



Designation: C645 – 11a

Standard Specification for Nonstructural Steel Framing Members¹

This standard is issued under the fixed designation C645; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This specification covers nonstructural steel framing members in interior construction assemblies.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The following safety hazards caveat pertains only to the test methods portion, Sections 9 and 10, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

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

[A1003/A1003M Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members](#)

[C11 Terminology Relating to Gypsum and Related Building Materials and Systems](#)

[C475/C475M Specification for Joint Compound and Joint Tape for Finishing Gypsum Board](#)

[C1396/C1396M Specification for Gypsum Board](#)

[C754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products](#)

[C1002 Specification for Steel Self-Piercing Tapping Screws](#)

¹ This specification is under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.02 on Specifications and Test Methods for Accessories and Related Products.

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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.

[for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs](#)

2.2 *AISI Standards:*³

[S100 North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 edition](#)

[S200 North American Standard for Cold-Formed Steel Framing – General Provisions, 2007 Edition](#)

2.3 *ICC-ES Document*⁴

[ICC-ES-AC86 Acceptance Criteria for Steel Studs and Gypsum-Board Interior Nonload-Bearing Walls—Complete Construction—AC86—Approved July 1995 \(Editorially revised September 2005\) \(Formerly ICBO AC86 dated July 1995\)](#)

3. Terminology

3.1 *Definitions*—Definitions shall be in accordance with Terminology C11.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *members, n*—in screw application of gypsum board, studs, runners (track), hat furring channels, main beams and cross furring members of grid suspension systems or other items manufactured in accordance with this specification.

3.2.2 *nonstructural wall stud, n*—a member in a steel framed wall system which is limited to a lateral (transverse) load of not more than 10 lb/ft² (480 Pa), a superimposed vertical load, exclusive of sheathing materials, of not more than 100 lbf/ft (1460 N/m), or a superimposed vertical load of not more than 200 lbs (890 N).

4. Materials and Manufacture

4.1 Members shall be manufactured from steel meeting the requirements of Specification A1003/A1003M.

4.2 Members shall have a protective coating conforming to Specification A653/A653M – G 40 minimum or shall have a protective coating with an equivalent corrosion resistance.

³ Available from American Iron and Steel Institute (AISI), 1140 Connecticut Ave., NW, Suite 705, Washington, DC 20036, <http://www.steel.org>.

⁴ Available from ICC Evaluation Services, Inc., 5360 Workman Mill Road, Whittier, CA 90601, www.icc-es.org.

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

4.3 Members shall be manufactured from steel having a minimum thickness, individual measurement of 0.0179 in. (0.455 mm) before application of protective coating.

5. Dimensions and Permissible Variations

5.1 Studs and rigid furring channels shall have a configuration and steel thickness such that the system in which they are used will carry the design transverse loads without exceeding either the allowable stress of the steel or the allowable design deflection. Main beams and cross furring of grid suspension systems shall be limited to a deflection of L/240. The manufacturer shall supply sufficient data for calculating design performance.

NOTE 1—Allowable deflection varies depending on the cladding used and architectural requirements. Detailed requirements shall be specified in application specifications.

5.1.1 Members, except main beams of grid suspension systems, shall be sufficiently rigid to permit penetration of the screw.

5.1.2 Minimum width of face to which gypsum board is screw-attached shall be not less than 1 1/4 in. (32 mm).

5.1.3 Minimum lip dimension shall be 3/16 in. (5 mm). See Fig. 1.

5.2 Members shall be manufactured within the limits as shown in Table 1 and Fig. 2.

5.3 Rigid Furring Channels—Minimum depth shall be 7/8 in. (22 mm). Minimum width of furring attachment flanges (see Fig. 3) shall be 1/2 in. (12.7 mm).

5.4 Grid suspension systems include main beams and cross furring members which mechanically interlock to form a modular supporting network. Length tolerance for grid suspension members shall be ±1/16 in. (1.59 mm).

5.5 Runners (track) shall be formed in a U-shaped configuration, having web depth compatible with those of the studs of the same nominal size. The runners (track) shall be designed such that when the studs are placed in both the top

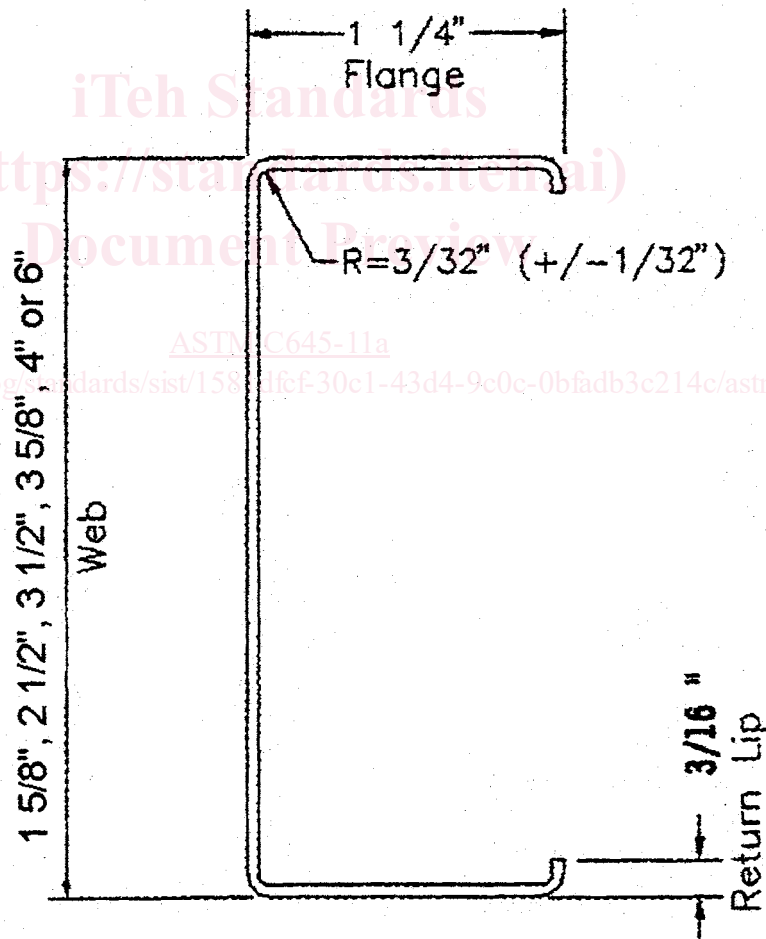


FIG. 1 Minimum Drywall Stud Cross Section

TABLE 1 Manufacturing Tolerances

Dimension ^A	Item Checked	Drywall Studs, in. (mm)	Drywall Track, in. (mm)
A	length	+ 1/8 (3.18)	+ 1 (25.40)
		- 1/4 (6.35)	- 1/4 (6.35)
B ^B	web width	+ 1/32 (0.79)	+ 1/8 (3.18)
		- 1/32 (0.79)	- 0 (0)
C	flare overbend	+ 1/16 (1.59)	+ 0 (0)
		- 1/16 (1.59)	- 3/16 (4.76)
D	hole center width	+ 1/8 (3.18)	NA
		- 1/8 (3.18)	
E	hole center length	+ 1/4 (6.35)	NA
		- 1/4 (6.35)	
F	crown	+ 1/8 (3.18)	+ 1/8 (3.18)
		- 1/8 (3.18)	- 1/8 (3.18)
G	camber	1/32 per ft (0.79)	1/32 per ft (0.79)
		1/2 max (12.7)	1/2 max (12.7)
H	bow	1/32 per ft (0.79)	1/32 per ft (0.79)
		1/2 max (12.7)	1/2 max (12.7)
I	twist	1/32 per ft (0.79)	1/32 per ft (0.79)
		1/2 max (12.7)	1/2 max (12.7)

^A All measurements shall be taken not less than 1 ft (305 mm) from the end.

^B Outside dimension for stud; inside for track.

and bottom runners (track), they are held by friction. Minimum height of flanges shall be 1 in. (25 mm).

6. Edges

6.1 Members shall be manufactured in such a fashion as to minimize burrs and sharp edges.

7. Cutouts

7.1 Cutouts shall not reduce the performance of the members in the gypsum board construction assembly below the specified performance requirements.

8. Sectional Properties

8.1 The sectional properties of members shall be computed in accordance with AISI S100 (See **Tables 2 and 3** and **Figs. 1 and 3**).

9. Performance Requirements

9.1 *Penetration*—When tested in accordance with Section 10, members shall be capable of pulling the head of the screw below the surface of the gypsum board in less than 2 s without spin out.

9.2 Members that can show certified third party testing in accordance with ICC-ES-AC86 (Approved July 1995—Editorially Revised September 2005) and conform to the limiting height tables in Specification **C754** need not meet the minimum thickness limitation set forth in **4.3** or the minimum section properties set forth in **8.1**.

10. Penetration Test

10.1 *Significance and Use*—This test method provides a procedure for evaluating the member's ability to pull the head of a screw below the surface of gypsum wallboard. It shall be used to determine compliance with this specification. The degree of performance of this test method with service performance has not been determined.

10.2 *Apparatus shall satisfy the following:*

10.2.1 *Power-Driven Drill Screw Gun*, capable of 4000 rpm (free spindle speed) with a depth-sensitive nose piece, supplied with a screw driving bit to fit the screw used in the test.

10.2.2 *Stop Watch*, capable of being read to the nearest 0.1 s.

10.3 *Materials shall satisfy the following:*

10.3.1 *Gypsum Wallboard*—Specification **C1396/C1396M**, Type X, 5/8 in. (16 mm) thick.

10.3.2 *Screws*—Specification **C1002**, Type S, minimum 1 in. (25.4 mm) long.

10.3.3 *Paper Joint Tape*—Specification **C475/C475M**.

10.4 *Sampling*—One member shall be selected from each bundle or package but not more than ten from any one shipment for testing.

10.5 *Specimen Preparation:*

10.5.1 Each member to be tested shall be cut into test specimens not less than 18 in. (460 mm) long.

10.5.2 For each test, one piece of gypsum wallboard, 6 in. (150 mm) square, shall be cut from not less than 12 in. (300 mm) from the edge or end of the gypsum wallboard.

10.5.3 For each test, four pieces of paper joint tape, 2 in. (50 mm) square shall be cut.

10.6 *Procedure*—

10.6.1 Assemble the member, gypsum wallboard and paper joint tape on a rigid, flat surface. (See **Fig. 4** for studs, **Fig. 5** for furring channels.)

10.6.2 Prior to performing the test, drive several screws without the paper joint tape to set the depth of the nose piece on the screw gun, allowing the screws to be driven below the surface of the wallboard without breaking the gypsum wallboard face paper.

10.6.3 Drive the screw through the paper joint tape, using the screw gun, while applying a force (dead weight and applied force) of 30 lbf (112.2 N). Drive the screw until the nosepiece of the screw gun has either stopped and seated the screw or the screw spins out. Record if the screw has spun out and if it exceeds 2 s to seat the screw in the gypsum wallboard.

10.7 *Number of Tests and Retests:*

10.7.1 A sample consisting of five specimens of members shall be tested.

10.7.2 If not more than one of the test specimens fails to meet the requirements, the sample has met the requirements.

10.7.3 If two of the five test specimens fail to meet the requirements, two additional test specimens shall be chosen for retesting. If either of the two additional test specimens fail, the sample has failed to meet the requirements of this test.

10.8 *Report*—Report shall indicate the total number of specimens tested and the number of specimens meeting the requirements of this specification.

10.9 *Precision and Bias*—No statement is made about either the precision or bias of this test method since the result merely states whether or not there is conformance to the criteria for success specified in the procedure.