

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Roof rafter framing.
4. Exterior ceiling and soffit framing.

B. Products furnished ~~but by~~ not designed under this Section include:

1. Exterior ceiling framing installed under roof joists for plywood ceilings.
2. Exterior non-load-bearing wall framing in wide flange pocket voids and wall framing attached to bottom of wide flange beams forming rough opening headers.

C. Related Sections include the following:

1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
2. Section 06 16 00 "Sheathing" for shear panels (sure-board).
3. Section 04 26 13 "Masonry Veneer" for ties attached to cold-formed metal framing.
4. Section 07 05 43 "Cladding Support systems" for cladding supports attached to and supported by cold-formed metal framing.
5. Section 07 21 00 "Thermal Insulation" for batt insulation installed in boxed framing assemblies.
6. Division 08 Sections for openings in exterior framing.
 - a. Section 08 36 13 "Sectional Doors" for framing requirements installed in this Section.
7. Section 09 22 16 "Non-Structural Metal Framing" for interior framing for non-load-bearing walls and soffits and ceiling-suspension assemblies; for design of exterior ceiling framing installed under roof joists.

1.2 COORDINATION

- A. Coordinate transition to other framing systems and bearing conditions to maintain differential movement between bearing conditions without bridging or rigidly preventing required movement.
- B. Coordinate requirements of items attached to and supported by cold-formed metal framing, including but not limited to exterior finishes in Division 07 and opening-glazing systems in Division 08.
- C. Coordinate required openings in framing for routing utilities.
- D. Coordinate additional reinforcement installed under this Section for openings designed in Division 08.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: For holes and openings in individual, unpunched, and boxed assemblies; for roof-rafters and headers. List framing size and build-up, including reference drawing references. Show layout, spacings, and sizes of required openings. Show proposed reinforcing and supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding Certificates.
- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - ~~5. Vertical deflection clips.~~
 - ~~6. Horizontal drift deflection clips~~
 - ~~7-5.~~ Miscellaneous structural clips and accessories.
- D. Research/Evaluation Reports: From ICC-ES or qualified testing agency acceptable to authorities having jurisdiction.
 - 1. For cold-formed metal framing, post-installed anchors, mechanical fasteners, and power-actuated fasteners.
 - 2. For cold-formed metal framing structural clips.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- B. 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-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. 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."
- D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Administrative Requirements."
 - 1. Include trades whose work is attaching to or supported by or within framing.
- F. Material Selection: Verify location of the air barrier, prior to ordering materials, to establish coating designation required for framing and accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. Allied Studco.
 - 2. CEMCO, California Expanded Metal Products Company.
 - 3. ClarkDietrich.
 - 4. Marino Ware; A Division of Ware Industries.
 - 5. SCAFCO Corporation.
 - 6. Steel Construction Systems.
 - 7. Steeler, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As noted in the Structural Drawings.
 - 2. Coating: G60 (Z180).
 - a. G90(Z275) for items outside the air barrier but not directly exposed to weather.
- B. Steel Sheet for Vertical Deflection and/or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1 or 2.
 - 2. Coating: G90 (Z275).

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on Drawings, General Structural Notes.
 2. Section Properties: As indicated on Drawings, General Structural Notes.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
 2. Flange Width: As indicated.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As indicated on Drawings, General Structural Notes.
 2. Section Properties: As indicated on Drawings, General Structural Notes.

2.4 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness Reference General Structural Notes.
 2. Flange Width: As indicated on Drawings, General Structural Notes.
 3. Section Properties: As indicated on Drawings, General Structural Notes.
- B. Built-up 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; unpunched; of web depths indicated; and as follows:
1. Minimum Base-Metal Thickness: As indicated on Drawings, General Structural Notes.
 2. Flange Width: As indicated.

2.5 EXTERIOR CEILING AND SOFFIT FRAMING

- A. Steel Ceiling and Soffit Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As indicated on Drawings, General Structural Notes.
 2. Flange Width: As indicated.
 3. Section Properties: As indicated on Drawings, Structural Drawings.

2.6 EXTERIOR NON-LOAD-BEARING FRAMING INFILL

A. General:

1. Minimum Base-Metal Thickness: As required by performance.
 - a. Framing Supporting Glazing Systems: Minimum 54 mil.
 - b. Framing, Backup to Exterior Cladding: Minimum 43 mil.
 - c. Blocking for Supporting other Work: Minimum 54 mil.
2. Section Properties: Match requirements of General Structural Notes on Drawings.

- B. Steel Studs: Match material for load-bearing.
 - 1. Flange Width: 1-5/8-inch minimum.
- C. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges.
 - 1. Minimum Base-Metal Thickness: Matching steel studs.
 - 2. Flange Width: 1-1/4-inch minimum.
- D. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges.

2-62.7 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, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers, knee braces, and girts.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2-72.8 ANCHORS, CLIPS, AND FASTENERS

- A. Products, Clips and Fasteners: Named products are basis-of-design.
 - 1. Substitutions: See Section 01 25 00 "Substitution Procedures."
 - 2. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- C. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed 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.
- D. Post-Installed Anchors: As indicated on Structural Drawings.
- E. Power-Actuated Anchors: As indicated on Structural Drawings. Substitutions not permitted.

- F. Mechanical Fasteners: As indicated on Structural Drawings. Dual hardner, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws. The self-drilling point lead tapping threads shall have a minimum hardness of HRL. The load bearing screen shank shall have a maximum of hardness of HRL 34.
 - 1. Head Type: Hex washer head, Undercut flathead, custom head styles as noted on Drawings.
- G. Welding Electrodes: Comply with AWS standards.

2-82.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time. Exterior type.
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2-92.10 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. Locate mechanical fasteners and install according to 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 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 metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Verify sequence of framing and adjacent materials. Coordinate with other trades requiring access and openings closed by or made inaccessible by framing.
 2. Verify blocking and support requirements of work by others being attached to framing.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track 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.
- B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations. Install between framing and accessories attached to concrete.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" 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 metal 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 metal framing members by welding, screw fastening, clinch fastening, or riveting. 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. Locate mechanical fasteners and install according to 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. Install supplementary framing, blocking, and bracing in stud framing indicated to support other work.
 - 1. Install horizontal blocking or strapping in storage areas at transition between plywood and gypsum board finishes.
- G.H. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints or provide slip, sliding or other joints allowing for movement while maintaining required connections.
- H.I. Maintain clearances at openings, to allow for construction tolerances.
- I.J. Install insulation, specified in Division 07 Section "Thermal Insulation," 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.
- J.K. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
 - 1. Fasten hole plates over web penetrations in rough openings receiving air barrier materials.
- K.L. Erection Tolerances: Install cold-formed metal 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 follows:
 - 1. Anchor Spacing: As shown on Structural Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding distance indicated on Drawings, between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks.
 - 1. Stud Spacing: As indicated.
- 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 roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry or concrete walls, to supporting structure as indicated. Install sill gasket between framing and masonry or concrete.
- 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 Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner 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 48 inches. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
- 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 INSTALLATION OF EXTERIOR NON-LOADBEARING WALL FRAMING INFILL

- A. Install continuous tracks sized to match studs and nested head tracks sized for top tracks. Align tracks accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to top interior track and to bottom track unless otherwise indicated.
- C. Space studs as follows: As required by delegated design but not greater than 16 inches o.c.
- D. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- E. Attach to structural members according to approved Shop Drawings.
- F. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install double deep-leg deflection tracks and anchor outer track to building structure.

- G. Install horizontal bridging in wall studs, spaced vertically in rows indicated but not more than 48 inches apart. Fasten at each stud intersection. Provide bridging type indicated on Shop Drawings:
1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 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.
- H. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.53.6 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.
- 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 of 1-1/2 inches.
 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 Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, 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 Drawings.
1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Drawings. Fasten bridging at each joist intersection as follows:
1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- 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.

3.63.7 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 Owner and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements at no additional cost to Owner and Project.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.73.8 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, to equivalent G-designation coating thickness and not less than 9 mil dry film thickness.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION