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 054000 COMMENTARY

The intent of the commentary is 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 S240-20 Definitions:

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).

Curtain wall: A wall that transfers transverse (out-of-plane) loads and is limited to a superimposed vertical load, exclusive of sheathing materials, of not more than 100 lb/ft; or a superimposed vertical load of not more than 200 lbs.

Floor joist: A horizontal structural member that supports floor loads and superimposed vertical loads.

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: The portion of a framing member that connects the flanges.

The following is from BuildSteel.org and it differentiates the roles of the engineer on a given cold-formed steel project:

The Structural Engineer of Record (SEOR or EOR) is responsible for the design of the primary structure and possibly, to some extent, to define or prescribe the elements of the exterior enclosure (cladding) system for the structure.

The Specialty Structural Engineer (SSE) is generally responsible for the final design and installation drawings of the aforementioned exterior enclosure system(s). The SSE is most often retained by one of the sub-contractors supplying the enclosure system.

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 Standard for the Design of Cold-Formed Steel Structural Members.

B. AISI S202 – Code of Standard Practice for Cold-Formed Steel Structural Framing.

C. AISI S240 – North American Specification for the Design of Cold-Formed Steel Framing – Structural Members.

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

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

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

G. ASTM C955 - Standard Specification for Cold-Formed Steel Structural Framing Members.

H. ASTM C1007 – Standard Specification for Installation of Load-Bearing (Transverse and Axial) Steel Studs and Related Accessories.

1.3 ACTION SUBMITTALS

B. 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 see 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

The above is based on SFIA EPD for (1) one metric ton of industry average CFS framing products.

The above data is 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

Structural performance as shown below should be determined by the Engineer of Record (EOR) or Specialty Structural Engineer (SSE).

A. Structural Performance:

1. Design loads: According to AISI S202, it is the requirement of the building designer (architect) to provide the required design loads to meet applicable building codes. These loads should be listed on the drawings.

2. The building designer should also provide information relating to the allowance of building movement. Common allowances include:

    a. Design framing system to provide for movement of framing members located outside the insulated building envelope 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 (67 deg C).

    b. 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:

        1. Upward and downward movement. Typical allowances are:

            1. 1/2 inch

            2. 3/4 inch

            3. 1 inch

            4. 1-1/2 inches

5. Horizontal deflection. Deflection limits - Design framing systems to withstand design loads without horizontal and vertical deflections greater than the following:

        a. **Exterior Load-Bearing Wall.** Framing horizontal deflection limits, based on a ratio of the wall height, possibly one of the following:

            1/240 - for elastic finish cladding such as exterior insulation finish systems

            1/360 - for brittle finish cladding such as cement plaster

            1/600 - for brittle finish cladding such as brick veneer

1/720 - for brittle finish cladding such as brick veneer

The designer needs to confirm deflections based on intended finish cladding.

b. **Horizontal Deflection of Interior Load-Bearing Wall Framing**. Horizontal deflection limits, based on a ratio of the wall height, possibly one of the following:

1/240 - for elastic finish cladding such as gypsum panels

1/360 - for brittle finish cladding such as plaster, ceramic tile

Typically, this is with a horizontal load of 5 lbs/sq.ft. The required horizontal load for a project should be verified prior to framing selection.

c. **Horizontal Deflection of Curtain Wall.** Applications where the framing assumes no axial loads, horizontal deflection limits, based on a ratio of the wall height, possibly one of the following:

1/240 - for elastic finish cladding such as exterior insulation finish systems

1/360 - for brittle finish cladding such as cement plaster

1/600 - for brittle finish cladding such as brick veneer

1/720 - for brittle finish cladding such as brick veneer

The designer needs to confirm deflections based on intended finish cladding.

6. **Vertical Deflection of Floor Joist Framing.** Vertical deflection limits, based on a ratio of the span, possibly one of the following:

1/360

1/480 for live loads and l/240 for total loads of the span

7. **Vertical Deflection of Roof Rafter Framing.** Vertical deflection limits based on a ratio of the span, possibly one of the following:

1/120 of the horizontally projected span for live loads

1/240 of the horizontally projected span for live loads

1/360 of the horizontally projected span for live loads

8. **Vertical Deflection of Ceiling Joist Framing.** Vertical deflection limits based on a ratio of the span, possibly one of the following:

1/120

1/240

1/360 of the span for live loads and 1/240 for total loads of the span

Deflection limits should be specified in construction documents. SFIA publishes in the ***SFIA Technical Guide for Steel Framing Products*** spanning capabilities for generic cold-formed steel profiles. The tables reflect curtain wall, exterior load-bearing walls, interior load-bearing walls, interior non-loadbearing walls, and floor conditions. 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 allowable limiting heights.

2.3 COLD-FORMED STEEL FRAMING

A. Framing Members

AISI S240 states that cold-formed steel framing structural members shall be made from sheet steel that complies with ASTM A1003. The Standard lists two Types, Types H and L. There are limitations placed on the use of Type L, requiring that this steel only be used with purlins, girts, and curtain wall studs. ASTM C955 requires compliance to ASTM A1003 as well, although there is no reference to the two Types (H & L).

Architectural specifications typically have two yield strengths as options. Those are 33 and 50 ksi. Determination of which allowable stress is based on the required capacity for a given condition. Therefore, the appropriate yield strength is best determined by the Specialty Structural Engineer (SSE) on the project.

The table below illustrates the transition within the International Building Code. The model code is moving away from ASTM and to AISI Standards as the referenced Standard. There are some subtle differences between the two Standards that may 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 S200-12 ASTM C955-11C Section 8	AISI S100-12 AISI S200-12 ASTM C955-11C	AISI S110-07/S1-09(2012) AISI S200-12 AISI S210-07(2012) AISI S211-07/S1-12(2012) AISI S212-07(2012) AISI S213--07/S1-09(2012) AISI S214-12 AISI S220-11 AISI S230-07/S3-12(2012)	AISI S200-12 ASTM C1007-11a	AISI S240-15	AISI S100-16 AISI S240-15	AISI S202-15 AISI S220-15 AISI S230-15 AISI S240-15 AISI S310-16 AISI S400-15/S1-16	AISI S240-15 ASTM C1007-11a (2015)

A recent survey on what states have adopted which version 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 C955. Therefore 2.3A could read:

A. Framing Members, General: Comply with ASTM C955 for conditions indicated.

IBC 2012: ASTM C955. Therefore 2.3A could read:

A. Framing Members, General: Comply with ASTM C955 for conditions indicated.

IBC 2015: AISI S200 & ASTM C955, Section 8. Therefore 2.3A could read:

A. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.

IBC 2018 (and 2021): AISI S240. Therefore 2.3A could read:

A. Framing Members, General: Comply with AISI S240 for conditions indicated.

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

In AISI S240 in Section A3.1 the Standard references that "structural members utilized in cold-formed steel light frame construction shall be cold-formed steel to shape from sheet steel complying with the requirements of ASTM A1003/A1003M.

B. Steel Sheet Components
In AISI S240 it lists two types of steel, L (low ductility) and H (high ductility). There are limitations on framing function placed on Type L. Therefore, Type H should be specified with no limitations on function.

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 structural applications AISI S240 calls for a G60 zinc coating. However, there are several coatings available that provide equivalent corrosion resistance performance. Taking this into account, AISI S240 calls for the coating designator of CP 60 which established minimum coating requirements for several options. In coastal areas some engineers and designers recommend a higher level of protection and call for a CP 90.

From an architectural specification standpoint there are two options shown. They are CP 60 and CP 90. The default is CP 60. The architect/specifier should discuss this with the SSE and the cold-formed steel framing manufacturer.

The following is taken from AISI S240-20:

Table A4-1
Coating Designations

Coating Classification	Coating Designator	Minimum Coating Requirements			
		Zinc Coated [A] oz/ft² (g/m²)	Zinc Iron [B] oz/ft² (g/m²)	55% Al-Zinc [C] oz/ft² (g/m²)	Zinc-5% [D] oz/ft² (g/m²)
Metallic Coated	CP 60	G60 [Z180]	A60 [ZF180]	AZ50 [AZM150]	GF30 [ZGF90]
	CP 90	G90 [Z275]	Not Applicable	AZ50 [AZM150]	GF45 [ZGF135]
Painted Metallic	PM	The metallic coated substrate shall meet the requirements of metallic coated. In addition, the paint film shall have a minimum thickness of 0.5 mil per side (primer plus topcoat) with a minimum primer thickness of 0.1 mil per side. [E]			

[A] Zinc-coated steel sheet as described in ASTM A653/A653M.
[B] Zinc-iron alloy-coated steel sheet as described in ASTM A653/A653M.
[C] 55% Aluminum-zinc alloy-coated steel sheet as described in ASTM A792/A792M.
[D] Zinc-5% aluminum alloy-coated steel sheet as described in ASTM A875/A875M.
[E] In accordance with the requirements of ASTM A1003/A1003M.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade - There are four options:
      a. ST33H – Essentially a 33ksi yield strength
      b. ST50H - Essentially a 50ksi yield strength
      c. 33 KSI for 43 mil and lighter and 50 KSI for 54 mil and heavier
   2. Coating - There are three options:
      a. CP 60 (which includes the following:)
         a) Zinc coated G60 (Z180) as specified in ASTM A653
         b) Zinc-iron alloy-coated (A60)
         c) 55% Aluminum-zinc alloy coated AZ50 (AZM150) as specified in ASTM A792
         d) Zinc 5% aluminum alloy coated GF30 (ZGF90) as specified in ASTM A875
      b. CP 90
         1) Coatings that meet CP 60 (which include the following:)
            a) Zinc coated G90 (Z275) as specified in ASTM A653
            b) 55% Aluminum-zinc alloy coated AZ50 (AZM150) as specified in ASTM A792
            c) Zinc 5% aluminum alloy coated GF45 (ZG135) as specified in ASTM A875
      c. Architect to select a specific coating designation

*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.

3.4 LOAD-BEARING WALL INSTALLATION

I. Horizontal bridging members and spacing should be detailed in the drawings. The bracing should be attached to wall framing with suitable fasteners as called out in the drawings. There are proprietary solutions where manufacturer's specifications should be followed.

END OF SECTION