

**SECTION 05 40 00
COLD-FORMED METAL FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

1.2 DESCRIPTION OF WORK

- A. This section includes the following types of cold-formed metal framing:
 - 1. C-shaped, load-bearing (transverse) steel studs.
 - 2. Manufacturer's accessories.

1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with latest editions of:
 - 1. American Iron and Steel Institute (AISI) "North American Standard for Cold -Formed Steel Framing," relevant provisions.
 - 2. AISI "Code of Standard Practice for Cold Formed Steel Structural Framing."
 - 3. Center for Cold-Formed Steel Structures (CCFSS) Technical Bulletin: "AISI Specification Provisions for Screw Connections."
 - 4. American Welding Society, Inc. (AWS): AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel."
 - 5. American Society for Testing and Materials (ASTM):
 - a. ASTM C 1007 "Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories."
 - b. ASTM A653 / A653M - 09a "Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process."
 - c. ASTM A780 / A780M - 09 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
 - 6. Light Gauge Steel Engineers Association (LGSEA) "Field Installation Guide for Cold-Formed Steel Roof Trusses."

1.4 DESIGN REQUIREMENTS:

- A. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.
 - 1. Design connection of cold-formed steel framing to flexural capacity of the member with the following (2) exceptions:
 - a. Vertical cantilever cold-formed steel framing at parapet will be designed for the design level pressures and have a maximum reaction of 4 kips. The vertical cantilever

reaction will be combined with the reaction for the typical vertical cold-formed steel framing resulting from the flexural capacity of the member.

- b. Typical cold-formed steel framing above and below openings will be designed for the design level pressures and a maximum reaction of 4 kips.

2. Connection Safety Factors (SF):

- a. SF = 1 shall be allowed for connection elements that provide a ductile mode of failure (e.g. bolt bearing, tensile yielding, etc.)
- b. SF = 1.5 shall be used for connection elements that provide a non-ductile mode of failure (e.g. weld fracture, concrete cone failure due to anchor bolt pull-out, etc.)

B. Qualifications for Welding Work:

- 1. Qualify welding processes and welding operators in accordance with AWS standards.
- 2. Provide one of the following certifications for welders to be employed in the work:
 - a. Certification of satisfactorily passing AWS qualification tests within previous 12 months to perform type of welding in work.
 - b. Work record signed by supervisor showing regular employment within previous 12 months to perform type of welding in work.

- C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating including those required for compliance with governing regulations, provide units that have been approved by governing authorities having jurisdiction.

1.4 SPECIAL INSPECTIONS

- A. Refer to Specification Section 01 45 29 and the Schedule of Special Inspections.

1.5 MATERIAL EVALUATION/QUALITY CONTROL

- A. Preconstruction Testing: Contractor shall employ a testing laboratory acceptable to Engineer and Architect to perform material evaluation tests.
- B. Submit testing service qualifications demonstrating experience with similar types of projects.
- C. The Registered Design Professionals (RDPs) for Structural Engineering and Architecture will visit the construction site at appropriate intervals to determine if work is in general conformance with Contract Documents and specifications. Notify RDPs 48 hours before anticipated time of completion for a given section of work so they may determine if site observations are required. If site observations are required, do

not conceal framing until RDPs have had an opportunity to make observations.

1.6 SUBMITTALS

A. Shop Drawings: Submit detailed drawings showing:

1. Reference Contract Drawing number and addendum number in each shop drawing.
2. Wall Framing:
 - a. Complete layout of framing. Provide building elevations showing framing layout.
 - b. Include placing drawings for framing members showing size and gauge designations, number, type, location, and spacing. Indicate fastening and anchorage details, including mechanical fasteners and welds, supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation and connections.
 - c. Design loadings for each load combination.
 - d. Load deflections.
 - e. Provide complete design calculations prepared by a registered Engineer in the state of New York. Indicate dead, live, wind, and other applicable loads used in design. Member sizes and configurations shown in drawings are minimum and intended to establish a standard of performance. Design deviations shall not be permitted unless accepted by architect in writing after review of complete design calculations and drawings; design deviations shall not incur additional cost to Owner.
 - f. Each Shop Drawing submitted for review to Architect shall be stamped by registered Professional Engineer indicating the Engineer's review and acceptance of the drawings.

B. Material Data: Submit to Special Inspector and Engineer laboratory test reports and other data as required to show compliance with specifications. Submit producer's or manufacturer's specifications and installation instructions for the following:

1. Product data and installation instructions for each item of cold-formed metal framing and accessories, including manufacturer's suggested capacities and certified test data.
2. Mill certificates signed by steel sheet producer or test reports from qualified independent Testing Agency indicating steel sheet complies with specified requirements.
3. Certification that framing members have equivalent or greater section properties than specified requirements.
4. Welding electrodes.
5. Product data for screws, bolts, and other fasteners used.
6. Postinstalled anchors (expansion, sleeve, or chemical adhesive) if used.

1.7 PERFORMANCE REQUIREMENTS

A. Comply with building code and design data as noted in drawings.

1.8 PRODUCT HANDLING

- B. Store materials in approximately horizontal position on supports above ground with one end elevated for drainage.
- C. Protect from weather, and keep free of dirt and debris.
- D. Ventilate to avoid condensation.
- E. Handle material carefully so it is not bent or marred.
- F. Replace damaged materials at no cost to Owner.

1.9 WORKMANSHIP

- A. Contractor shall be responsible for correction of work not conforming to specified requirements. Correct deficient work as directed by Architect.
- B. Remove work found to be defective. Replace with new acceptable work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. System Components: Manufacturer's standard load-bearing steel studs of type, size, shape, and gauge as indicated. With each type of metal framing required, provide manufacturer's standard steel runners (tracks), bridging, blocking, lintels, clip angles, vertical deflection (slide) clips, shoes, reinforcements, fasteners, and accessories for application indicated as needed to provide complete metal framing system.
- B. Framing Components and Finishes:
 - 1. For 16 gauge and heavier units, fabricate metal framing components of structural- quality steel sheet with minimum yield point of 50,000 psi; ASTM A 653, SS Grade 50.
 - 2. For 18 gauge and lighter units, fabricate metal framing components of commercial- quality steel sheet with minimum yield point of 33,000 psi; ASTM A 653, SS Grade 33 unless otherwise indicated.
 - 3. Provide galvanized finish to metal framing components complying with ASTM A 653 for minimum G60 coating.
 - a. Provide minimum G90 coating for exposed exterior components.
 - 4. Section Properties: Physical and structural properties used for design are based on properties listed by Marino\Ware and shall be considered minimum permitted for framing members. Provide members with equivalent or greater section properties. These properties are as follows (Area and I_x are gross section properties; S_x and R.M. are effective section properties):

Depth (in.)	Flange (in.)	Gauge	Area (in. ²)	I_x (in. ⁴)	S_{xe} (in. ³)	R.M. (in.-K.)
3 5/8"	1 5/8	20	0.26	0.53	0.26	5.3
3 5/8"	1 5/8	18	0.34	0.69	0.37	7.3
3 5/8"	1 5/8	16	0.42	0.86	0.46	9.2
6"	1 5/8	20	0.34	1.79	0.57	11.4

6"	1 5/8	18	0.45	2.31	0.76	16.6
6"	2	16	0.61	3.32	1.01	30.3

C. Deflection Track:

1. For exterior walls, provide minimum 14-gauge track unless noted otherwise.
2. For interior walls, provide minimum 18-gauge track unless noted otherwise.
3. Minimum leg depth shall be as required to provide at least 1-inch clearance between top of studs and top of track and to provide at least 1½ inches overlap of studs and track leg.

2.2 ACCESSORIES

A. Fasteners:

1. Screws: Self-tapping in accordance with manufacturer's recommendations for size and spacing unless detailed otherwise in drawings.
2. Bolts and Nuts: ASTM A 307.
3. Finish: Corrosion-resistant, plated finish.

B. Welding Electrodes: As permitted by AWS.

C. Powder-Actuated Fasteners: 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 the design load as determined by testing in accordance with ASTM E 1190, performed by a qualified independent Testing Agency.

D. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Hole reinforcing plates.
7. Backer plates.

H. Steel Shapes and Clips: Provided under Section 05 12 00; installed under this section.

2.3 MISCELLANEOUS MATERIALS

A. Cold-Galvanizing: Zinc-rich, cathodic-acting paint. "Theme-Zinc 90-97" by Themec Inc.; "ZRC Galvalite" by ZRC Worldwide; or accepted equivalent.

2.4 FABRICATION

A. Fabricate units in jig templates to hold members in proper alignment and position and to ensure consistent component placement.

- B. Fastenings: Attach components by welding, bolting, or screw fasteners as standard with manufacturer unless noted otherwise in drawings.
- C. Wire-tying of framing components shall not be permitted.
- D. Welds shall be fillet, plug, butt, or seam unless noted otherwise.
- E. Cut framing components squarely or on an angle required to fit tightly with proper bearing against abutting members. Maintain members firmly in position until permanently fastened.
- F. Wire-brush shop welds clean, and apply galvanizing repair paint in accordance with ASTM A 780 and manufacturer's written instructions.
- G. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members within plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finish materials.
 - 2. Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.
 - 3. Length of end bearing members shall be within plus or minus 1/16 inch of length shown.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Examine conditions under which work shall be erected. Do not proceed until unsatisfactory conditions are corrected.
- B. Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.

3.2 ERECTION

- A. Install framing in accordance with ASTM C 1007 unless noted otherwise.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks to satisfy performance requirements, except do not exceed 24 inches on center spacing for nail or power-driven fasteners or 16 inches on center for other types of attachment. Provide fasteners at corners and ends of tracks.
- C. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element or they shall be butt-welded or spliced together.
- D. Installation of Wall Studs: Secure studs to top and bottom runner tracks by either welding or screw-fastening at both inside and outside flanges as shown in drawings. Do not screw or weld studs to vertical deflection clips or deflection slip tracks.
 - 1. Set studs plumb.
 - 2. Where stud system abuts structural columns or walls, including

masonry walls, anchor ends of blocking to supporting structure.

3. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards, considering weight or loading resulting from item supported.
 4. Frame both sides of expansion and control joints with separate studs. Do not bridge the joint with components of stud system.
 5. Framing system shall be constructed to maintain clearances to allow for construction tolerances and to accommodate live load deflection of primary building structure as indicated in drawings.
- E. Cutting of flanges in joist, stud, and header framing members shall not be permitted.
- F. Splicing of joist, stud, and header framing members shall not be permitted.

3.3 ERECTION TOLERANCES

A. Framing:

1. Length of end bearing members: $\pm 1/16$ inch.
2. Vertical alignment of studs: $\pm 1/8$ inch in 10 feet.
3. Horizontal alignment of walls: $\pm 1/8$ inch in 10 feet, 1/4-inch maximum deviation from theoretical line.
4. Framing spacing: $\pm 1/8$ inch from design spacing, 1/2-inch maximum cumulative error.

3.4 TOUCH-UP PAINTING

- A. After installing framing, wire-brush, clean, and paint scarred areas (scratches, weld burn marks, etc.), welds (shop and field), and rust spots on both surfaces of framing units and supporting steel members.
1. Touch up paint-damaged galvanized surfaces and welded areas with cold-galvanizing paint applied in accordance with manufacturer's instructions.

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