

SECTION 05 40 00

COLD-FORMED METAL FRAMING

04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG02-1	(2001) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002) Cold-Formed Steel Design Manual Set
AISI S200-07	(2007) North American Standard for Cold-Formed Steel Framing-General Provisions Commentary
AISI S210-07	(2007) North American Standard for Cold-Formed Steel Framing-Floor and Roof System Design with Commentary
AISI S211-07	(2007) North American Standard for Cold-Formed Steel Framing-Wall Stud Design with Commentary
AISI S212-07	(2007) North American Standard for Cold-Formed Steel Framing-Header Design with Commentary
AISI S213-07	(2007) North American Standard for Cold-Formed Steel Framing-Lateral Design with Commentary
AISI S214-07	(2007) North American Standard for Cold-Formed Steel Framing-Truss Design with Commentary

AMERICAN WELDING SOCIETY (AWS)

AWS D1.3	(1998; Errata 1998) Structural Welding Code - Sheet Steel
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ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel

Hardware

ASTM A 653/A 653M

(2007) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM C 955

(2006) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J78

(1998) Steel Self Drilling Tapping Screws

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components;

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component. Indicate strapping, bracing, splices, bridging and accessories as required for proper installation.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation. When applicable, connection details shall address fastening methods to be utilized to attach to existing structure. The details shall be project specific, i.e. individual task orders.

c. Roof plan indicating truss bearing points on structure. The plan shall include dead and live loading which will occur for each contact point for maximum design loading conditions. When applicable, the drawings shall include primary and secondary truss components that rely on the existing roof structure for support.

d. Truss design drawings shall be submitted and shall include the minimum data outlined in AISI S214-07. Unless specified on contract drawings, the design drawings shall also show/indicate locations of permanent truss bracing required to resist wind, seismic and any other lateral forces acting perpendicular to the plane of the truss. Permanent lateral bracing shall also be shown and/or indicated and shall address connection to existing roof diaphragm or in the absence of an existing diaphragm, bracing which will provide the necessary diaphragm.

e. Shear wall (including walls with diagonal straps) drawings shall be submitted. The design drawings shall include connection details of straps to frame and anchorage components to foundation.

The design drawings shall indicate loads and load combinations considered.

f. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

- Metal trusses; G
- Steel Studs
- Joists
- Tracks
- Tension straps
- Foundation structural hold down assembly; G
- Bracing
- Bridging and accessories

SD-05 Design Data

- Metal Framing Calculations; G
- Metal truss and shear wall calculations; G
- Wind load calculations; G

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to job site and store in adequately ventilated, dry locations. Storage area shall permit easy access for inspection and handling. If necessary to store materials outside, stack off the ground, support on a level platform, and protect from the weather as approved. Handle materials to prevent damage. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust. Replace damaged items with new, as directed by the Contracting Officer.

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with **AISI SG and AISI S 210 through AISI S214**. Non-load-bearing metal framing, furring, and ceiling suspension systems are specified in Section **09 22 00 METAL SUPPORT ASSEMBLIES**. Metal suspension systems for acoustical ceilings are specified in Section **09 51 00 ACOUSTICAL CEILINGS**.

1.5 MAXIMUM DEFLECTION

Deflection Criteria

Exterior Finish

a. Exterior Studs:

- L/360
- L/360

- Synthetic Plaster, Metal Panels
- Cement Plaster, Wood Veneer

L/600

Brick Veneer, Stone Panels

Wall deflections shall be computed on the basis that studs withstand all lateral forces independent of any composite action from sheathing materials. Studs abutting windows or louvers shall also be designed not to exceed 1/4 inch maximum deflection.

b. Floor Joists:

L/360 - Live load only
L/240 - Total load

c. Roof Rafters and Framing

L/240 - Live load only

d. Roof Trusses

L/360 - Live load only
L/240 - Total load

1.6 QUALITY ASSURANCE

1.6.1 Drawing Requirements

Submit **framing components** to show sizes, thicknesses, layout, material designations, methods of installation, and accessories.

1.6.2 Design Data Required

Submit **metal framing calculations** to verify sizes, gages, and spacing of members and connections. Show methods and practices used in installation. Wind load calculations shall be accompanied with sketches of pressure diagrams on the building. Submit **metal truss and shear wall calculations**. Design calculation for shear walls shall neglect lateral load resistance provided by gypsum wall board. Address connections of truss and truss components to new or existing structure. The data shall be coordinated and submitted concurrently with other "Design Calculations" required in Section 07 61 14.00 20, "Steel Standing Seam Roofing" as required in Section 07 61 14. 00 20, calculations shall be prepared by a professional engineer, specializing in structural engineering. Compute and apply **wind load** pressures in accordance with ASCE 7. Basic wind speed is 130 MPH with occupancy category of II with exposure category D unless noted otherwise on drawings. Refer to contract drawings or task order scope for other design load criteria such as dead loads, snow loads and seismic loads.

1.6.3 Welder Qualifications

Shall be currently qualified in accordance with AWS.

PART 2 PRODUCTS

2.1 METAL TRUSSES, STEEL STUDS, JOISTS, TRACKS, TENSION STRAPS, FOUNDATION STRUCTURAL HOLD DOWN ASSEMBLY, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with **ASTM C 955** and the following.

2.1.1 Metal Trusses, Studs and Joists of 16 Gage (0.0598 Inch) and Heavier Galvanized steel, ASTM A 653/A 653M, SS Grade 50

2.1.2 Metal Trusses, Studs and Joists of 18 Gage (0.0478 Inch) and Lighter Metal Trusses, Studs and Joists of 18 Gage (0.0478 Inch) and Lighter, Track, and Accessories (All Gages): Galvanized steel, ASTM A 653/A 653M, SS, Grade 50 33,000 psi G60

2.1.3 Sizes, Gages, Section Modulus, and Other Structural Properties

Size and gage as indicated. Where gage is not specified for load bearing studs, the minimum gage shall be "16 gage". Steel stud deflection shall be limited to L/600 for exterior wall brick veneer construction.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICBO number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling tapping in compliance with SAE J78 of the type, size, and location as shown on the drawings. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A 123/A 123M or ASTM A 153/A 153M as appropriate.

2.4 PLASTIC GROMMETS

Supply plastic grommets, recommended by stud manufacturer, to protect electrical wires. Prevent metal to metal contact for plumbing pipes.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling or self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3, as modified by AISI SG02-1. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials

lighter than 18 gage.

3.1.2 Screws

Screws shall be of the type, size, and location required by the "Design Calculations" or as shown on the drawings. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in [AISI SG02-1](#). Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location required by the "Design Calculations" or as shown on the drawings. Powder-actuated anchors or "pneumatic nailing" is not permitted.

3.2 INSTALLATION

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of partitions. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Provide additional studs where necessary for shear walls. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and [AISI SG03-3](#), consisting of, as a minimum, runner channel cut to fit between and welded to the studs or hot- or cold-rolled steel channels inserted through cutouts in web of each stud and secured to studs with welded clip angles. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
Wind load only	Up to 10 feet Over 10 feet	One row at mid-height Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet Over 10 feet	Two rows at 1/3 points Rows 3'-4" o.c. maximum

3.2.3 Joists and Trusses

Locate each joist or truss directly above a stud. Provide doubled joists under parallel partitions wherever partition length exceeds 1/2 of joist span. Joists shall have at least 2.50 inches of bearing on steel, 4 inches on masonry, and shall be reinforced over bearings where required to prevent

web crippling. Splice joists over bearings only. Lap and weld splices as indicated. Provide manufacturer's standard bridging which shall not be less than the following:

CLEAR SPAN

Up to 14 feet
14 to 20 feet
20 to 26 feet
26 to 32 feet

BRIDGING

One row near center
Two rows at 1/3 points
Three rows at 1/4 points
Four rows at 1/5 points

Temporary bracing shall be provided and remain in place until work is permanently stabilized.

3.2.4 Roof Trusses Installed on Existing Structures

3.2.4.1 Existing Structure

The Contractor shall become familiar with the existing structure by studying the contract and referenced drawings. Special precaution shall be exercised to assure other components which are to remain, are not damaged by staged or temporary materials.

3.2.4.2 Existing Roof System Preparation

Prepare existing roof structure to receive new truss system.

3.2.5 Truss Installation

Fasten trusses to building beams/purlins or other structural components utilizing supports, bracing, bridging and fasteners as recommended in the approved shop drawings and design calculations. The bottom cord or track of trusses shall connect to a horizontal diaphragm. Where there is no existing diaphragm, the bottom cord shall incorporate lateral bracing as necessary to form an approved diaphragm. Fastenings to any roof materials other than the structural components are not allowed. Secondary components which are necessary to complete the roof enclosure/envelope which do not transfer significant loads to non-load bearing roof components will be allowed so long as submitted design calculations demonstrate that the connection will not damage the subject existing material and/or component. Refer to the general details on the contract referenced drawings as necessary.

3.2.6 Erection Tolerances

- a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:
 - (1) Layout of walls and partitions: 1/4 inch from intended position;
 - (2) Plates and runners: 1/4 inch in 8 feet from a straight line;
 - (3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and
 - (4) Face of framing members: 1/4 inch in 8 feet from a true plane.
- b. Framing members which will be covered by ceramic tile set in

dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

- (1) Layout of walls and partitions: 1/4 inch from intended position;
- (2) Plates and runners: 1/8 inch in 8 feet from a straight line;
- (3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 1/8 inch in 8 feet from a true plane.

3.2.7 Special Inspection and Testing for Seismic-Resisting Systems

When specified (by Task Order), special inspections and testing for seismic-resisting systems and components shall be done in accordance with Section 01 45 35 SPECIAL INSPECTION FOR SEISMIC-RESISTING SYSTEMS.

-- End of Section --