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SUMMARY: This publication reviews the process of ordering sheet steel for roll forming into studs, joists, and track. Key reference documents include [ASTM A1003 Standard Specification for Sheet Steel, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members](#); the [SFIA Code Compliance Certification Program \(CCCP\)](#); the [SFIA Technical Guide for Cold-Formed Steel Framing Products \(SFIA Tech Catalogue\)](#); [AISI S100: North American Specification for the Design of Cold-Formed Steel Structural Members](#); [AISI S220: North American Standard for Cold-Formed Steel Nonstructural Framing](#) and [AISI S240: North American Standard for Cold-Formed Steel Structural Framing](#). All versions referenced should be the latest incorporated per the applicable code. Additional ASTM standards worth referencing include [ASTM A653 Standard Specification for Sheet Steel, Zinc-Coated \(Galvanized\) or Zinc-Iron Alloy-Coated \(Galvannealed\) by the Hot-Dip Process](#) and [ASTM A924 Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process](#) for the sheet steel makeup and properties.

Disclaimer: These standards and practices are for educational purposes only and are not a mandate. These standards and practices may vary depending on geographic region, type of work and member preference.

The Importance of Proper Steel Ordering

Cold-formed steel (CFS) sheet is an engineered product, where ingredients and manufacturing processes must be precisely controlled to meet the performance requirements of a very wide range of applications, from food cans and washing machines, to a car's frame and steel studs.

Cold-formed steel framing (CFSF) is made from strips of structural quality sheet steel that are fed through roll forming machines with a series of dies that progressively shape the steel into channel or C-shaped sections. The formability of cold-formed steel enables it to also be formed into a variety of other shapes, including "U", "Z", and even hat-shaped sections. Cold-formed steel framing members can be formed from a wide range of material thicknesses that enable them to meet the requirements of many structural and nonstructural applications.

The *AISI Specification and Standards...* (of which *S220*, *S240* and others are now administered by the SFIA) define the requirements that a cold-formed steel framing member must meet when used for construction. In addition to formability and a corrosion-resistant coating, it also stipulates that the

steel meet certain absolute minimum thicknesses per designation, minimum yield strengths, and for any structural application, minimum tensile strength, and elongation requirements. The drive for higher

efficiency, lower cost and the ability to adjust the chemical and physical properties of steel products has enabled the development of new generations of nonstructural studs that are lighter and thinner than standard nonstructural (NS) studs. Proprietary structural members are also creating market improvements in the exterior and load-bearing wall, floor, and roof framing building segments.

What Must I Do In a Steel Order?

ASTM A1003 is a code referenced standard that provides information on coated steel used in the manufacture of cold-formed framing members. Also, *ASTM A653* and *ASTM A924* are good references for the required properties and coatings of the ordered sheet steel. Allowable steel classifications are wide ranging, but for CFSF generally fall under a yield grade designation (such as 33, 40, 50, etc.), type H (for structural products – ex: ST50H) or similarly for nonstructural products, type NS (ex: NS33).

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Ordering information is explicitly listed in *ASTM A1003* Section 5 and includes: base steel thickness; ASTM steel designation if applicable; grade and type; type of coating; whether oiled and/or chemically treated; dimensions (minimum thickness, width, flatness and length if cut); coil size requirements; packaging; certification; and any special requirements. Examples of ordering descriptions are also given. If specific steel designation or composition type is not ordered, chemical composition analyses are listed and noted in Table 2 of Section 5.

Guidelines on Materials and Manufacture; Chemical Composition; Mechanical Properties; Coating Properties; Testing; Certification; and Product Marking for the coil steel are given throughout the document. Specifics for many of these requirements for the rolled framing products are provided in the *SFIA's quality assurance Code Compliance Certification Program (CCCP)*.

The Appendix of *ASTM A1003* includes a correlation of minimum base steel thickness associated with ordered coated steel thickness, however – it must be noted that this applies only when steel is ordered to the metallic coated thickness. The producer is responsible to adhere to both the base steel MINIMUM and coated thickness. For CFS framing, it is CRITICAL that the base steel thickness does not fall below the designated minimum (usually the mil thickness designator) AT ANY POINT IN THE COIL (outside of a 3/8" minimum edge distance on the MAIN coil itself per *ASTM A924*).

What About Secondary Steel?

Secondary, or excess steel refers to steel that is produced in excess of normal production volumes or contains variances that make it unsuitable for prime steel applications. This material makes up a fraction of total steel production in North America. Utilizing secondary and excess steel presents opportunities for cost savings in some industries that can tolerate small differences from primary steel applications.

According to *AISI S220* this steel must still follow the requirements of *ASTM A1003*. This means that all of the previous requirements still apply.

What Properties Matter?

As noted above and indicated in *ASTM A1003* as well as the *SFIA CCCP* and the *AISI* standards, a number of the steel properties are critical. Since these are all code referenced standards and specifications, they are part of the building code and must be followed. The SFIA tests random product samples based on the *SFIA CCCP* requirements to the critical properties in accordance with the defined ASTM standards and testing criteria for all manufacturers. If a variance from the program is found, they are notified and required to take corrective action. If a code deficiency is found, more significant

action must be taken. If unresolved or if more deficiencies occur, the manufacturer can be removed as a certified member of the SFIA.

The most critical properties are as follows:

- Base Steel thickness (this is a MINIMUM – no tolerance is given below this)
- Yield strength (this is a MINIMUM – no tolerance is given below this)
- Tensile strength (this is a MINIMUM – no tolerance is given below this. But it is not a requirement for nonstructural framing products)
- Elongation (this is a MINIMUM – no tolerance is given below this. But it is not a requirement for nonstructural framing products)
- Coating (thickness for an accepted standard coating; PERFORMANCE for an EQ Coating - as provided by a coil coater)
- Profile measurements (with tolerances per *AISI* and *SFIA CCCP*)
- Member measurements (also with tolerances per the *AISI* and *SFIA CCCP*)
- Marking/Identification for traceability.

These properties are all absolutely critical in a steel order and product. The producing steel mill should be notified in the purchase order of all the items pertinent to them, and the latter items are the responsibility of the producer of the cold-formed framing members.

What Else Is Critical?

Material quality inspection – The buyer must do their due diligence and verify the product received meets their specifications.

Proper documentation – the supplier should also be able to provide proper documentation for the makeup and specifications of the steel.

Traceability of the coil is also critical. Per the IBC and for an SFIA manufacturer, coil traceability is absolutely required. Samples of steel framing members will be measured and tested via an unannounced audit, and in some cases steel samples shipped back to the independent testing lab in order to be bench tested. Lab tests include Yield, Elongation and Tensile strengths, thickness rechecks and coating. In the event of a conflict or a nonconformance issue, the members and the coil from which they are produced must be able to

be traced to verify exactly what was ordered from the steel coil provider. They should then be notified as to which properties came up as substandard in accordance with the code.

Protocols to Follow

As noted throughout this document, the critical protocols to follow in steel ordering for CFSF members are as follows:

- *AISI S220 and/or AISI S240*
- *ASTM A1003*
- *SFIA Code Compliance Certification Program (CCCP).*

Additionally, the *AISI S100 specification* is critical with regard to the applicable lists of acceptable steels. The *SFIA Tech Catalog* is also important with regard to the standard profiles to be produced from these steels for framing members.

Minimums v. Tolerances

To further reinforce what should be understood, minimums are absolutes and tolerances are tolerances as defined. Tolerances are a plus or minus measurement generally applied to member sizes, or girths or lengths of the steel required to form the member. Minimums are generally absolutes and are applied most critically to the steel yield strength and base steel thickness required to manufacture a member of a certain profile and expected performance.

Minimum Thickness and Coatings (SFIA CCCP B.1.2)

The typical designation for thickness or “t” in the code refers to the base uncoated absolute minimum that the steel member can be provided with. This means that at any location along any length or point on a given member, the thickness CANNOT fall below this minimum or the product will not meet the code, or more importantly, will not meet its expected engineered performance. This is critical. In any case, it is advisable to ALWAYS order to an absolute bare minimum uncoated thickness. Either this or be considerably safe when ordering to a coated thickness. The key is that the manufacturer remains liable in any case if the base steel falls below the minimum (an ABSOLUTE) at ANY point within the ordered coil.

Nuances In Steel Ordering

In today’s very competitive industry, profit margins are narrow and every part of material costs count. This is both the result and an impetus for the development of new products intended to meet codes, standards, and engineering requirements while lowering material costs or making for more efficient installations. Minimizing costly errors is therefore key. A few activities can help along these lines: Certified suppliers – using suppliers who are certified can help to trust they are able to provide such steel products.

Quantity – 20 ton increments or full truckloads will create quantity discounts and better pricing than smaller purchases. Mixing sizes in single orders or shipments also generally results in higher costs. However, when buying through a Service Center, sometimes combining smaller orders is a more efficient method.

If the capability exists, carefully consider buying master coils versus pre-slit coils. This includes initial cost savings, processing time and quality risk.