

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Cold-formed steel trusses for roofs.

1.03 REFERENCES

- A. Refer to the latest editions for each of the following references:
 - 1. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 2. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - 3. ASTM A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Non-metallic-Coated Cold-Formed Framing Members.
 - 4. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 5. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
 - 6. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - 7. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Accessories
 - 8. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
 - 9. AISC - Manual of Steel Construction, Load Resistance Factor Design
 - 10. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Fabrication Shop Drawings:
 - 1. Erection drawings depicting floor plan and layout of shop fabricated trusses.
 - 2. Shop Details of each individual truss.
 - 3. Fabrication details indicating shop welds and connections.
- C. Engineering Shop Drawings:
 - 1. Engineering Shop Drawings shall be prepared by an Engineer licensed in the State of the Project.
 - 2. Show layout, spacing, sizes, thicknesses, and types of cold-formed metal framing.
 - 3. Show fastening and anchorage, including mechanical fasteners.
 - 4. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- D. Structural Calculations:

1. Provide structural calculations prepared by an Engineer licensed in the State of the Project.
2. Calculations shall include: design criteria; engineering analysis depicting stress and deflection requirements for each framing application; selection of framing components, accessories and welded connection requirements; and attachments to structure and adjacent framing components.

E. Welding certificates.

1.05 QUALITY ASSURANCE

- A. Prefabricated Cold Formed Steel Truss Manufacturer Qualifications: An experienced Fabricator with a minimum of 5 years experience, who has completed cold-formed metal trusses similar in material, design, and extent to that indicated for the project and whose work has resulted in construction with a record of successful in-service performance. Fabricator shall provide a strict Quality Assurance Program in the factory during all phases of the fabrication in order to insure conformance with construction documents.
- B. Engineering Responsibility: Preparation of Engineered Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal trusses that are similar to those indicated for this Project in material, design, and extent.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- E. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- G. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- H. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "North American Standard for Cold-Formed Steel Framing - General Provisions."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling per requirements of AISI's "Code of Standard Practice".

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Prefabricated Cold Formed Steel Truss Manufacturer: Subject to compliance with requirements, but are not limited to the following:
 - 1. American Panel Tec

2.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: Design Loads: as required by local code and as indicated on the Construction Documents
 - 2. Deflection Limits: Design framing systems to withstand deflection limits per the requirement of the finish material or as specified by the architect or engineer of record but not to exceed the following:
 - a. Floor Trusses: Vertical deflection of 1/480 for live loads and 1/360 for total loads of the span.
 - b. Roof Trusses: Vertical deflection of 1/360 for roof/snow loads and 1/240 for total loads of the span.
 - c. Scissor Roof Trusses: Horizontal deflection of 1-1/4 inches (32 mm) at reactions.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope 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 of 120 deg F (67 deg C).
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: Design according to AISI S210.
 - 2. Lateral Design: Design according to AISI S213.
 - 3. Roof Trusses: Design according to AISI S214.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.03 COLD-FORMED STEEL TRUSS MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H (ST230H)
 - 2. Grade: ST50H (ST340H)
 - 3. Grade: As required by structural performance
 - 4. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90)
 - 5. Coating: G90 (Z275) or equivalent
- B. Steel Sheet for Vertical Deflection, Drift Clips: ASTM A 1003/A1003 M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1 or 2, As required by structural performance.
 - 2. Coating: G60 (Z180).

2.04 ROOF TRUSSES

- A. Roof Truss Members: Built-up members of manufacturer's standard C-shaped steel section with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; un-punched; of web depths indicated; and as follows:
1. Minimum Base-Metal Thickness: 20 Gauge - 0.0329 inch (0.84 mm), 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).

2.05 FLOOR TRUSSES

- A. Floor Truss Members: Manufacturer's standard C-shaped steel joists, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-5/8 inches (41 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).
 3. Section Properties: Refer to Drawings.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, un-punched, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 18 Gauge - 0.0428 inch (1.09 mm), 16 Gauge - 0.0538 inch (1.37 mm), 14 Gauge - 0.0677 inch (1.72 mm) 12 Gauge - 0.0966 inch (2.45 mm).
 2. Flange Width: 1-1/4 inches (31.8 mm), 2 inches (51 mm), 2-1/2 inches (63 mm).

2.06 ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.
- B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.07 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C or mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

- F. Welding Electrodes: Comply with AWS standards.

2.08 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

2.09 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Touch up all welds with Zinc rich paint.
 - c. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabrication shall only proceed after the fabricator has received approved drawings. Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).
 - 3. Built up members: shall be welded together with 3/4" length weld at a maximum spacing of 24" o.c., unless otherwise indicated more stringent on the design documents.
- D. All built-up members inaccessible in the field shall be insulated in the factory.
- E. All hot rolled structural steel shall be painted, unless noted otherwise.
- F. Required exterior sheathing shall be factory applied, screw type and spacing per the specification and drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of trusses or joists and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction as required.
- D. Install sealer gaskets to isolate the underside of truss or joist track or rim track and the top of foundation wall or slab at stud or joist locations as required.

3.03 INSTALLATION

- A. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
- B. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Fasten cold-formed steel trusses by welding or mechanical fasteners.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.
- C. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- D. Truss Spacing: As indicated.
- E. Do not alter, cut, or remove framing members or connections of trusses.
- F. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
- G. Erect trusses without damaging framing members or connections.
- H. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
- I. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's TechNote 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- D. Testing agency will report test results promptly and in writing to Contractor and Architect.
- E. Remove and replace work where test results indicate that it does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.05 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

END OF SECTION