SECTION 05 44 00
COLD-FORMED METAL TRUSSES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Cold-formed steel roof trusses.

B. Anchorages, bracing, and bridging.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 05 40 00 - Cold-Formed Metal Framing: structural metal studs, joists, and rafters.

1.04 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020.

E. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018.

F. CFSEI 5000 - Field Installation Guide for Cold-Formed Steel Roof Trusses; May 2000.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Span charts.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Include detailed roof truss layout.
   2. Show member type, location, spacing, size and gauge, methods of attachment, and erection details. Indicate supplemental bracing, strapping, splices, bridging, and accessories.
   3. Include truss design drawings, signed and sealed by a qualified professional engineer registered in the State in which the Project is located, verifying ability of each truss design to meet applicable code and design requirements. Include the following:
      a. Design criteria.
      b. Engineering analysis depicting member stresses and deflections.
      c. Member sizes and gauges.
      d. Details of connections at truss joints.
      e. Truss support reactions.
      f. Bracing - both temporary and permanent.
      g. Truss to truss connection details.

D. Fabricator's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Steel truss fabricator with minimum 10 years of experience designing and fabricating truss systems equivalent to those required for this project and licensed by an acceptable manufacturer.

C. Installer Qualifications: Experienced installer approved by truss system fabricator.

D. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.

E. Truss Design Engineer Qualifications: Engage a professional engineer, registered in the state where the trusses will be erected. The engineer shall be experienced in design of cold-formed steel trusses.

F. Provide Special Inspectors with access to fabrication plant to facilitate inspection. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

G. The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver trusses and other materials in manufacturer’s unopened bundles or containers, each marked with manufacturer’s name, brand, type, and grade. Exercise care to avoid damage during unloading, storing, and erection.

B. Store trusses on blocking, pallets, platforms, or other supports, off the ground and in an upright position, sufficiently braced to avoid damage from excessive bending. Gently slope stored trusses to avoid accumulation of water on interior of truss chord members.

C. Protect trusses and accessories from contact with earth, corrosion, deformation, mechanical damage, or other deterioration when stored at project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cold-Formed (Light Gauge) Steel Trusses shall be manufactured by a fabricator certified and/or licensed and the product of one of the following manufacturers:
   1. Aegis Metal Framing, a Division of MiTek Industries: www.aegismetalframing.com.
   2. TrusSteel Division of Alpine Engineered Products, Inc: www.trussteel.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL

2.03 TRUSS DESIGN REQUIREMENTS

A. Design: Calculate structural characteristics of cold-formed steel truss members according to AISI S100.

B. Structural Performance: Design, engineer, fabricate, and erect trusses and bracing to withstand specified design loads for project conditions within required limits.
   1. Design Loads: As indicated.
   2. Deflections: Live load deflection meeting the following, unless otherwise indicated:
      a. Roofs: Maximum vertical deflection under live load of 1/360 of span.

3. Design trusses to accommodate movement attributable to temperature changes within a range of 120 degrees F without damage or overstressing, sheathing failure, undue strain on fasteners and anchors, or other deleterious effects.

2.04 COMPONENTS

A. Trusses: Cold formed steel assemblies providing a complete horizontal framing system for locations indicated, ready for deck installation.
   1. Truss Type, Span, and Height: As indicated on drawings.
   2. Chord and Web Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A 653/A 653M, with minimum yield strength of 40,000 psi; minimum G60/Z180 coating; gages as required for load conditions; all edges rolled or closed. Top chord shall be fabricated from minimum 18 gauge material. All other members shall be fabricated from minimum 20 gauge material.
   3. Truss chord members shall be U-shaped members designed to accept web members with connectors on both sides. Chords shall be fabricated with minimum 18 gauge material.
   4. Truss web members shall be square tubes or rectangular members with or without longitudinal slots in one face.

B. Fasteners: Self-drilling, self-tapping screw fasteners with corrosion-resistant plated finish, as recommended by steel truss manufacturer and marked for easy identification.
   1. Welding: Comply with applicable provisions of AWS D1.1/D1.1M and AWS D1.3/D1.3M.

C. Bracing, Bridging, and Blocking Members: Fabricate required shapes from commercial quality galvanized steel sheet complying with ASTM A653/A653M, with minimum yield strength of 33,000 psi; minimum G60/Z180 coating; gauges as required for load conditions.

2.05 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with secure connections, complying with manufacturer’s recommendations and project requirements.
   1. Fabricate trusses using jig templates.
   2. Cut truss members by sawing, shearing, or plasma cutting. Torch cutting is not acceptable.
   3. Fasten members by screwing or welding in full compliance with instructions of manufacturer. Wire tying of framing members is not permitted.
   4. Locate mechanical fasteners and install according to manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

B. Splicing of members:
   1. Splicing of webs is not permitted
   2. Splice chord members using a minimum 24 inch piece of chord material the same size and gauge of the member being spliced. Attach splice with the number of screws on each side of the splice based on the calculated screw count for the member, but not less than four screws.

C. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift trusses to prevent damage of distortion.

D. Tolerances: Fabricate trusses to maximum allowable tolerance variation from plumb, level and true line of 1/8 inch in 10 feet.
   1. Up to 30 feet Long: Maximum plus or minus 1/2 inch from design length.
   2. Over 30 feet Long: Maximum plus or minus 3/4 inch from design length.
   3. Up to 5 feet High: Maximum plus or minus 1/4 inch from design height.
   4. Over 5 feet High: Maximum plus or minus 1/2 inch from design height.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine structure, substrates, and installation conditions. Notify Architect Engineer of unsatisfactory preparation. Do not begin installation until substrates have been properly prepared and unsatisfactory conditions have been corrected.

B. Proceeding with installation indicates installer's acceptance of substrate conditions.

3.02 INSTALLATION

A. Install cold-formed steel trusses in strict accordance with manufacturer's instructions and approved shop drawings, using approved fastening methods.

B. Install temporary erection bracing and permanent bracing and bridging before application of any loads. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at spacing indicated. Anchor trusses securely at bearing points.

C. Adequately distribute applied loads to avoid exceeding the carrying capacity of any one joint, truss, or other component.

D. Exercise care to avoid damaging truss members during lifting and erection and to minimize horizontal bending of trusses.

E. Removal, cutting, or alteration of any truss chord, web, or bracing member in the field is prohibited, unless approved in advance by Architect Engineer or the engineer of record and the truss manufacturer.

F. Repair or replace damaged members and complete trusses as directed and approved in writing by Architect Engineer or the engineer of record and the truss manufacturer.

G. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

H. Field Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M, as applicable, and as follows:
   1. Connections: Provide fillet, flat, plug, or butt welds, as indicated.
   2. Minimum steel thickness for welded connections, 18 gauge, 0.0478 inch.

I. Roof Trusses:
   1. Comply with recommendations of CFSEI 5000.
   2. Align truss bottom chords with load-bearing studs or continuously reinforce track as required to transfer loads to structure.
   3. Install continuous bridging and permanent truss bracing as indicated on approved shop drawings.
   4. Install roof cross bracing and diagonal bracing as indicated on approved shop drawings.

3.03 TOLERANCES

A. Install trusses to maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

B. Space individual trusses not more than plus or minus 1/8 inch from plan location. Cumulative error in placement may not exceed minimum fastening requirements of sheathing or other material fastened to trusses.

3.04 FIELD QUALITY CONTROL

A. Special Inspectors shall perform field inspection and testing in accordance with Section 01 45 33 (01410).

B. The truss manufacturer or their qualified representative shall visit the project site and inspect the trusses and accessories in place and shall provide specific written directions as to any deficiencies in the trusses or accessories and/or truss installation. After the deficiencies are corrected the truss manufacturer shall provide written certification that the trusses are installed as required and that all permanent bracing is installed as required.

3.05 PROTECTION

A. Protect trusses from damage by subsequent construction activities.

B. Repair or replace damaged trusses, truss members, and bracing members; obtain approval in advance by the truss manufacturer for all cutting, repairs, and replacements.

END OF SECTION

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