

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

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
  - 1. *Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).*
  - 2. *The University of Houston's Supplemental General Conditions and Special Conditions for Construction.*

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Exterior non-load-bearing wall framing.
  - 2. Roof rafter framing.
  - 3. Soffit framing.
- B. Related Requirements:
  - 1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
  - 2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
  - 3. Section 09 22 16 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

#### 1.3 PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

- A. Preinstallation Conference: Conduct conference at Project site .

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. LEED Submittals (Projects authorized for LEED certification only):
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed 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.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. 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.

C. 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."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
1. ClarkDietrich Metal Framing; a Worthington Industries Company, [www.clarkdietrich.com](http://www.clarkdietrich.com)
  2. MarinoWARE, [www.marinoware.com](http://www.marinoware.com).
  3. SCAFCO Corporation, [www.scafco.com](http://www.scafco.com).
  4. Substitutions: See Section 01 25 00 - Substitution Procedures.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: As indicated .
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Select deflection ratios to suit finish material(s) to be used on the specific project.Exterior Non-Load-Bearing Framing: Horizontal deflection of **[1/240] 1/360 [1/600] [1/720]** of the wall height.
    - b. Roof Rafter Framing: Vertical deflection of **[1/120] 1/240 [1/360]** of the horizontally projected span for live loads.
    - c. Soffit Framing: Vertical deflection of **[1/120] [1/240] [1/360]** of the span for live loads and 1/240 for total loads of the span.
  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.

Retain first subparagraph below for non-load-bearing and load-bearing walls if design responsibility for cold-formed framing is assigned to Contractor. Indicate locations on Drawings if different movement is anticipated for different building elements. If preferred, change deflection limits to ratios such as L/300 for floors and L/200 for roofs.

4. 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 3/4 inch .

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

Retain subparagraphs below, as applicable, if Project includes floor and roof systems, wall studs, headers for load-bearing walls, or lateral design requirements.

1. Wall Studs: AISI S211.
2. Headers: AISI S212.
3. Lateral Design: AISI S213.

- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

### 2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance .
2. Coating: G90 or equivalent .

Retain "Steel Sheet for (Vertical Deflection) (Drift) Clips" Paragraph below if applicable.

- C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

Retain grade requirements from options in "Grade" Subparagraph below.

1. Grade: As required by structural performance.
2. Coating: G90.

### 2.4 EXTERIOR NON-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:

Retain one steel thickness from "Minimum Base-Metal Thickness" Subparagraph below or revise to suit Project. Sequence corresponds to common thickness designators 33, 43, 54, 68, and 97 and obsolete 20-, 18-, 16-, 14-, and 12-gage designations.

1. Minimum Base-Metal Thickness: 0.0538 inch .

Flange widths vary with application. If sheathing or masonry ties are required, consider minimum flange width of 1-5/8 inches (41 mm). Sequence corresponds to common flange width designators 137, 162, 200, and 250.

2. Flange Width: 1-5/8 inches .

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

Retain one steel thickness from "Minimum Base-Metal Thickness" Subparagraph below or revise to suit Project. Sequence corresponds to common thickness designators 33, 43, 54, 68, and 97 and obsolete 20-, 18-, 16-, 14-, and 12-gage designations.

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches .

- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following :
  - a. ClarkDietrich Metal Framing; a Worthington Industries Company, [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - b. MarinoWARE, [www.marinoware.com](http://www.marinoware.com).
  - c. SCAFCO Corporation, [www.scafco.com](http://www.scafco.com).
  - d. Substitutions: See Section 01 25 00 - Substitution Procedures.

- D. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

## 2.5 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths required, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch .
2. Flange Width: 2 inches , minimum.

## 2.6 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths required, with stiffened flanges, and as follows:
  - 1. Minimum Base-Metal Thickness: 0.0538 inch .
  - 2. Flange Width: 2 inches , minimum.

## 2.7 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:

Revise list below to suit Project.

- 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 and knee braces.
- 9. Joist hangers and end closures.
- 10. Hole reinforcing plates.
- 11. Backer plates.

## 2.8 ANCHORS, CLIPS, AND FASTENERS

Retain "Expansion Anchors" Paragraph below if expansion anchors are acceptable. Verify safety factor with Project's structural engineer. Revise as required or insert specific load requirements and names of acceptable products.

- A. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- B. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

- C. 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.
- D. Welding Electrodes: Comply with AWS standards.

## 2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- 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/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- 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.

## 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 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.

### 3.3 INSTALLATION, GENERAL

- A. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- B. 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.
    - 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, and complying with requirements for spacing, edge distances, and screw penetration.
- C. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- D. 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.
- E. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

Retain first paragraph below if insulation for exterior framing is required.

- F. Install insulation, specified in Section 07 21 00 "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.
- G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

Revise "Erection Tolerances" Paragraph below to suit Project. Coordinate with limitations of subsequent finish materials.

- H. 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 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
  - 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 requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support, as detailed on drawings.

Retain one of first two subparagraphs below if using deflection track with infill wall framing. Delete both subparagraphs and retain third if deflection clips are required for bypassing or infill wall framing. Vertical deflection clips are used if wall is stick built or panelized. Single deflection track is used if stud wall is stick built; double deflection track is used with wall panels. Drift clips may be used in seismic areas.

- 1. Install single deep-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to **[bypassing]** **[infill]** studs and anchor to building structure.
  - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

Retain "Top Bridging for Single Deflection Track" Subparagraph below if required.

- 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within **[12 inches]** **[18 inches]** of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
    - a. Install solid blocking at centers indicated .
  - 2. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. 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.

Insert additional article titles here if other framing classifications warrant more detailed installation requirements than those in "Installation, General" Article.

3.5 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, in a manner acceptable to manufacturer and Installer, conditions that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00