
USACE / NAVFAC / AFCEA / NASA UFGS-05 40 00 (May 2010)
Change 1 - 08/12

Preparing Activity: NAVFAC Superseding
UFGS-05 40 00 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2013

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SECTION 05 40 00

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05/10

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SECTION 05 40 00

COLD-FORMED METAL FRAMING 05/10

NOTE: This guide specification covers the requirements for framing components and erection of load-bearing light gage steel.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

NOTE: The following information shall be shown on the project drawings:

1. The extent and location of all framing indicating gage, size, section modulus, and other structural properties required.
2. Connections and other installation details.
3. Indicate concentrated loads, e.g., pipe supports, that may overstress a flange or connection.

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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 S100	(2007; Supp 1: 2009; Supp 2: 2010) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S200	(2007) North American Standard for Cold-Formed Steel Framing - General Provision
AISI S201	(2007) North American Standard for Cold-Formed Steel Framing - Product Data
AISI S202	(2011) Code of Standard Practice for Cold-formed Steel Structural Framing
AISI S211	(2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design
AISI S212	(2007) North American Standard for Cold-Formed Steel Framing - Header Design
AISI S213	(2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design
AISI SG02-KIT	(2001; Supp 1 2004) North American Specification for the Design of Cold-Formed Steel Structural Members

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set
AMERICAN WELDING SOCIETY (AWS)	
AWS D1.1/D1.1M	(2012; Errata 2011) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel
ASTM INTERNATIONAL (ASTM)	
ASTM A1003/A1003M	(2012) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM A1008/A1008M	(2012) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A1011/A1011M	(2012) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A123/A123M	(2012) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A370	(2012) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2011) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1007	(2011a) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2012) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM C955	(2011c) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and

Bracing or Bridging for Screw Application
of Gypsum Panel Products and Metal Plaster
Bases

ASTM E119

(2012a) Standard Test Methods for Fire
Tests of Building Construction and
Materials

ASTM E329

(2011c) Standard Specification for
Agencies Engaged in the Testing and/or
Inspection of Materials Used in
Construction

ASTM F1941

(2010) Standard Specification for
Electrodeposited Coatings on Threaded
Fasteners (Unified Inch Screw Threads
(UN/UNR))

ASTM F1941M

(2007) Standard Specification for
Electrodeposited Coatings on Threaded
Fasteners (Metric)

1.2 SUBMITTALS

NOTE: Review Submittal Description (SD) definitions
in Section 01 33 00 SUBMITTAL PROCEDURES and edit
the following list to reflect only the submittals
required for the project.

The Guide Specification technical editors have
designated those items that require Government
approval, due to their complexity or criticality,
with a "G". Generally, other submittal items can be
reviewed by the Contractor's Quality Control
System. Only add a "G" to an item, if the
submittal is sufficiently important or complex in
context of the project.

For submittals requiring Government approval on Army
projects, a code of up to three characters within
the submittal tags may be used following the "G"
designation to indicate the approving authority.
Codes for Army projects using the Resident
Management System (RMS) are: "AE" for
Architect-Engineer; "DO" for District Office
(Engineering Division or other organization in the
District Office); "AO" for Area Office; "RO" for
Resident Office; and "PO" for Project Office. Codes
following the "G" typically are not used for Navy,
Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force
and NASA projects, or choose the second bracketed
item for Army projects.

Government approval is required for submittals with a "G" designation;
submittals not having a "G" designation are [for Contractor Quality Control

approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components[; G][; G, [____]]

- 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.
- b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.
- c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

Steel studs, joists, tracks, bracing, bridging and accessories

[SD-05 Design Data

NOTE: Require calculations for items considered
critical by the designer. Delete paragraph if
calculations are not necessary.

Metal framing calculations[; G][; G, [____]]

SD-07 Certificates

Load-bearing cold-formed metal framing

Mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

Welds

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M.

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. Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

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 SG03-3. [Non-load-bearing metal framing, furring, and ceiling suspension systems are specified in Section 09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD.] [Metal suspension systems for acoustical ceilings are specified in Section 09 51 00 ACOUSTICAL CEILINGS.]

1.5 MAXIMUM DEFLECTION

NOTE: Modify to suit project requirements. Use maximum deflection of L/360 unless special considerations require modification.

a. Exterior Studs:

<u>Deflection Criteria</u>	<u>Exterior Finish</u>
L/240 or L/360	Synthetic Plaster, Metal Panels
L/360	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 6 mm 1/4 inch maximum deflection.

b. Floor Joists:

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

c. Roof Rafters:

L/240 - Live load only

1.6 QUALITY ASSURANCE

- a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- b. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located

and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this project in material, design, and extent.

- c. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to [ASTM E329](#) for testing indicated.
- d. 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.
- e. 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".
- f. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per [ASTM E119](#) by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.
- g. AISI Specifications and Standards: Comply with:
 - 1. [AISI S100](#), "North American Specification for the Design of Cold-Formed Steel Structural Members".
 - 2. [AISI S200](#), "North American Standard for Cold-Formed Steel Framing - General Provision".
 - 3. [AISI S201](#), "North American Standard for Cold-Formed Steel Framing - Product Data".
 - 4. [AISI S202](#), "Code of Standard Practice for Cold-Formed Steel Structural Framing".
 - 5. [AISI S211](#), "North American Standard for Cold-Formed Steel Framing - Wall Stud Design".
 - 6. [AISI S212](#), "North American Standard for Cold-Formed Steel Framing - Header Design".
 - 7. [AISI S213](#), "North American Standard for Cold-Formed Steel Framing - Lateral Design".

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.

] PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

- 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 not less than [25] [_____] percent.
- b. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: [ST33H (ST230H)] [ST50H (ST340H)] [[_____]][As required by structural performance].
 2. Coating: [G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90)] [G90 (Z275)] [[_____]].
- c. Steel Sheet for [Vertical Deflection] [Drift] Clips: ASTM A1003/A1003M, ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: [50 (340)] [As required by structural performance].
 2. Coating: G90 (Z275).
- d. 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: [0.84 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. Flange Width: [35 mm 1-3/8 inches] [41 mm 1-5/8 inches] [51 mm 2 inches] [63 mm 2-1/2 inches].
 3. Section Properties: Section modulus = [_____] ; moment of inertia = [_____] ; allowable moment = [_____] .
- e. 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: [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] [Matching steel studs].
 2. Flange Width: [[32 mm] [_____] [1-1/4 inches] [_____]].

NOTE: It is assumed that members will be protected from the weather. If members will be exposed or subject to moisture directly, by water infiltration, or via vapor transmission and condensation or

indirectly in a corrosive atmosphere, delete carbon steels (painted) and specify coating Class **Z275 G90** for such members. Specify G40 for brick ties and screw fasteners. See special option below for deflection limit on exterior wall brick construction. Grades specified are normally used for this type of framing. See manufacturer's current literature for other grades and section properties available.

2.1.1 Studs and Joists of **1.37 mm 16 Gage (0.0538 Inch)** and Heavier

Galvanized steel, **ASTM A653/A653M** and **ASTM A1003/A1003M**, SS Grade 50, **[Z180] [Z275] [G60] [G90]** [; or carbon steel, **ASTM A1011/A1011M**, Grade 50, painted].

2.1.2 Studs and Joists of **1.2 mm 18 Gage (0.0478 Inch)** and Lighter

Studs and Joists of **1.09 mm 18 Gage (0.0428 Inch)** and Lighter, Track, and Accessories (All Gages): Galvanized steel, **ASTM A653/A653M** and **ASTM A1003/A1003M**, SS, **Grade 345 230 MPa Grade 50 33,000 psi Z180 G60**[; or carbon steel, **ASTM A1008/A1008M**, Grade C, painted].

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

Size and gage as indicated. 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 **1200 mm 4 feet** on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICC 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 screws in compliance with **ASTM C1513** of the type, size and location as shown on the drawings. Electroplated screws shall have a minimum 5 micron zinc coating in accordance with **ASTM F1941M ASTM F1941**. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with **ASTM A123/A123M** or **ASTM A153/A153M** as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with **ASTM A123/A123M** or **ASTM A153/A153M** 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

NOTE: The welding of cold-formed steel should be performed by qualified workmen. The Contractor, Subcontractor, or Fabricator shall provide verification that welders are qualified in accordance with AWS D1.3/D1.3M.

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI SG02-KIT. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 1.09 mm 18 gage.

3.1.2 Screws

Screws shall be [of the] [self-drilling self-tapping] type, size, and location 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-KIT. Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location shown on the drawings.

3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location shown on the drawings.

3.2 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

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 75 mm 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 600 mm 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. 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 3000 mm 10 feet	One row at mid-height
	Over 3000 mm 10 feet	Rows 1500 mm 5'-0" o.c. maximum
Axial load	Up to 3000 mm 10 feet	Two rows at 1/3 points
	Over 3000 mm 10 feet	Rows 900 mm 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 60 mm 2.50 inches of bearing on steel, 100 mm 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:

<u>CLEAR SPAN</u>	<u>BRIDGING</u>
Up to 4200 mm 14 feet	One row near center
4200 mm to 6000 mm 14 to 20 feet	Two rows at 1/3 points
6000 mm to 7800 mm 20 to 26 feet	Three rows at 1/4 points

7800 mm to 10600 mm 26 to 32 feet	Four rows at 1/5 points
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Temporary bracing shall be provided and remain in place until work is permanently stabilized.

3.2.4 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: 6 mm 1/4 inch from intended position;
- (2) Plates and runners: 6 mm in 2400 mm 1/4 inch in 8 feet from a straight line;
- (3) Studs: 6 mm in 2400 mm 1/4 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 6 mm in 2400 mm 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: 6 mm 1/4 inch from intended position;
- (2) Plates and runners: 3 mm in 2400 mm 1/8 inch in 8 feet from a straight line;
- (3) Studs: 3 mm in 2400 mm 1/8 inch in 8 feet out of plumb, not cumulative; and
- (4) Face of framing members: 3 mm in 2400 mm 1/8 inch in 8 feet from a true plane.

-- End of Section --