

The Steel Framing Industry Association (SFIA) is dedicated to expanding the market for cold-formed steel in construction through programs and initiatives that promote the use of cold formed steel framing as a sustainable and cost-effective solution, advocate the development and acceptance of favorable code provisions, educate members with reliable data and other critical information that is essential to effective business planning, and create a positive environment for innovation.

One of the critical aspects of obtaining quality installations is manufacturer certification and certification of installers. This guide specification provides significant quality assurance by requiring certification.

Much of the technical information in this specification maybe listed on the drawings by the SE. It is critical to coordinate this section with the structural drawings.

Note to Specifier: *This specification is based on the 2018 International Building Code. Check commentary if another version of IBC governs.*

SECTION 054000 – COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall cold-formed steel framing.
2. Floor joist cold-formed steel framing.
3. Exterior non-load bearing wall cold-formed steel framing.
4. Roof rafter cold-formed steel framing.
5. Ceiling joist cold-formed steel framing.
6. Soffit cold-formed steel framing.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092216 "Non-Structural Metal Framing" for interior non-structural cold-formed steel framing.

1.2 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Conduct conference at Project site.

1. Prior to the start of the cold-formed steel framing work, and at the Contractor's direction, meet at the site and review the installation procedures and coordination with other work.
2. Include Contractor, Owner, Owners Testing and Inspection Agency, as well as any subcontractors or material technical service representatives whose work, or products, must be coordinated with the cold formed steel framing work.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturers printed technical data indicating products provided that comply with requirements of the drawings.
- B. Sustainable Design Submittals: Submit published documentation for each product.
 - 1. Provide documentation for recycled material content.
 - 2. Environmental Product Declaration (EPD): For each product.
 - 3. Construction and Demolition Waste Management: For each product.

Note to Specifier: Add specific sustainability requirements as appropriate. Many attributes are manufacturer and product specific. See commentary Section 1.3 ACTION SUBMITTALS B.

- C. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- D. Delegated-Design Submittal: For cold-formed steel framing by Specialty Structural Engineer (SSE).

1.4 INFORMATIONAL SUBMITTALS

Note to Specifier: These need to be coordinated with 092216.

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product certificates.

Note to Specifier: See 1.5 (A&C) Quality Assurance for what is required

- 1. Studs and Track
- 2. Anchor Clips
- D. Evaluation Reports: For cold-formed steel framing and accessories
 - 1. Products to be certified under an independent qualified third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 Accreditation Criteria for Inspection Agencies.
- E. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.

4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA).
- B. Provide framing members that are certified in accordance with the “Code Compliance Certification Program” implemented by the Steel Framing Industry Association (SFIA).
- C. Provide anchoring clips that are certified in accordance with the “Cold-Formed Connector Program” implemented by the Steel Framing Industry Association (SFIA).
- D. Installer Qualifications: Provide documentation that the installing contractor of the cold-formed framing system has 5 years of experience on similar work and a project specific manufacturer approval letter from steel stud manufacturer or installing contractor is recognized in Steel Framing Industry Associations (SFIA) “Contractor Certification Program”.

Note to Specifier: See commentary Section 1.5 Quality Assurance E. for clarification on mill certifications.

- E. Product Tests: Mill certificates or data from a qualified independent testing agency or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness. Manufacturer inclusion in the “SFIA Code Compliance Certification Program” meets this requirement.
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling, as required in AISI S202 “Code of Standard Practice.”

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Provide products by Steel Framing Industry Association (SFIA) Members in good standing found at http://www.archtest.com/certification/SFIA_SteelFraming_Intertek.aspx.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Specialty Structural Engineer to design cold-formed steel framing as defined in Division 01. The design professional shall be licensed in the jurisdiction and acceptable to the AHJ.

Note to Specifier: See commentary Section 2.2 PERFORMANCE REQUIREMENTS A for additional information on structural performance requirements.

- B. Structural Performance: Provide cold-formed steel framing capable to withstand design loads within limits and under conditions indicated within the construction documents.
 - 1. Design Loads: As indicated on Drawings.
 - 2. 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).
 - 3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of X/X inches.
 - 4. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 - 5. Horizontal Deflection: Deflection Limits: Design framing systems to withstand design loads without horizontal and vertical deflections greater than the following:
 - a. Exterior Load (Axial)-Bearing Wall Framing: X/XXX.
 - b. Interior Load-Bearing Wall Framing: X/XXX.
 - c. Exterior Non-Load Bearing Wall Framing (curtain wall): X/XXX
 - 6. Floor Joist Framing, vertical deflection limits: X/XXX.
 - 7. Roof Rafter Framing, vertical deflection limits: X/XXX.
 - 8. Ceiling Joist Framing, vertical deflection limits: X/XXX.
- C. Fire-Resistant-rated assemblies: For fire-resistance-rated assemblies that incorporate non-structural steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 and displaying a classification label from an independent testing agency acceptable to the authority having jurisdiction.
 - 1. Construct fire-resistance rated partitions in compliance with tested assembly requirements indicated on drawings.
 - 2. Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.
- D. Sound-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.3 COLD-FORMED STEEL FRAMING

- A. Framing Members, General: Comply with AISI S240 for conditions indicated.

Note to Specifier: The above is based on the 2018 International Building Code. Check commentary if another version of IBC governs. See Commentary 2.3 COLD-FORMED STEEL FRAMING A for information.

- B. Steel Sheet Components: Comply with AISI S240, ASTM A1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Protective Coating: Comply with AISI S240, CP60
- C. Steel Sheet for [Vertical Deflection] [Drift] [Rigid] [Foundation] Clips: ASTM A1003/A1003M, ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: [33 (230)] [50 (340), Class 1] [As required by structural performance].
 - 2. Coating: CP 90: G90 (Z275), AZ50 (AZM150), or GF45 (ZGF135).

2.4 COLD-FORMED STEEL LOAD-BEARING WALL FRAMING OR EXTERIOR NON (Axial) -LOAD BEARING (CURTAIN WALL)

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, with minimum base-steel thickness, flange width and section properties required to meet design requirements.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching properties of steel studs.
- C. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths required, and with minimum base steel thickness, flange width and section properties required to meet design requirements.
- D. Steel Box or Back-to-Back Headers: Manufacturer's one-piece members, or standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and with minimum base steel thickness, flange width and section properties required to meet design requirements.

Note to Specifier: Delete items from the following not in the project.

2.5 COLD-FORMED STEEL FLOOR JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, [unpunched,] [punched,] [punched, with enlarged service holes,] with stiffened flanges, and with minimum base-steel thickness, flange width and section properties required to meet design requirements.

- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths required, unpunched, with unstiffened flanges, and with minimum base-steel thickness, flange width and section properties required to meet design requirements.

2.6 COLD-FORMED STEEL ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and with minimum base steel thickness, flange width and section properties required to meet design requirements.

2.7 COLD-FORMED STEEL CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, [unpunched,] [punched with enlarged service holes,] [punched with standard holes,] with stiffened flanges, and with minimum base steel thickness, flange width and section properties required to meet design requirements.

2.8 COLD-FORMED STEEL SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and with minimum base steel thickness, flange width and section properties required to meet design requirements.

2.9 FRAMING 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 framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, required by design requirements.

2.10 ANCHORS, CLIPS, AND FASTENERS

- A. Specialty Structural Engineer (SSE) shall include the following anchors, clips and fasteners required by the design requirements:
 1. Steel Shapes and Clips.
 2. Anchor Bolts.
 3. Expansion Anchors.
 4. Power-Actuated Anchors if allowed by Structural Engineer of Record.
 5. Mechanical Fasteners, head type: low-profile head beneath sheathing, manufacturer's standard elsewhere.
 6. Welding Electrodes.

2.11 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780.
- B. Cement Grout: ASTM C476, Standard Specification for Grout for Masonry.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout complying with ASTM C 1107/C 1107M.
- D. Shims:
 - 1. Load bearing, high-density multimonomer, nonleaching plastic.
 - 2. Cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene, ¼-inch thick, match width of bottom track or rim track members.

2.12 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to AISI S240, 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 steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M 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, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, 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: 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. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to ASTM C1007 and to manufacturer's written instructions unless more stringent requirements are indicated
- C. Install shop or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

3. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 4. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
 - F. 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.
 - G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
 - H. Install indicated insulation, per specifications, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
 - I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
 - 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 and as follows:
 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as indicated on shop drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as indicated on shop drawings.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S240. Where framing cannot be aligned, continuously reinforce track to transfer loads.

- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically as indicated on shop drawings. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing indicated on Shop Drawings.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

- C. Space joists not more than 2 inches from abutting walls, and as indicated on Shop Drawings.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as indicated on Shop Drawings.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

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

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel 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 ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

Disclaimer: The SFIA Guide Specifications and specification review process are intended for use as product reference material by architects, engineers, other design professionals, contractors, building code officials, or other competent construction industry trade professionals having an interest in the selection,

specification and use of Cold-Formed Steel Framing as manufactured by the members of the Steel Framing Industry Association. The specifications are intended solely as technical support incident to the sale and use of cold-formed steel framing and not intended to be a substitute for the design review and approval of the licensed design professionals for the project.