SFIA
STEEL FRAMING INDUSTRY ASSOCIATION

The Collective Voice of America's Steel Framing Industry

The Steel Framing Industry Association (SFIA) is dedicated to expanding the market for cold-formed steel in construction through programs and initiatives that promote the use of cold formed steel framing as a sustainable and cost-effective solution, advocate the development and acceptance of favorable code provisions, educate members with reliable data and other critical information that is essential to effective business planning, and create a positive environment for innovation.

One of the critical aspects of obtaining quality installations is manufacturer certification and certification of installers. This guide specification provides significant quality assurance by requiring certification.

Much of the technical information in this specification maybe listed on the drawings by the SE. It is critical to coordinate this section with the structural drawings.

SFIA 092216 COMMENTARY

The intent of the commentary is to provide additional information to clarify understanding within this specification section. The commentary follows the format of the actual SFIA guide specification.

The following is not included in the guide specification but is added here for supporting information.

AISI S220-20 Definitions (note IBC 2018 references the 2015 version of AISI S220):

Base steel thickness: The thickness of bare steel exclusive of all coatings.

C-shape: A cold-formed steel shape used for structural and nonstructural members consisting of a web, two (2) flanges and two (2) stiffening lips (edge stiffeners).

Nonstructural member: A member in a steel-framed system that is not part of a gravity load-resisting system, lateral force-resisting system or building envelope.

Structural member: A member that resists design loads (factor loads), as required by the applicable building code, except when defined as a nonstructural member.

Stud: A vertical framing member in a wall system or assembly.

Track: A framing member consisting of only a web and two (2) flanges. Track web depths are taken to the inside of the flanges.

Web: That portion of a framing member that connects the flanges.

The following is not included in the guide specification, but is added here for supporting information.

1.2 REFERENCED STANDARDS – These Standards are specific to cold-formed steel framing:

A. AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members.

B. AISI S220 – North American Specification for the Design of Cold-Formed Steel Framing – Nonstructural Members.

C. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process.

D. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

E. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic- Coated for Cold-Formed Steel Framing Members.

F. ASTM C645 – Standard Specification for Nonstructural Framing Members. *Note: this is no longer referenced after the 2018 IBC*

G. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

1.3 ACTION SUBMITTALS

A. Sustainable Design Submittals

Note to Specifier: Add specific sustainability requirements as appropriate. Many attributes are manufacturer and product specific. Considerations: Should the project be required to meet LEED® or Green Globes requirements section is very important. This should be expanded to include specific requirements on sustainability. SFIA has published an ***Environmental Product Declaration*** (EPD) which is recommended to request as a submittal. There may be some manufacturers who now offer a ***Health Product Declaration***, (HPD). For specific information relating to LEED® v4: https://sfia.memberclicks.net/assets/LEED%202017%20update%20V4%20%205.25.18.pdf.

1. Provide documentation for recycled material content. Comment: The Cold-Formed Steel Industry suggests that the recycled content of CFS be set at 25%. **EXPAND THIS STATEMENT AS NEEDED**
2. Provide documentation for source for regional materials and distance from Project Site. To be determined by contractor, supplier, and manufacturer.

Beyond LEED® there is concern about a building's carbon content. This includes the building materials that are used in the project. If this is the case, the EPD can be a submittal requirement as well. The submittal for this would be a cold-formed steel Environmental Product Declaration (EPD).

The following is taken from the SFIA EPD: **THIS TO BE REVIEWED BY SFIA TASK FORCE FOR NEED AND CONTENT**

Note: technically the data is specific only to the company's products that participated in the study.

Cold-Formed Steel Framing shall meet the following averages (includes extraction, transportation, and fabrication):

Global Warming Potential (GWP) $kgCO_2eq$ - 2440

Ozone Depletion Potential (ODP) kgCFC11eq – 5.58

Acidification Potential (AP) $kgSO_2eq$ - 0.81

Eutrophication Potential (EP) kgNeq – 101

Smog Formation Potential (SFP) kgO_3 eq – 3.37×10^{-5}

Fossil Fuel Depletion Potential (FFD) MJ Surplus, LHV – 26.8

Based on SFIA EPD for (1) one metric ton of industry average CFS framing products.

Above data provided by 13 CFS framing fabricators and is specific to those companies.

1.5 QUALITY ASSURANCE

E. Product Tests

A 'mill cert' is documentation provided by the manufacturer of the steel material, the steel mill. It includes information relative to the composition of the steel itself. From a contractor perspective, there is nothing written into the model codes for a cert to be provided as part of either the permit or inspection process which would include the submittal phase.

Recently, Pat Ford, P.E., Technical Director for the Steel Framing Industry Association, SFIA, wrote a paper on the subject which is available upon request from the SFIA. The term itself can be seen as an industry colloquialism regarding what is more accurately termed a ***mill test report*** *or MTR, which can be certified. The certified report states that the specific material in question meets recognized Standards such as ASTM. (AWCI Construction Dimensions - Wachuwannano 4/20)*

Mill certs are not always available. That doesn't imply that the cold-formed steel is substandard, simply that there is a disconnect in that particular 'paper trail'. Manufacturer members of SFIA must submit to a Code Compliance Certification process where there are audits of what is produced. Essentially the audits cover what is contained in the mill test report. Therefore, the requirement for specified product to provide certification of compliance meets the intent of the "mill test report".

The intent in the guide specification is to provide an option. The first option is either the mill certs (mill test report) or independent recognized lab testing. The second option is to select a cold-formed steel framing manufacturer that is part of the Steel Framing Industry Association's Code Compliance Program.

PART 2 – PRODUCTS

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Design loads: Shall be indicated on the Architectural Drawings or 5 PSF minimum as required by the International Building Code. Design framing systems to accommodate deflection of primary building structure and construction tolerances and to withstand design loads with a maximum deflection limit ratio to minimize the potential of cracking of the finished materials (painted gypsum panels, plaster, ceramic tile. Therefore, options could be:

A. 5 psf (IBC minimum)

B. 10 psf

C. As indicated on the construction documents

2. Horizontal deflection: For wall assemblies, limited to l/240 for elastic finish materials or l/360 for brittle materials. Common interior design loads, based on IBC, is 5 lbf/sq. ft. Sometimes a 10 lbf/sq. ft. is desired by the design professional. Therefore, options could be

A. 1/240

B. 1/360

SFIA publishes in the ***SFIA Technical Guide for Steel Framing Products*** limiting heights for generic cold-formed steel profiles. The tables reflect both composite and non-composite applications. Many cold-formed steel framing manufacturers produce members that are proprietary in base steel thickness, yield strength and profile. These members are proprietary and the design professional is urged to research these framing products for their unique allowable limiting heights.

2.3 COLD-FORMED STEEL FRAMING

A. Framing members

AISI S220 states that cold-formed steel framing structural members shall be made from sheet steel that complies with ASTM A1003 Type NS. ASTM C645 requires compliance to ASTM A1003 as well.

The table below illustrates the transition within the International Building Code. The model code is moving away from ASTM and to AISI standards as a referenced standard. There are some subtle differences between the two standards that will potentially cause conflict at the jobsite.

2015 INTERNATIONAL BUILDING CODE				2018 INTERNATIONAL BUILDING CODE			
MATERIAL	**PRODUCT and FABRICATION**	**DESIGN PROCEDURE**	**INSTALLATION PROCEDURE**	**MATERIAL**	**PRODUCT and FABRICATION**	**DESIGN PROCEDURE**	**INSTALLATION PROCEDURE**
AISI S220-2011 ASTM C645-13 Section 10	AISI S220-11 ASTM C645-13	AISI S200-12 AISI S220-11 ASTM C754-11 (Limiting Heights)	AISI S200-12 AISI S220-11 ASTM C754-11	AISI S220-15	AISI S220-15	AISI S220-15 ASTM C754-15 (Limiting Heights)	AISI S220-15 ASTM C754-15

A recent survey on what states have adopted which versions of the IBC reveals that currently the 2015 and 2018 versions are the most common. SFIA suggests that the following standards be written into the specific specifications based on the version of the IBC that has been locally adopted:

IBC 2009: ASTM C645. Therefore 2.3A could read:

A. Framing Members, General: Comply with ASTM C645 for conditions indicated.

IBC 2012: ASTM C645. Therefore 2.3A could read:

A. Framing Members, General: Comply with ASTM C645 for conditions indicated.

IBC 2015: AISI S220 & ASTM C645, Section 10. Therefore 2.3A could read:

A. Framing Members, General: Comply with AISI S220 and ASTM C645, Section 10 for conditions indicated.

IBC 2018 (and 2021): AISI S220 Therefore 2.3A could read:

A. Framing Members, General: Comply with AISI S220 for conditions indicated.

This is as shown in the guide spec.

Many local building codes have amendments to the IBC. These should be reviewed before final selection.

B. Steel Sheet Components

This section typically references Standards that are to be followed, SFIA suggests the following:

IBC 2009: ASTM C645. Therefore 2.3B could read:

B. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.

IBC 2012: ASTM C645. Therefore 2.3B could read:

B. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.

IBC 2015: AISI S220 & ASTM C645 Section 10 Therefore 2.3B could read

B. Steel Sheet Components: Comply with AISI S220 and ASTM C645, Section 10 requirements for steel unless otherwise indicated.

IBC 2018 (and 2021): AISI S220. Therefore 2.3B could read:

B. Steel Sheet Components: Comply with AISI S220 requirements for metal unless otherwise indicated.

This is as shown in the guide spec.

2.3B Corrosion resistance

Cold-formed steel requires a corrosion resistant coating to be placed over the bare steel. This coating is not measured by thickness but by weight, and the benchmark for cold-formed steel structural members is galvanization where the bare steel is immersed in zinc in a molten form. The zinc then bonds to the bare steel and provides the required corrosion resistance. For most nonstructural applications AISI S220 and ASTM C645 call for a G40 zinc coating or protective coating with equivalent resistance. However, there are several coatings available that provide equivalent corrosion resistance performance.

IBC 2009: ASTM C645. Therefore 2.3B1 could read:

1. Protective Coating: Comply with ASTM C 645. Coatings shall have a protective coating meeting the requirements of ASTM A653/A653M, G40, or shall have a protective coating with an equivalent corrosion resistance. Galvannealed products are unacceptable.

IBC 2012: ASTM C645. Therefore 2.3B1 could read:

1. Protective Coating: Comply with ASTM C 645. Coatings shall have a protective coating meeting the requirements of ASTM A653/A653M, G40, or shall have a protective coating with an equivalent corrosion resistance. Galvannealed products are unacceptable.

IBC 2015: AISI S220 & ASTM C645. However, C645 is not cited for corrosion resistance. Therefore 2.3B1 could read:

1. Protective Coating: Comply with AISI S220. Coatings shall have a protective coating meeting the requirements of ASTM A653/A653M, G40, or shall have a protective coating with an equivalent corrosion resistance. Galvannealed products are unacceptable.

IBC 2018 (and 2021): AISI S220. Therefore 2.3B could read:

1. Protective Coating: Comply with **AISI S220**. Coatings shall have a protective coating meeting the requirements of ASTM A653/A653M, G40, or shall have a protective coating with an equivalent corrosion resistance. Galvannealed products are unacceptable.

*Note to Specifier: AISI specifications state "**minimum base steel thickness"** not "minimum base metal"*.

Note to Specifier: Newer technology in corrosion resistance offers benefits over the traditional galvanized (zinc) coatings. Some manufacturers offer these new coatings and provide technical data from recognized third-party agencies to support performance.

D. Slip-Type Head Joints

There are essentially four options available for maintaining the structural integrity of the nonstructural wall while allowing for the differential movement caused between the wall and the structure. This is important in that if the wall is rigidly connected to the floor structure above there will be a high probability that the gypsum panels, or any finish cladding, on the wall will crack. It is important to note that to accommodate this movement the stud must be shorter than the overall wall height. This will require special engineering to take that into account to make the wall have the structural capacity required to remain in place. Refer to CFSEI Tech notes W101-09 and W100-08a, or have a structural engineer review the final design. These solutions tend to be proprietary.

E. Firestop Tracks

These top tracks are intended to maintain the fire resistance of the wall assembly while accommodating building movement. They tend to be a major component of 'head-of-wall' assemblies as listed in UL. It is important to use all the components as they are listed and installed in accordance with what was tested. That implies that these tracks are also proprietary.

It is important to note that when using any 'head-of-wall' system, either fire resistive or not, that special attention must be paid to limiting heights of the wall assembly. There are two tables available for determining the appropriate stud for a given wall height and they are composite or non-composite. The composite table provides for the added contribution to wall stiffness provided by the gypsum panels.

This can only be used if the panels are installed as per what was tested. The designer must take this into account during stud selection. SFIA published a technical paper that offers detailed information.

G. U-Channel Bridging

U-Channel is the terminology recognized by the AISI. In the past it was termed “CRC” for cold-rolled channels, “black iron” based on the coating applied over the base steel that rendered the member black. It is primarily used to provide lateral bridging in both structural and nonstructural partitions. It also can be used in traditional ceiling grillage. See Section 2.4.

H. Furring Channels

The term furring channel is recognized by the AISI. Historically it was known as a “hat-shaped” channel due to its profile. It was also known as a “DWC” for drywall furring channels. It is used in traditional suspended ceiling grillage. Another usage is to fur gypsum panels off of poured-in-place concrete or CMU. See Section 2.4.

2.4 SUSPENSION SYSTEMS

Note to Specifier: Suspension systems are beyond the scope of SFIA, but are offered here as a service. Information here should be verified by manufacturer.

There are basically three ways that gypsum panel ceilings are suspended. The conventional manner is to use hanger wires, U-channels, and furring channels. Typically, 12 ga hanger wire is attached to the structure using several means. The hanger should meet ASTM A641. That gage wire is seen to have the capacity to support a load of 6 psf at a spacing of 4 feet on center. Each wire then supports 16 SF of ceiling area.

A main carrying channel (known as a U-channel) is then attached to the hanger wire. Perpendicular to the mains is a furring channel. It can be either clipped (for non-fire resistive assemblies) or wire-tied to the mains. The installation for this system must follow ASTM C754.

A second option for the suspension systems is to use cold-formed steel C-shaped studs. The studs must conform to either ASTM C645 or AISI S220.

The final option is the proprietary drywall suspension system. The profiles are highly proprietary, meeting ASTM C645 and the installation per ASTM C754.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing components to spacings indicated. For gypsum panels follow guidelines in ASTM C840.

From ASTM C840-20 the following is offered:

Maximum framing spacing for single-layer application (ASTM C840 Table two):

A. 5/8" thick gypsum panels parallel to framing on ceilings – 16 inches on center
B. 5/8" thick gypsum panels perpendicular to framing on ceilings – 24 inches on center
C. 5/8" thick gypsum panels parallel or perpendicular to framing on sidewalls – 24 inches on center

Maximum framing spacing for two-ply systems, fasteners only (ASTM C840 Table three):

A. Follow table recommendations for both walls and ceilings

For tile backing applications, framing spacing should be 16 inches on center per Tile Council of North America (TCNA).

There are special applications that require compliance in terms of both cold-formed steel stud selection and framing. They are:

For cement board applications the TCNA recommends studs should be a maximum of 16 inches on center with a minimum 33 mil steel thickness.

For high performance impact and abuse resistant gypsum panels the Gypsum Association (GA) recommends a maximum of 16 inches on center with a minimum 33 mil steel thickness.

3.4 INSTALLING FRAMED ASSEMBLIES

a. Curved Partitions:

Note to specifier: Proprietary curved track options are available.

g. Fabrication Tolerances: Fabricate assemblies, level, plumb, and true to line within a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

a. 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.
b. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

h. Suspended Ceiling Tolerances: Installation Tolerances - Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

i. Framing Tolerance: Follow requirements of ASTM C840
   i. ASTM C840 6.1 - The attachment surface of any framing member shall not vary more than 1/8" from the plane of the faces of the adjacent framing members.
   ii. Devices or items attached to framing members, including the fasteners used to install such devices or items, shall not protrude more than 1/8" beyond the surface to which the gypsum board is to be applied.

j. Post construction clean-up: Verify if there is to be wording specific to recycling of construction demolition and waste.

END OF SECTION