Designation: A1003/A1003M – 15

Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members[1]

This standard is issued under the fixed designation A1003/A1003M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers coated steel sheet used in the manufacture of cold-formed framing members, such as, but not limited to, studs, joists, purlins, girts, and track.

1.2 The steel sheet used for cold-formed framing members includes metallic-coated, painted metallic-coated, or painted nonmetallic-coated.

1.3 The values stated in either inch-pound or SI units shall be regarded separately as standard. Within the text, SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other.

1.4 Unless the order specifies the "M" designation [SI units], the product shall be furnished to inch-pound units.

1.5 The text of this specification references notes and footnotes, which provide explanatory material. These notes and footnotes, excluding those in tables and figures, shall not be considered as requirements of this specification.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A463/A463M Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process

A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A755/A755M Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

A792/A792M Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

A875/A875M Specification for Steel Sheet, Zinc-5 % Aluminum Alloy-Coated by the Hot-Dip Process

A879/A879M Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

A902 Terminology Relating to Metallic Coated Steel Products

A924/A924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A1004/A1004M Practice for Establishing Conformance to the Minimum Expected Corrosion Characteristics of Metallic, Painted-Metallic, and Nonmetallic-Coated Steel Sheet Intended for Use as Cold Formed Framing Members

A1046/A1046M Specification for Steel Sheet, Zinc-Aluminum-Magnesium Alloy-Coated by the Hot-Dip Process

A1063/A1063M Specification for Steel Sheet, Twin-Roll Cast, Zinc-Coated (Galvanized) by the Hot-Dip Process

D714 Test Method for Evaluating Degree of Blistering of Paints

D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

D4138 Practices for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive, Cross-Sectioning Means

D4145 Test Method for Coating Flexibility of Prepainted Sheet

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 *ISO Standard:*

ISO 9223 Corrosion of Metals and Alloys—Corrosivity of Atmospheres-Classification[3]

[1] This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.11 on Sheet Specifications.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

***A Summary of Changes section appears at the end of this standard**

2.3 *AISI Standard:*
Specification for the Design of Cold-Formed Steel Structural Members[4]

3. Terminology

3.1 *Definitions*—See Terminology A902 for definitions of general terminology relating to metallic-coated steel products, and Terminology A941 for definitions of general terminology relating to uncoated steel sheet products.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aluminum coating type 1, n*—a coating of aluminum and silicon alloy on steel sheet.

3.2.1.1 *Discussion*—Aluminum-coated steel sheet type 1 provides protection from corrosion primarily through the barrier action of the coating. The aluminum-silicon alloy coating provides galvanic corrosion only in marine environments. Because this coating does not generally provide galvanic protection, rust staining may be evident at area where the base metal is exposed to the environment, such as at punch-outs, cut or sheared edges of members, and at scratches.

3.2.2 *aluminum coating type 2, n*—a coating of commercially pure aluminum on steel sheet.

3.2.2.1 *Discussion*—Aluminum-coated steel sheet type 2 provides protection from corrosion primarily through the barrier action of the coating. The aluminum coating provides galvanic corrosion only in marine environments. Because this coating does not generally provide galvanic protection, rust staining may be evident at areas where the base metal is exposed to the environment such as at punch-outs, cut or sheared edges of members, and at scratches.

3.2.3 *coating sequence, n*—the unbroken or uninterrupted manufacture of coils of the same coating designation.

3.2.4 *coil coater, n*—the organization that applies paint film coatings to coils of steel sheet on continuous paint lines.

3.2.5 *producer, n*—the organization that produces the steel sheet coil product from which the cold-formed members are fabricated.

3.2.6 *purlins and girts, n*—horizontal structural members that support roof deck or panel covering with loads applied principally by bending.

3.2.7 *resample, n*—additional tests made when the original test results do not satisfy the specification requirements.

3.2.8 *retest, n*—additional test, or tests, made when the original test results do not satisfy the specification requirements and the failure is due to a mechanical condition of the test specimen.

3.2.9 *roll former, n*—the organization that produces the cold-formed members.

3.2.10 *zinc-iron alloy, n*—a dull grey coating with no spangle pattern that is produced on hot-dip zinc-coated steel sheet.

3.2.10.1 *Discussion*—Zinc-iron alloy-coating is normally dull gray in appearance when produced by the manufacture of the coated sheet. Typically, the coating contains between 8 and 12 % iron, which is the result of a diffusion reaction between the steel sheet and the zinc coating during the coating process. In most applications, this product is intended to be painted. The coating offers excellent paint adhesion. When the product is exposed to the environment without a paint coating, there is a tendency for the development of a rust-colored stain on the surface. This is caused by the presence of iron in the coating. This stain may be aesthetically objectionable to some users of cold formed framing members.

3.3 *Suffixes: H, adj*—high ductility.
L, adj—low ductility.
NS, adj—nonstructural.

3.3.1 These designations are associated with aspects of the end uses of the steel products; *H* and *L* are associated with structural or load-bearing applications, and *NS* with nonstructural or nonload-bearing applications.

4. Classification

4.1 The steel sheet is available in the following designations:

4.1.1 Structural Grade 33, 37, 40, 50, 55, 57, 60, 70, and 80 Type H (for example, ST50H), Structural Grade 230, 255, 275, 340, 380, 395, 410, 480, and 550 Type H [for example, ST340H].

4.1.2 Structural Grade 33, 37, 40, 50, 55, 60, 70, and 80 Type L (for example, ST50L), Structural Grade 230, 255, 275, 340, 380, 410, 480, and 550 Type L [for example, ST340L].

4.1.3 Nonstructural Grade 33, 40, 50, 57, 60, 65, 70, and 80 (for example, NS33), Nonstructural Grade 230, 275, 340, 395, 420, 450, 480, 550 [for example, NS230]).

NOTE 1—Abbreviated designations are shown in parentheses or brackets.

4.2 Use of Type L steels is limited to purlins and girts (see 3.2.6).

5. Ordering Information

5.1 Steel sheet in coils or cut lengths shall be supplied to either base metal thickness requirements or coated steel thickness requirements, as specified on the purchase order or upon agreement between producer and user. If not specified or no agreement established, base steel thickness requirements shall apply.

5.1.1 Thickness shall be expressed in increments of 0.0001 in. [0.001 mm].

5.1.2 Thickness shall be specified as minimum, nominal thickness is not permitted.

5.1.3 Thickness tolerance is defined in accordance with Specification A568/A568M for orders specified with base steel thickness and Specification A924/A924M for orders specified with coated steel thickness. For thickness tolerance of thickness expressed in increments of 0.0001 in. [0.001 mm], Practice E29 rounding rules shall apply.

5.1.4 Annex A2 provides a correlation between minimum base steel thickness and ordered coated steel thickness, for all approved coating designations. Table A2.1 shall be used to minimize risk of the base steel thickness falling below the

[4] Available from American Iron and Steel Institute (AISI), 1140 Connecticut Ave., NW, Suite 705, Washington, DC 20036, http://www.steel.org.

ordered coated thickness minus the coating thickness additive for orders and steel produced to the coated steel thickness requirements.

5.1.5 For orders specifying base steel thickness, it is the producer's responsibility to adhere to the minimum base steel thickness regardless of coating thickness or coating designation specified.

5.2 Orders for product to this specification shall include the following information, as necessary to adequately describe the desired product.

5.2.1 ASTM specification number and year of issue (A1003 – __ for inch-pound units and A1003M – __ for SI units),

5.2.2 Name of the material (metallic-coated steel sheet), (painted metallic-coated steel sheet), or (painted nonmetallic-coated steel sheet), and designation (see 4.1). For Structural Grades, if a type is not specified, type H shall be furnished.

5.2.2.1 See Specification A755/A755M for additional ordering requirements for the painted-metallic-coated steel sheet.

5.2.3 Type of coating (metallic-coated; zinc, zinc-iron alloy, zinc-aluminum-magnesium alloy, 55 % aluminum-zinc alloy, zinc-5 % aluminum alloy, aluminum-coated Type 1, and aluminum-coated Type 2, electrolytic zinc-coated), (painted-metallic-coated; metallic-coating and nonmetallic-coating type), (painted nonmetallic coated: nonmetallic-coating type).

5.2.3.1 Metallic coating weight [mass] designation (see Table 1), (see 9.1).

5.2.3.2 Nonmetallic coating thickness (see 9.2 or 9.3).

5.2.4 Chemically-treated or not chemically-treated (metallic-coated only).

5.2.5 Oiled or not-oiled,

5.2.6 Dimensions (show minimum thickness, width, and flatness requirements and length, if cut lengths).

5.2.7 Coil size requirements (specify maximum outside diameter (OD) acceptable inside diameter (ID), and maximum weight [mass].

5.2.8 Packaging (specify requirements for banding, paper wrapping and other special packaging requirements).

5.2.9 Certification, if required (heat analysis, metallic coating weight or nonmetallic coating thickness and mechanical properties report).

TABLE 1 Coating Weight [Mass] Requirements (Metallic Coatings)

Product Designation	Coating Designation
Type H and Type L	G60 [Z180][A] A60 [ZF180][B] AZ50 [AZM150][C] GF30 [ZGF90][D] T1–25 [T1M 75][E] T2–100 [T2M 300][E] 30Z/30Z [90G/90G][F] ZM20 [ZMM60][G]
Type NS	G40 [Z120][A] A40 [ZF120][B] AZ50 [AZM150][C] GF20 [ZGF60][D] T1–25 [T1M 75][E] T2–100 [T2M 300][E] 20Z/20Z [60G/60G][F] ZM20 [ZMM60][G]

[A]Zinc-coated steel sheet as described in Specifications A653/A653M, A1063/A1063M.
[B]Zinc-iron alloy-coated steel sheet as described in Specification A653/A653M.
[C]55 % aluminum-zinc alloy-coated as described in Specification A792/A792M.
[D]Zinc-5 % aluminum alloy-coated steel sheet as described in Specification A875/A875M.
[E]Aluminum-coated Type 1 and Type 2 steel sheet as described in Specification A463/A463M.
[F]Zinc-coated steel sheet as described in Specification A879/A879M.
[G]Zinc-aluminum-magnesium alloy-coated as described in Specification A1046/A1046M.

5.2.10 Special Requirements, if any.

5.2.11 When a composition type is not selected (see Table 2) then Class 1 shall be furnished.

NOTE 2—Typical ordering descriptions are as follows:
• Steel sheet, zinc-coated, Structural Grade 50 Type H (ST50H), ASTM A1003, Coating Designation G60, chemically-treated, not oiled, 0.0350 in coated steel thickness, by 48 in. by coil, 24-in. ID, 30 000 lb maximum for steel studs, or
• Steel sheet, zinc-coated, Structural Grade 230 Type L [ST230L], ASTM A1003M, Coating Designation Z180, chemically-treated, not oiled, 1.000 mm base steel thickness, by 920 mm by coil, 600 mm ID, 10 000 kg maximum for purlins.

NOTE 3—Electrolytic zinc-coated steel sheet designations indicate the coating on one surface only; therefore, the coating requirement must be specified for each side of the steel sheet as indicated in Table 1. Also, the electrolytic zinc-coated steel sheet is only available in SI values.

6. Materials and Manufacture

6.1 The ordered thickness shall be either the base steel thickness or the coated steel thickness, as specified on the purchase order or upon agreement between producer and user. If not specified and no agreement established, base steel thickness shall apply.

7. Chemical Composition

7.1 *Base Metal:*

7.1.1 The chemical composition of the steel sheet shall conform to the requirements of Table 2, as indicated for the class selected for the steel.

7.1.2 All tests shall be conducted in accordance with the requirements for chemical composition as described in Specification A924/A924M for products with metallic coatings and Specification A568/A568M for nonmetallic coated products.

7.1.3 An analysis of each heat of steel shall be made by the producer to determine the percentage of elements specified in Table 2.

7.1.4 In those cases where the heat analysis is not available a product analysis test shall be performed to determine conformance with the requirements of Table 2.

7.1.5 Each of the elements listed in Table 2 shall be included in the report of heat or product analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, report the analysis as <0.02 % or the actual determined value. When the amount of vanadium, columbium, or titanium is less than 0.008 %, report the analysis as <0.008 % or the actual determined value.

8. Mechanical Properties

8.1 The mechanical properties of the steel sheet shall conform to the requirements shown in Table 3.

8.2 Tests for mechanical properties of the "H" and "NS" steel designations shall be conducted in accordance with the tests for mechanical properties described in Specification A924/A924M for metallic-coated steel sheet and A568/A568M for nonmetallic coated steel sheet.

8.3 Tests for elongation in ½ in. [13 mm] of the "L" steel designations shall be conducted in accordance with the procedure found in the *AISI Cold Formed Design Manual*, "Standard Methods for Determination of Uniform and Local Ductility."