

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

SPEC WRITER NOTE: Delete between //---// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

SPEC WRITER NOTE: Adjust the list below to suit the Project.

1. Exterior load-bearing steel stud walls.
2. Interior load-bearing steel stud walls.
3. Exterior non-load-bearing steel stud curtain wall.
4. Steel joists.
5. Steel trusses.

1.2 RELATED WORK

- A. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Section 05 12 00, STRUCTURAL STEEL FRAMING: Structural steel framing.
- C. Section 05 21 00, STEEL JOIST FRAMING: Open web steel joists.
- D. Section 09 22 16, NON-STRUCTURAL METAL FRAMING: Non-load-bearing metal stud framing assemblies.
- E. Section 09 29 00, GYPSUM BOARD: Gypsum board assemblies.

1.3 DESIGN REQUIREMENTS

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

SPEC WRITER NOTE: Retain one of the two "Structural Performance" articles below. Retain the first article when the Architect provides cold-formed steel physical and structural properties. Retain the second article when the fabricator is responsible for designing the metal framing.

- B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the minimum physical and structural properties indicated.

C. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.

1. Design Loads:

a. Gravity, wind and seismic loading as indicated on the drawings or in this specification.

b. Blast Loads:

1) Light gauge framing in exterior walls shall be blast resistant and meet the following criteria per the VA Physical Security and Resiliency Design Manual.

2) Standoff Distance: //25 feet (Life Safety Protected)// 50 feet (Mission Critical Protected//

3) Design Threat in accordance with Table 6-1 of the referenced Physical Security and Resiliency Design Manual.

4) Deformation not to exceed deformation limits shown in Table 6-2 of the referenced Physical Security and Resiliency Design Manual.

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

SPEC WRITER NOTE: Deflection limits below are examples only. Select deflection limits as appropriate for wall, floor, and ceiling finish materials.

a. Exterior Load-Bearing Walls: Lateral deflection of // 1/240 // // 1/360 // // 1/600 // of the wall height.

b. Interior Load-Bearing Walls: Lateral deflection of // 1/240 // // 1/360 // of the wall height.

c. Exterior Non-load-Bearing Curtain wall: Lateral deflection of // 1/240 // // 1/360 // // 1/600 // // 1/720 // of the wall height.

d. Floor Joists: Vertical deflection of // 1/240 // // 1/360 // of the span.

e. Roof Trusses: Vertical deflection of // 1/240 // //1/360 // of the span.

3. 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 (range) of 67 degrees C (120 degrees F).

4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
5. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
6. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer's Representative (COR) review and approval
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

SPEC WRITER NOTE: Retain the paragraph below when cold-formed metal framing is indicated to withstand specific design loadings.

- D. Design of the light gauge for this project shall be provided by the contractor's structural engineer for the loads shown on the construction documents. Submit signed and sealed calculations performed by a structural engineer with at least 5 years experience in the design of light gauge metal and registered in the state of the project. Calculations shall be submitted with plans elevations and details for review and approval.
- E. Blast Design Calculations: Light Gauge Members and Connections
 1. Submit calculations for review and approval prepared by qualified blast consultant, with a minimum of 5 years experience in design of blast resistant window systems when delegated designer of the light gauge responsible for design of light gauge members for gravity, wind and seismic loadings varies from minimum sizes required for blast loading shown on the drawings. The magnitudes of the design

threats //W1, W2// and //GP1, GP2// are defined in the Physical Security and Resiliency Design Standards Data Definitions which is a document separate from the referenced VA Security and Resiliency Design Manual. The Physical Security and Resiliency Design Standards Data Definitions are provided on a need to know basis by the structural blast specialist performing the blast design on VA projects. It is the responsibility of the delegated engineer responsible for the design of blast resistant cold formed framing to request and obtain the Physical Security Design and Resiliency Data Standard Data Definitions from the VA Office of Construction and Facilities Management (CFM). Any associated delays or increased costs due to failure to obtain this information will be borne by the contractor.

F. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

- 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Iron and Steel Institute (AISI): Specification and Commentary for the Design of Cold-Formed Steel Structural Members (2016)

C. ASTM International (ASTM):

A36/A36M-19.....Standard Specification for Carbon Structural Steel

A123/A123M-17.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-16a.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-14e1.....Standard Specifications for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

A653/A653M-20.....Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

- C955-18e1.....Standard Specification for Cold Formed Steel
Structural Framing Members
- C1107/1107M-20.....Standard Specification for Packaged Dry,
Hydraulic-Cement Grout (Non-shrink)
- E488/E488M-18.....Standard Test Methods for Strength of Anchors
in Concrete Elements
- E1190-11(2018).....Standard Test Methods for Strength of Power-
Actuated Fasteners Installed in Structural
Members
- D. American Welding Society (AWS):
D1.3/D1.3M-18.....Structural Welding Code-Sheet Steel
- E. Military Specifications (Mil. Spec.):
MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing
Repair
- F. VA Physical Security and Resiliency Design Manual October 1, 2020.

PART 2 - PRODUCTS

2.1 MATERIALS

SPEC WRITER NOTE: Select CP60 or G90 coating. The Brick Industry Association recommends G90 for stud backup for brick veneer applications.

- A. Sheet Steel for joists, studs and accessories 16 gauge and heavier:
ASTM A653, structural steel, zinc coated // CP60 // // G90 //, with a yield of 340 MPa (50 ksi) minimum.
- B. Sheet Steel for joists, studs and accessories 18 gauge and lighter:
ASTM A653, structural steel, zinc coated // G60 // // G90 //, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
SPEC WRITER NOTE: Retain grout when concrete or masonry substrates require leveling prior to setting track or prefabricated assemblies.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 WALL FRAMING

SPEC WRITER NOTE: Retain this article when steel studs are required. Select the steel thickness as required. Sequence corresponds to 20 gauge, 18 gauge, 16 gauge, 14 gauge, and 12 gauge thicknesses.

- A. Steel Studs: Complying with ASTM C 955. Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness(uncoated): //0.84 mm (0.0329 inch)//
//1.09 mm (0.0428 inch)// //1.37 mm (0.0538 inch)// //1.72 mm
(0.0677 inch)// //2.45 mm (0.0966 inch)//

SPEC WRITER NOTE: Flange widths vary with application. When sheathing and/or masonry ties are required, use a minimum flange width of 41 mm (1 5/8 inches).

2. Flange Width: //35 mm (1-3/8 inches)// //(1-5/8 inches)// //(2 inches)// //(2-1/2 inches)//

SPEC WRITER NOTE: Select appropriate choice below. Stud webs are punched to manufacturer's standard punch-out shape, size and spacing.

3. Web: Punched // Unpunched //.

- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

2.3 JOIST FRAMING

SPEC WRITER NOTE: Retain this article when steel joists are required. Select the steel thickness as required. Sequence corresponds to 20 gauge, 18 gauge, 16 gauge, 14 gauge, and 12 gauge thicknesses.

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched, of web depths indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness: // 0.84 mm (0.0329 inch). // // 1.09 mm (0.0428 inch). // // 1.37 mm (0.0538 inch). // // 1.72 mm (0.0677 inch). // // 2.45 mm (0.0966 inch).//
2. Design Thickness: // 0.88 mm (0.0346 inch). // // 1.15 mm (0.0451 inch). // // 1.45 mm (0.0566 inch). // // 1.81 mm (0.0713 inch). // // 2.58 mm (0.1017 inch).//

SPEC WRITER NOTE: Select required flange width from subparagraphs below. Flange width may vary with application.

3. Flange Width: // 41 mm (1 5/8 inches) minimum. // // (2 inches). // // 63 mm (2 1/2 inches) //

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Thickness: Matching steel joists.

SPEC WRITER NOTE: Select required flange width from subparagraphs below. Flange width may vary with application.

2. Flange Width: // 41 mm (1 5/8-inches) minimum. // 51 mm (2 inches). // // 63 mm (2 1/2-inches). //

2.4 FRAMING ACCESSORIES

SPEC WRITER NOTE: Revise minimum yield strength of accessories as required.

- A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

SPEC WRITER NOTE: Revise list below to suit project.

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 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 the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 REQUIREMENTS

- A. Welding in accordance with AWS D1.3
- B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.
- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
 - 1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 ERECTION

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. Securely anchor tracks to supports as shown.
- C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.
- E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- G. Install headers in all openings that are larger than the stud spacing in that wall.
- H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- I. Studs in one piece for their entire length, splices will not be permitted.
- J. Provide a load distribution member at top track where joist is not located directly over bearing stud.
- K. Provide joist bridging and web stiffeners at reaction points where shown.
- L. Provide end blocking where joist ends are not restrained from rotation.
- M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 TOLERANCES

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 **FIELD REPAIR**

A. Touch-up damaged galvanizing with galvanizing repair paint.

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