strut.
 - 5. The "Bay Spacing" shall be the distance between the centerlines of frames for interior bays and the distance from the outside face of endwall girt to the centerline of the adjacent interior frame for end bays.
 - 6. "Module Spacing" shall be measured between the centerlines of interior columns for interior modules and the distance from the outside face of sidewall girts to the centerline of the adjacent interior column.
 - 7. "Roof Pitch" shall be the inches of vertical rise per inches of horizontal run, expressed as inches of rise per 12 inches of run.

1.5 DESIGN REQUIREMENTS

- A. Design primary and secondary structural members and exterior covering materials for applicable load and combinations of loads in accordance with the building code requested. Design loads shall be combined to produce maximum stresses within the structure in accordance with AISC and/or AISI as they apply.
- B. The design loads plus Dead Load shall be used in the structure design.
 - 1. Roof Live Load shall be applied on the horizontal projection of the roof. Live Load reduction shall be applied according to the code specified above.
 - 2. Wind Load shall be applied as pressure and suction in accordance with standard design criteria.
 - 3. The Roof Snow Load shall be applied on the horizontal projection of the roof.
 - 4. The Ground Snow Load shall be used with the exposure factor, thermal factor, slope factor, and importance factor to determine the Roof Snow Load.
- 5. Collateral loads shall be those other than the basic design loads for which the building must be adequately designed. Loads of this type include, but shall not be limited to, suspended ceilings, sprinkler, electrical or mechanical systems, or any suspended or roof mounted HVAC units.
- A. The building components shall be designed to the following minimum deflection requirements unless a specific deflection is required by the building code. Deflection based on wind shall be based on a 10-year map, or 75% of the design pressure for a 50-year map.

1. Frame rafters – L/180
2. Frame sidesway – H/90
3. Purlins – L/180
4. Girts – L/120
5. Roof panel – L/150

1.6 SUBMITTALS

- A. Erection Drawings including:
 1. Anchor bolt setting plan, base plate details, and column reactions
 2. Roof framing plan
 3. Transverse cross sections
 4. Panel
 5. Framing details
 6. Flashing details
 7. Accessory details
- B. Design calculations, stamped by a Professional Engineer registered in the state where building will be erected, including:
 1. Stress analysis
 2. Deflection analysis
 3. Foundation loads for each loading case
- C. Letter of Certification, prepared and signed by a Professional Engineer, verifying that building design meets indicated loading requirements and building code as requested.

1.7 QUALIFICATIONS

- A. The company manufacturing the products specified in this Section shall:
 1. be a member of MBMA
 2. be accredited under the International Accreditation Service, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems (AC472)
 3. have a minimum of 10 years' experience in the manufacture of steel building systems
- B. Acceptable Manufacturers
 1. Bigbee Steel Buildings, Inc.
 2. Approved Equal
- C. Erector's Qualifications
 1. Minimum of 5 years experience in this or similar trade
 2. Five similar installation references in past 3 years

1.8 WARRANTY

- A. The metal building manufacturer shall warrant for 1 year that components were free from defects in composition of material and workmanship and in accordance with industry standard for such components.
- B. Unpainted Galvalume® panels shall be warranted by the metal building manufacturer for 20 years against rupture, perforation, or structural failure as a result of corrosion caused by exposure to normal atmospheric conditions.
- C. The exterior color finish of factory coated panels shall be warranted by the metal building manufacturer for 20 years against peeling, cracking, checking, and flaking.
- D. Provide the owner with a copy of all warranties.

PART 2 PRODUCTS

2.1 MATERIALS – STRUCTURAL FRAMING

- A. General
 - 1. Structural steel members shall be sheared, plasma cut, formed, punched, welded, and painted in the plant of the manufacturer. All shop connections shall be welded in accordance with the AWS "Standard Code for Welding in Building Construction".
 - 2. All structural framing members shall be prepared according to SSPC-SP2 and given one shop coat of standard red oxide primer.
 - 3. All framing members shall carry an easily visible identifying mark to aid the erector in the erection of the building.
 - 4. Field connections shall be bolted with high strength bolts and nuts.
- B. Primary Structural Members
 - 1. The primary structural members shall be rigid framing manufactured of solid web members having tapered or uniform depth rafters rigidly connected to tapered or uniform depth columns.
 - 2. Steel used to fabricate built-up framing members shall be 55,000 PSI minimum yield point material and shall conform to the physical characteristics of ASTM A1011, ASTM A572 or ASTM A529, Grade 55.
 - 3. Steel used for interior pipe columns, if required, shall be 35,000 PSI minimum yield point material.
 - 4. The building manufacturer shall have on file certified mill test reports that verify that these requirements have been met.
- C. Secondary Structural Members
 - 1. Secondary structural framing shall distribute the loads to the primary structural system and shall include endwall columns and rafters, purlins, girts, eave struts, base support, headers, jambs, flange bracing, clips, and other miscellaneous structural framing.
 - 2. Steel used for cold-formed members shall be 55,000 PSI minimum yield point material and shall conform to the physical characteristics of ASTM A1011 Grade 55.

3. Light gauge cold-formed sections shall be manufactured by precision roll or brake forming. All dimensions shall be true, and the formed member shall be free of fluting, buckling or waviness.
4. Purlins and girts shall be precision roll-formed 8" or 10" deep "Z" sections of adequate size and thickness as determined by the design criteria, minimum 16 gauge. Purlins and girts shall be either simple span or continuous span members.
5. Eave struts shall be precision roll-formed and/or press brake formed "C" sections, minimum 14 gauge. The upper flange shall slope with the normal roof slope, and the web shall be vertical and free to receive the sidewall covering.
6. Headers and jambs shall be precision roll-formed "C" sections of the same depth as the girts.
7. Flange bracing shall consist of angle members connected to the web of the purlin or girt and to the compression flange of the primary structural member.
8. Clips shall be fabricated from 55,000 PSI minimum yield point material and be factory punched for field bolted connections.

D. Bracing

1. Horizontal load resisting bracing shall be accomplished by diagonal cable bracing, rod bracing, portal frames, and/or diaphragm action of the roof covering.
2. All cables for diagonal bracing shall be fabricated from extra high strength Grade-7 wire Class A coating, left hand lay, galvanized steel strand, conforming to the provisions of ASTM A475. Adjustment shall be provided by an eyebolt assemble.
3. Rod bracing shall be fabricated from minimum 5/8" diameter steel rod conforming to the provisions of ASTM A36.
4. Portal frames shall be fabricated of built-up sections and conform to the same specifications as primary framing.

2.2 MATERIALS – ROOF SYSTEM

Roof panel shall be one of the following types.

A. Ribbed roof panel

1. Rollformed profile shall be BigbeeRib II configuration as manufactured by Bigbee Steel Buildings, Inc. Panels shall have 1 1/4" deep major ribs spaced at 12" on center, with minor ribs between major ribs. Each panel shall provide a net coverage width of 36".
2. Panels shall be manufactured from 26 gauge 80,000 PSI material.
3. Panel finish shall be acrylic coated Galvalume® AZ55 coating in accordance with ASTM A792.

2.3 MATERIALS – WALL SYSTEMS

- A. Exterior wall panels are not included in this contract. Building shall be manufactured to allow for wall framing and panels to be added in the future.

2.5 MATERIALS – TRIM

- A. Trim shall be 26 gauge with a Siliconized-Modified Polyester topcoat. Color to be selected from Bigbee's full range of standard colors.
- B. Provide trim at all corners of the building and for all sides of framed openings. Provide trim for base of building if required.
- C. Downspouts, if required, shall be 26 gauge with a Siliconized_modified Polyesterr finish and shall have a minimum cross sectional area of 15 square inches. Downspouts shall terminate with an elbow at approximately 75° or transition to an underground drainage system.

2.6 INSULATION

- A. Roof and wall insulation is not included in this contract.

2.7 METAL PERSONNEL DOORS AND FRAMES

- A. Personnel doors and frame are not included in this contract.

2.8 WINDOWS

- A. Windows are not included in this contract.

2.10 ACCESSORIES

- A. Fasteners to be manufacturers standard long-life fasteners. Exposed fastener heads to be factory painted to match the panel color. Self-drilling fasteners shall be used for panel to structural connections. Lapteks shall be used for panel-to-panel connections. Pop rivets shall be used at endlaps of eave and gable trims.
- B. Closed cell foam closure strips, die cut to match CS, AP, or LTC panel configuration. Metal closures shall be used with STC or MSC panels.
- C. Mastic for roof sidelaps, endlaps, and flashings to be a non-hardening butyl tape, non-corrosive to the substrate, of 100% solids. Tape size to be minimum 3/32" x 3/4", supplied in rolls.
- D. Caulk shall be manufacturers' standard product as appropriate for the application.
- E. Roof curbs shall be used at all roof penetrations except pipes 13" diameter and less. Roof curb shall have a structural subframe. Curb and subframe shall be designed to support the weight of the unit. Curb shall be designed specifically for the model number of the roof top unit. Curb shall be supplied with rib covers and all necessary fasteners and mastic for a weathertight installation. The roof curb shall be a two-piece floating curb when required by building conditions.
- F. Roof Jacks shall be used at all 13" diameter and less pipes that penetrate the roof. Roof jacks shall be EPDM with a flexible aluminum base to form a weathertight seal at the roof panel.
- G. Building manufacturer shall provide anchor bolts for building columns.

2.11 FABRICATION

- A. Fabricate built-up members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. Fabricate hot rolled members in accordance with AISC Specification for pipe, tube, and rolled structural shapes.
- C. Fabricate cold formed members in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.

- D. Provide factory drilled or punched framing members for field bolted connections.
- E. All framing members shall be prepared according to SSPC-SP2 and given one shop coat of standard red oxide primer.
- F. Clearly and legibly mark each piece to correspond with previously prepared erection drawings.

PART 3 EXECUTION

3.1 ERECTION – FRAMING

- A. Erect framing in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection equipment and erection operation, but not including loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed to be adequate during erection. The temporary guys, braces, falseworks, and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.
- C. Do not field cut or alter structural members without approval of the metal building manufacturer.
- D. After erection, prime welds, abrasions, and surfaces not shop primed.

3.2 ERECTION –ROOFING SYSTEM

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.

3.3 INSTALLATION - ACCESSORIES

- A. Install accessories in accordance with manufacturer's instructions.
- B. Seal Froof accessories weather tight.

END OF SECTION