

SECTION 05410 PRE-ENGINEERED, PRE-FABRICATED LIGHT GAUGE STEEL ROOF & FLOOR TRUSSES

PART 1: GENERAL

1.01 SUMMARY

- A. Section includes pre-engineered, pre-fabricated light gauge cold-formed steel framing elements. Work includes:
 - 1. Light gauge cold-formed steel roof trusses.
 - 2. Light gauge cold-formed steel open web floor trusses.
 - 3. Anchorage, bracing and bridging.
- B. Related Work
 - 1. Drywall attachment.
 - 2. Roofing, fascia and soffit.

1.02 REFERENCES

- A. Reference standards:
 - 1. ASTM:
 - a. ASTM A653/A653M-94 "Sheet Steel, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process."
 - b. ASTM A780-93a "Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
 - 2. American Welding Society (AWS)
 - a. AWS D1.1 "Structural Welding Code - Steel."
 - b. AWS D1.3 "Structural Welding Code - Sheet Steel."

1.03 PERFORMANCE REQUIREMENTS

- A. AISI "Specifications". Calculate structural characteristics of cold-formed steel truss members according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members, 1986 (1990)."
- B. Structural Performance: Design, engineer, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required.
 - 1. Design Loads: As specified.
 - 2. Deflections: Live load deflection meeting the following (unless otherwise specified):
 - a. Floor Trusses: Vertical deflection less than or equal to 1/360 of the span
 - b. Roof Trusses: Vertical deflection less than or equal to 1/240 of the span
 - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120° F (67°C).
 - 4. Specifically, the prefabricated light gauge steel roof truss manufacturer (vendor) shall provide the following services:
 - a. Design and supply a complete light gauge steel roof system stamped by a registered engineer to include all of the following components:
 - 1.) Light gauge steel trusses for gravity and lateral loads with truss sizes, gauges and connections at truss joints.
 - 2.) Design and stamp truss to truss connections and truss to bearing connections for gravity, lateral and uplift loads.
 - 3.) Design and stamp the top cord, bottom cord and web permanent bracing locations.
 - 4.) Design and stamp the roof deck structural support at eave edge, valley, hip and ridge transition planes to support corrugated steel or plywood decking.
 - 5.) Design the roof deck shear transfer framing required to transfer the roof deck shear to the building structure. The Engineer-Of-Record or Architect is responsible to determine the roof diaphragm, to

determine the location and magnitude of the roof shear transfer and to determine location within the building structure through which this shear will pass.

6.) Provide stamped calculations and shop drawings for project submittal requirements.

- b. Truss manufacturer is to inspect the roof and/or floor trusses after the installation is complete and issue a written report indicating whether the trusses were installed per Part 3 'Execution'.

1.04 SUBMITTALS

- A. Submit manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.
- B. Submit shop drawings showing member, type, location, spacing, size and gauge of member, method of attachment to supporting members and all necessary details. Indicate supplemental bracing, strapping, splices, bridging, accessories and details required for proper installation
- C. Submit detailed floor truss and roof truss layouts.
- D. Submit truss drawings, sealed and signed by a qualified registered Professional Engineer, verifying the truss ability to meet local code and design requirements. Specifically include the engineering and design for all of the following:
1. Description of design criteria.
 2. Engineering analysis depicting member stresses and truss deflection
 3. Truss member sizes, gauges and connections at truss joints; truss to truss attachment details.
 4. Truss reaction at all bearing locations; truss to bearing attachment details.
 5. Top chord, bottom chord and web permanent bracing requirements; construction and temporary bracing per the Light Gauge Steel Engineers Association (LGSEA) 'Field Installation Guidelines' dated October 1999.
 6. Eave edge, valley, hip and ridge structural support for roof corrugated or plywood decking.
 7. Roof deck shear transfer framing required transferring the roof deck shear to the building structure.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Fabrication shall be performed by a cold-formed steel truss fabricator with experience in designing and fabricating cold-formed steel truss systems equal in material, design, and extent to the systems required for this Project.
1. Cold-formed steel truss system installation shall be performed by an experienced installer approved by the steel truss system fabricator.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel." And AWS D1.3 "Structural Welding Code-Sheet Steel."
1. Quality welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."
 2. Welding of any nature to these trusses is specifically prohibited unless permission is received from the manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's unopened containers or bundles, fully identified by 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.
- C. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.07 PROJECT CONDITIONS

- A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one joist, truss or other component

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable truss manufacturers for light gauge metal trusses:
1. **MiTek Industries, Inc. "Ultra-Span"** truss system. Fabrication and installation by:

Superior Truss & Panel, Inc.
2204 West 159th Street
Markham, Illinois 60426
Ph. 708-339-1200 Fx. 708-339-1248
Contact: Mike Goncher or Bryce Welty

2. Request for substitutions will be considered in accordance with provisions of Section 01600. The Architect or Engineer of Record must approve all permitted equals in writing. All applications for substitutions must include samples and technical data.

2.02 COMPONENTS

- A. System components: MiTek Industries, Inc. ULTRA-SPAN® light gauge steel roof trusses and floor truss components.
- B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete light gauge cold-formed steel truss package.

2.03 MATERIALS

- A. Materials:
 1. All component gauges: Fabricate components of structural quality steel sheet per ASTM A653/A653M-95 with a minimum yield strength of 45,000 psi.
 2. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A653/A653M-95 with a minimum yield strength of 33,000 psi.
- B. Ultra-Span steel truss components: Provide sizes, shapes and gauges indicated.
 1. Design Uncoated-Steel Thickness: 20 gauge, 0.0350 inch (0.91 mm).
 2. Design Uncoated-Steel Thickness: 18 gauge, 0.0460 inch (1.20 mm).
 3. Design Uncoated-Steel Thickness: 16 gauge, 0.0570 inch (1.52 mm).
 4. Design Uncoated-Steel Thickness: 14 gauge, 0.0730 inch (1.90 mm).
- C. Finish: Provide components with protective zinc coating complying with ASTM A653/A653M-95, minimum G60 coating.
- D. Fastenings:
 1. Manufacturer recommended self-drilling, self-tapping screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
 2. Welding of any nature to these trusses is specifically prohibited unless permission is received from the truss manufacturer.
 3. Other fasteners as accepted by truss engineer.

2.04 FABRICATION

- A. Factory fabricate cold-formed steel trusses plumb, square, true to line and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 1. Fabricate truss assemblies in jig templates.
 2. Cut truss members by sawing or shearing or plasma cutting
 3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with fabricator. Wire tying or welding of framing members is not permitted.
 - a. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- B. Care shall be taken during handling, delivery and erection. Use of a crane or lull with a spreader bar is recommended for trusses longer than 30 foot. Brace, block or reinforce truss as necessary to minimize member and connection stresses.
- C. Fabrication Tolerances: Fabricate trusses to a maximum allowable tolerance variation from plumb, Level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:
 1. Spacing: Space individual trusses no more than plus or minus 1/8 inch (3mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Sequences: Fabricate each cold formed steel truss to a maximum out-of-square tolerance of 1/8 inch (3mm).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installations until unsatisfactory conditions have been corrected. Verify that the bearing elevations are correct before trusses are installed.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION, GENERAL

- A. General:
 1. Erection of trusses, including proper handling, safety precautions, temporary bracing and other safeguards or procedures are the responsibility of the General Contractor and the Installation Subcontractor. The use of a crane or lull with a spreader bar is recommended for trusses over 30 foot.
 2. Exercise care and provide erection bracing required to prevent toppling or dominoing of trusses during erection as identified in the Light Gauge Steel Engineers Association (LGSEA) publication "Field Installation Guide For Cold-Formed Steel Roof Trusses" October, 1999.
- B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.
- C. Provide proper lifting equipment suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator and use spreader bars for larger span trusses. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.
- D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points and the anchor must be attached to the correct side of the truss as shown in the truss drawings and attachment details.
- E. Install roof framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
 1. DO NOT cut truss members without prior approval of truss manufacturer.
 2. Fasten cold-formed steel roof framing by mechanical fasteners only per truss manufacturer's recommendation. Wire tying or welding of roof framing is not permitted.
 - a. Welding of any nature to these trusses is strictly prohibited unless specific permission is received from the truss manufacturer.
 - b. Locate mechanical fasteners and install according to cold-formed roof framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - c. Install roof framing in one-piece lengths, unless splice connections are indicated.
 - d. Provide temporary bracing per Light Gauge Steel Engineers Association (LGSEA) publication "Field Installation Guide For Cold-Formed Steel Roof Trusses" and leave in place until trusses are permanently stabilized.
- F. Erection Tolerances: Install trusses to a maximum allowable tolerance variation from plumb, level, and true to line of 1/4 inch in 10 feet (1:480) and as follows:
 - a. Space individual trusses no more than plus or minus 1/4 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 OPEN-WEB FLOOR TRUSS INSTALLATION

- A. Install perimeter joist tracks or belly band sized to match trusses. Align and securely anchor or fasten track to supporting structure at corners, end, and spacing indicated or as recommended by the manufacturer.
- B. Install trusses bearing on supporting framing, level, straight, and plumb, adjust to final position, brace, and reinforce.
 1. Install trusses over supporting framing with a minimum end bearing of 1-1/2 inches (38mm)
- C. Space trusses not more than 2 inches (51mm) from abutting walls and not greater than 24 inches on center or less as indicated on the plans.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists where indicated.

- E. Install bridging at each end of trusses and at intervals indicated. Fasten bridging at each truss intersection as follows:
 - 1. Bridging: Cold-rolled steel channel or cold-formed steel section, fastened to truss bottom chord.
 - 2. Bridging: Flat, steel-sheet straps of width and thickness indicated, fastened to truss bottom chord flange.
 - 3. Bridging: Cold-formed steel section strongback (6" minimum), fastened to truss web or other means.
- F. Secure trusses to load-bearing interior walls to prevent lateral movement of bottom flange.
- G. Install miscellaneous truss framing and connections, including closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable truss-framing assembly.

3.04 ROOF TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to manufacture's recommendations and requirements of this Section.
- B. Space trusses as shown on the plans.
- C. Do not alter, cut, or remove truss members or connections of trusses.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacing indicated.
- E. Erect trusses without damaging truss members or connections.
- F. Align truss bottom chords with load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
- G. Install construction continuous bridging, bracing, cross bracing and diagonal bracing per Light Gauge Steel Engineers Association (LGSEA) publication "Field Installation Guide For Cold-Formed Steel Roof Trusses" October 1999.
- H. Attach trusses to trusses per truss manufacturer's recommendation.
- I. Attach trusses to bearing per truss manufacturer's recommendation.
- J. Attach permanent truss lateral and diagonal bracing per manufacturer's recommendation.
- K. Attach roof deck or sheathing structural support per truss manufacturer's recommendation.
- L. Attach roof deck shear transfer framing per truss manufacturer's recommendation.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

3.06 ISSUE FINAL INSPECTION REPORT

- A. Truss manufacturer is to inspect the roof and/or floor trusses after the installation is complete and issue a written report indicating whether the trusses were installed per Part 3 'Execution'.