

SECTION 05 4000 - COLD-FORMED METAL FRAMING

1. GENERAL

1.1 SUMMARY

A. Section Includes

1. Exterior non-load-bearing wall framing

B. Related Sections

1. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing
2. Division 09 Section "Gypsum Board" for conventional suspended gypsum ceiling framing

1.2 REFERENCES

A. AISI – American Iron and Steel Institute

1. S100 – Design of Cold-Formed Steel Structural Members
2. S200 – Cold-Formed Steel Framing—General Provisions

B. ASTM International

1. A 36 – Carbon Structural Steel
2. A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
3. A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
5. A 780 – Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
6. A 1003 – Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
7. C 1107 – Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
8. C 1513 – Steel Tapping Screws for Cold-Formed Steel Framing Connections
9. E 119 – Fire Tests of Building Construction and Material
10. E 488 – Strength of Anchors in Concrete and Masonry Elements
11. E 1190 – Strength of Power-Actuated Fasteners Installed in Structural Members
12. F 1554 – Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

C. AWS – American Welding Society

1. D1.1 – Structural Welding Code—Steel
2. D1.3 – Structural Welding Code - Sheet Steel

D. MIL – Military Specifications, United States Department of Defense

1. P-21035 – Paint High Zinc Dust Content, Galvanizing Repair

E. SSMA – Steel Stud Manufacturers Association

1. Product Technical Information

F. SSPC – The Society for Protective Coatings

1. Paint 20 – Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As follows

- a. Dead Loads: As shown on the structural drawings.
- b. Live Loads: As shown on the structural drawings.
- c. Wind Loads: As per the criteria provided in the structural drawings.
- d. Seismic Loads: As per the criteria provided in the structural drawings.

2. Deflection Limits: Design framing systems to withstand the design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing: Horizontal deflection limit as follows –

Walls with flexible finish (metal panel): L/120.

Walls with brittle finish (glass): L/240

Walls with stucco/plaster: L/360.

Walls with brick finish: L/600

b. Ceiling Joist Framing: Vertical deflection of L/360 of the span.

3. Deflection Design framing systems to provide for movement of framing members 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.

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. Downward movement of 1/2 in.

1.4 SUBMITTALS

A. Sustainable Design Submittals: For products having recycled content, document percentages by weight of postconsumer and preconsumer recycled content.

1. Include statement indicating costs for each product having recycled content.

- B. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the California Registered Professional Engineer responsible for their preparation.
- D. Welding certificates.
- E. Research/Evaluation Report: For cold-formed metal framing.

1.5 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.

2. PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Current SSMA Members (ICC-ES Report ESR-3064P)
 - 2. California Expanded Metal Products Company.
 - 3. Clark Steel Framing.
 - 4. Dale/Incor.
 - 5. Dietrich Metal Framing; a Worthington Industries Company.
 - 6. MarinoWare; a division of Ware Industries.
 - 7. United Metal Products, Inc.
 - 8. Or equal, as approved in accordance with Division 01 requirements for Substitutions

2.2 REGULATORY REQUIREMENTS

- A. 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.
- B. Comply with AISI S100 and S200

2.3 MATERIALS

- A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H (ST230H)
 - 2. Coating: G90 or equal.
- C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 (340), Class 1 or 2
 - 2. Coating: G90 (Z275)

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:
 - 1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm)
 - 2. Flange Width: 1-5/8 inches (41 mm)
- 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: 1-1/4 inches (32 mm)
- C. Steel Headers: ProX Header, by Brady Construction Innovations Inc, or approved equal
- D. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company
 - b. MarinoWare, a division of Ware Industries
 - c. SCAFCO Corporation
 - d. The Steel Network, Inc.
 - e. Or equal, as approved in accordance with Division 01 requirements for Substitutions
- E. Single Deflection Track for use in fire-rated assemblies: As specified in Section 07 84 00

- F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm)
 - b. Flange Width: As noted on drawings.
 - 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm)
 - b. Flange Width: Outer deflection track flange width plus 1 inch (25 mm)
- G. 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

2.5 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

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C

- 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.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035, ASTM A 780 Annex 2
- B. 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
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members

2.8 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, SSMA publications, 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 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: 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.

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. 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 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.

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 S200 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 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 and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07, 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 standard punched openings.
- J. 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 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: 16 inches unless indicated otherwise
- 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.
 - 1. Connect vertical deflection clips to studs and anchor to building structure.
 - 2. Connect drift clips to cold formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

- A. Testing: The University 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 the Design Build team and the University Representative.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Design Builder's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 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 framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 4000