

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.01 BUY AMERICAN REQUIREMENTS

- A. Provide certificates to show that all products meet the following requirements.
 - 1. American Iron and Steel (AIS)
 - 2. Build America, Buy America Act
- B. See Supplementary Conditions for details.

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural-steel framing.
 - 2. Foam Insulated Metal Wall Panels and Trim
 - 3. Foam Insulated Metal Roof Panels and Trim
 - 4. Wall girts
 - 5. Roof purlins
 - 6. Lateral bracing
 - 7. Anchor rods
 - 8. Accessories
- B. The CONTRACTOR shall coordinate the Metal Building design with all trades and installations included in the Contract Documents. This includes, but is not limited to the application of loads; fit and function between building and other components; and required clearances for equipment operation and intended occupant use.
- C. Related Requirements:
 - 1. Section 03 30 00 – Cast-in-Place Concrete.

1.03 DEFINITIONS

- A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.04 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and attachments to other work.
 - 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 - 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field- assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including roof hatches, equipment supports, pipe supports, and penetrations, light fixtures, and items mounted on roof curbs.
 - b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and light fixtures.
 - 4. Buy America Compliance Letter of Certification.
- C. Samples: For units with factory-applied finishes. For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Delegated Design Submittals: For metal building systems.
 - 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer licensed in the State of Alaska, responsible for their preparation.
 - 2. Provide calculations for the full building structural system including foundation reactions.

1.06 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Qualification Data: For erector and manufacturer.
- C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 - 1. Name and location of Project.
 - 2. Order number.
 - 3. Name of manufacturer.
 - 4. Name of Contractor.
 - 5. Building dimensions including width, length, height, and roof slope.
 - 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - 7. Governing building code and year of edition.
 - 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 - 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- D. Material test reports.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Sample warranties.
- H. Erector certificates: for qualified erector, from manufacturer.

1.07 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. As-Built Drawings: As-built conditions shall be updated on shop drawings and submitted after Substantial Completion. All revisions shall be drafted and the drawings labeled "As-Built" and signed by the CONTRACTOR.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Accreditation: Manufacturer's facility accredited according to IAS AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."

2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer approved under an accredited third-party quality control program
- E. Manufacturer Qualifications: Approved manufacturer listed in this Section with minimum ten years' experience in the manufacturing of similar foam insulated metal panel products and successful use in similar applications
- F. Installer Qualifications: Experienced foam insulation metal panel installer certified by metal panel manufacturer with minimum of five years' experience with successfully completed projects of a similar nature and scope.
 1. Installer's Field Supervisor: Experienced mechanic [certified by metal panel manufacturer] supervising work on site whenever work is underway.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements:
 - 1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
 - 2. Established Dimensions for Metal Panels: Coordinate framing and opening dimensions with approved metal wall and roof panel shop drawings. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.11 WARRANTY

- A. Special Weathertightness Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal building system components that fail to remain weathertight, including leaks, within 20 years from date of Substantial Completion.
- B. Roof and Wall Paint Finish Warranty
 - 1. Paint Systems
 - a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
 - b. The warranty shall be for a period of 30 years from the date of substantial completion for PVDF paint systems.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Butler Manufacturing Company, a BlueScope Steel company.
 - 2. Garco Building Systems: Division of NCI Building Systems, L.P.
 - 3. Nucor Building Systems.
 - 4. Star Building Systems; an NCI company.
 - 5. VP Buildings; a United Dominion company.
- B. Source Limitations: Obtain metal building system components, including primary and secondary framing from single source from single manufacturer.

2.02 SYSTEM DESCRIPTION

- A. Provide a complete, integrated set of 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.
- B. Primary-Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing
 - 1. Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists and flush-framed or exterior-framed (bypass) girts as indicated on the drawings.
- E. Eave Height: As indicated by nominal height on Drawings.
- F. Bay Spacing: As indicated on Drawings.
- G. Roof Slope: As indicated on Drawings.
- H. Foam Insulated Metal Panels
 - 1. Labeling: Labeled through [a nationally recognized program] [FM Global], identifying the manufacturer, product name and model and product listings required in this section.
 - 2. Panel Core: Foamed in-place, Zero Ozone Depletion Potential polyurethane or polyisocyanurate.
 - 3. Fire Resistance:
 - a. FM 4880 Class 1 Approval with no height restrictions.
 - b. Flame Spread and Smoke Developed Index: The Flame Spread Index shall not exceed 25 and the Smoke Developed Index shall not exceed 450 when tested to ASTM E 84.
 - 4. Panel Strength: Determine and certify panel allowable strengths as follows:
 - a. Positive Loading (Toward Panel Supports): Determine in accordance with ASTM E 72.
 - b. Negative Loading (Away from Panel Supports): Determine in accordance with ASTM E 1592.
 - 5. U-Factor Determination: ASTM C 1363 conducted in accordance with ASHRAE 90.1 Section A9.3.2 or by Finite Element Modeling per ASHRAE 90.1 Section A9.4 and using core insulation thermal conductivity (k-factor) determined using ASTM C 518 conducted at 75 degree F mean temperature in the calculation.
- I. Roof System: Standing Seam Insulated Roof Panels:
 - 1. Panel profile Basis of Design: Metl-Span CFR-Insulated Roof Panel. A mechanically seamed vertical rib standing seam roof sandwich panel with concealed clips. Installed directly over purlin. Tested in accordance with ASTM E 1646 and E 1680 for water penetration and air infiltration, and per ASTM E1592 for wind uplift capacity
 - 2. Panel thickness: 5 inches (U-.029 maximum)

3. Panel Width: 36 inches.
 4. Exterior Face:
 - a. Profile: Stucco embossed 1/8" (3.2mm) Mesa symmetrical ribs nominally 4 inches (10mm) on centers with 2" vertical leg standing seam side laps.
 - b. Sheet Thickness: 24 gauge
 - c. Finish: PVDF.
 - d. Color: Selected from manufacturer standard colors.
 5. Interior Face:
 - a. Profile: Stucco embossed 1/8" (3.2mm) Mesa symmetrical ribs nominally 4 inches (10mm) on centers.
 - b. Sheet Thickness: 24 gauge
 - c. Finish: PVDF
 - d. Color: Selected from manufacturer standard colors.
 6. Air Infiltration: Maximum air infiltration of 0.04 cubic feet per minute per square foot of specimen area when tested to ASTM E 1680 at a pressure differential of +/- 1.57 psf (75 Pa).
 7. Water Infiltration: No uncontrollable water leakage when tested to ASTM E 1646 at a 20 psf (955 Pa) pressure differential when sprayed with 5 gallons of water per hour per square foot (203 liters per square meter) of specimen area.
- J. Exterior Wall System: Concealed Fastener Insulated metal panels conforming to ASTM A 792.
1. Panel Profile Basis of Design: Metl-Span: CF Mesa. A through fastened wall sandwich panel with concealed fasteners
 - a. Panel thickness: 2.5 (U-050 maximum)
 - b. Panel width: 36"
 - c. Exterior Face Color: Selected from manufacturer standard colors.
 - d. Interior Face Color: Selected from manufacturer standard colors.
 2. Finishes:
 - a. Exterior Paint: Fluoropolymer Two-Coat System (PVDF): 0.2 – 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat. Basis of Design: Signature 300.
 - b. Interior Paint: 0.5 mil total dry film thickness consisting of primer coat and wash coat of manufacturer's standard light-colored acrylic or polyester backer finish.
- K. Fasteners:
1. Through-fastened panels: Self-drilling with sealing washer.
 2. Standing seam panels: Long life self-drilling with sealing washer.
 3. Ridge: Long-life self-drilling with sealing washer.
 4. Clips to purlin or bar joists: Long-life self-drilling with hex washer head and washer.
- L. Clips:
1. Low or high fixed clips: Use where moderate thermal expansion and contraction in roof panel is expected.
 2. Low or high sliding clips: Provide 2 to 4 inches of travel for panel thermal expansion and contraction.

M. Sealants and closures:

1. Side-laps: Factory applied, hot melt, foamable mastic.
2. End-laps, eave, ridge assembly, gable flashings: Field-applied non-skinning sealant as specified in Section 07 92 00.

N. Standing Seam Roof Closures:

1. Outside closures: 24 gauge steel sheet.
2. Inside closures: 18 gauge Galvalume or G-40 galvanized coated steel complying with ASTM A 653/A 653M.

O. Through-Fastened Roof Closures: Provide closed-cell polyethylene inside [and outside] foam closures.

1. Bulk Density: 2 pounds per cubic foot.
2. Service Temperature: -100 to 180 degrees Fahrenheit.
3. Shore Hardness: 7 on AA scale or 51 on 00 scale when tested to ASTM D 2240.

2.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.

B. Structural Performance: Metal building systems and components to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings in accordance with the applicable code.
2. Deflection and Drift Limits:
 - a. Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
 - b. No greater than the following:
 - 1) Purlins and Rafters: Vertical deflection of 1/180 of the span.
 - 2) Girts: Horizontal deflection of 1/180 of the span.
 - 3) Metal Roof Panels: Vertical deflection of 1/240 of the span.
 - 4) Metal Wall Panels: Horizontal deflection of 1/240 of the span.
 - 5) Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - 6) Lateral Drift: Maximum of 1/500 of the building height at a 10-year MRI wind event.

C. Seismic Performance: Metal building system to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Wind Performance: Metal building system shall withstand the effects of wind forces determined according to ASCE/SEI 7-16. Framing members and fasteners shall support the components and

cladding loads to resist design wind forces within the deflection limits indicated. There shall be no provision requiring doors to be closed during wind events in order to meet performance requirements.

- E. Snow Load Performance: Metal building system shall withstand the full roof snow load value. No reduction in roof snow load value due to slope or roof surface type.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: +110 deg F to -70 deg F, ambient.
- G. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Snow Loads: As indicated on Drawings.

2.04 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Owner's Representative.
 - 2. Frame Configuration: Single gable.
 - 3. Exterior Column: Tapered.
 - 4. Rafter: Tapered.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
- G. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- H. Bracing: Provide adjustable lateral bracing as follows:
 - 1. Rods: ASTM A36/A36M; ASTM A572/A572M, Grade 50; or ASTM A529/A529M, Grade 50; minimum 5/8-inch-diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
 - 2. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.

2.05 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. 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. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fascia, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fascia, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
- D. Base member flashing: As indicated on Drawings
 - 1. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 - 2. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other

defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

3. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
4. Design Pressure: As indicated on Drawings.
5. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
6. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal
 - a. Fasteners for Pre-Finished Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
7. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
8. Elastomeric Sealant: ASTM C 920, elastomeric **[polyurethane]** polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.06 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members to be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.
 - 2. Fabricate metal joints configured to accept applied sealant providing weathertight seal and preventing metal to metal contact and minimizing noise resulting from thermal movement.
 - 3. Sheet Metal Flashing and Trim: Fabricate or install flashing and trim to comply with manufacturer's written instructions and construction drawings.
 - 4. End Laps:
 - a. Fabricate with 16 gauge backup plates and eight end lap joint fasteners installed in six pre-punched holes in flat and in dimples in trapezoidal legs.
 - b. Apply mastic between panels and secure with self-drilling fasteners through panels and backup plate.
 - c. Through roof fasteners may be used only at end laps and eaves.
 - 5. Thermal performance as indicated.
- F. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
 - 1. Clean and prepare in accordance with SSPC-SP2.
 - 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.07 SOURCE QUALITY CONTROL

- A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.
 - 1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.01 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.

- H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.
1. Before installation, splice joists delivered to Project site in more than one piece.
 2. Space, adjust, and align joists accurately in location before permanently fastening.
 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 4. Joist Installation:
 - a. Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
 - b. Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
 - c. Weld joist seats to supporting steel framework.
 5. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.
- I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
- J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.02 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform tests and inspections required by building codes or local Authorities Having Jurisdiction, and to submit reports. The Owner will engage a special inspector to perform field quality control and special inspections.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Tests and Inspections:
1. High-Strength, Field-Bolted Connections: Connections shall be inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts." Special inspection during installation of high strength bolts may follow provisions in the most current version of the IBC adopted by the state, when joints

require only snug-tight condition or when tension-indicator washers or twist-off bolts are used.

2. Welded Connections: Visual inspection of ¼ fillet single pass welds. In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1 and one of the following inspection procedures, at inspector's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
3. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

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