



# Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness<sup>1</sup>

This standard is issued under the fixed designation C 954; 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 ( $\epsilon$ ) 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 minimum requirements for steel drill screws for use in fastening gypsum panel products or metal plaster bases to steel members from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in thickness.

1.2 This specification also covers physical properties and test methods for determining performance requirements.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following safety hazards caveat pertains only to the test methods described in 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:

A 510 Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel<sup>2</sup>

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems<sup>3</sup>

C 36 Specification for Gypsum Wallboard<sup>3</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 For definitions relating to gypsum and related building materials and systems, see Terminology C 11.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *steel drill screw*—self-drilling tapping screw with the ability to drill its own hole, form or cut mating threads without deforming its own threads or breaking during assembly.

<sup>1</sup> 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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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>3</sup> Annual Book of ASTM Standards, Vol 04.01.

## 4. Materials

4.1 Screws shall be manufactured from Grade 1018 to 1022 steel wire manufactured in accordance with Specification A 510.

## 5. Physical Properties

### 5.1 Metallurgical Requirements:

5.1.1 The surface of the screw shall be carbonitrided to a depth of 0.004 to 0.008 in. (0.10 to 0.20 mm).

5.1.2 The core hardness shall be 32 to 40 HRB after being drawn at a minimum temperature of 625°F (330°C).

5.1.3 The screw shall have no band of free ferrite between the case and core nor shall the case contain appreciable amounts of retained austenite or other soft constituents.

5.1.4 Surface hardness shall be determined by a micro hardness instrument at “the root of the thread profile,” as exposed by removal of enough material to form a flat surface along the length of the screw.

### 5.2 Dimensions and Permissible Variations:

#### 5.2.1 General:

5.2.1.1 *Head Diameter*—The head of the screw shall not be out of round more than 0.021 in. (0.51 mm) and have the following shape and dimensions:

5.2.1.2 *Screw Diameter*—Screws shall have a major diameter not less than 0.136 in. (3.45 mm).

5.2.1.3 *Points*, shall provide for self-drilling into steel studs from 0.333 in. (0.84 mm) to 0.112 in. (2.84 mm) in thickness and meet the performance tests in Section 6.

5.2.1.4 *Driving Recess*, shall be a No. 2 “Phillips” design with a minimum depth of 0.104 in. (2.64 mm) as determined with a “Phillips” penetration depth gage or a recess of equal performance.

5.2.1.5 *Length*—Nominal lengths shall be minimum length.

#### 5.2.2 Screws for Fastening Gypsum Board:

5.2.2.1 Screw-head minimum diameter shall be 0.3145 in. (8.00 mm).

5.2.2.2 The top of the head shall be flat. The outer flange thickness shall be  $0.025 \pm 0.005$  in. ( $0.64 \pm 0.13$  mm). The contour beneath the flange head shall be such that the screw head shall be able to be driven so that the head of the screw

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

rests immediately below the surface of the gypsum panel products.

5.2.2.3 The threads shall extend to the lower edge of the head contour.

5.2.3 *Screws for Fastening Metal Plaster Bases:*

5.2.3.1 Screw head minimum diameter shall be 0.437 in. (11.1 mm).

5.2.3.2 The top of the head shall be flat or contoured. The underside of the head shall be flat.

5.2.3.3 The threads shall extend to the underside of the head.

## 6. Performance Requirements

6.1 *Spin Out:*

6.1.1 Screws shall self-drill and drive into a stud 0.0598 in. (1.5 mm) thick with an approximate hardness of 65 HRB without spinout.

6.1.2 Screws shall self drill and drive into a stud 0.105 in. (2.7 mm) thick, with a hardness of 80 HRB without spinout.

6.2 *Performance:*

6.2.1 When tested in accordance with Section 10, screws shall meet the requirements as follows:

6.2.1.1 *Gypsum Panel Products*—Screw threads shall be adequate to pull the head of the screw below the surface of the gypsum panel through four layers of kraft paper placed over the gypsum panel products and a steel stud 0.033 in. (0.84 mm) thick when tested in accordance with 10.5.1.

6.2.1.2 *Metal Plaster Bases*—Screw threads shall be adequate to pull metal lath tight against the flange of a steel stud 0.033 in. (0.84 mm) thick so that when subjected to a steady pull, the lath will tear and not slip out from under the screw head when tested in accordance with 10.5.1.

## 7. Finish and Appearance

7.1 Screws shall be corrosion-resistant treated with a material which will not inhibit adhesion to joint compounds or plaster and will not bleed through decorative finishes.

7.2 Screws shall be straight, clean, smooth, neatly formed, and free of defects such as burrs and deformations.

## 8. Sampling

8.1 One screw from each of 5 containers in a lot of 16 000, but not less than 5 screws per 16 000 screws shall constitute a sample.

## 9. Number of Tests and Retests

9.1 Test the sample specified in 8.1 in accordance with Section 10. If any one screw of the sample fails to meet this specification, test a second sample using 25 screws. If two or more screws from the second sample fail, the represented lot of 16 000 screws is considered to have failed to meet this specification.

## 10. Test Method

10.1 *Summary of Test Method:*

10.1.1 This test method utilizes steel screws designed for use to hold gypsum panel products and metal plaster base materials applied with power-driven screw guns of 2500 r/min maximum to steel studs.

10.2 *Significance and Use:*

10.2.1 This test method evaluates the ability of steel drill screws used to secure gypsum panel products and metal plaster bases to certain steel framing members.

10.2.2 The test shall be conducted in a laboratory or on-site.

10.3 *Apparatus:*

10.3.1 *Power-Driven Drill Screw Gun*, having the capacity of turning 2500 r/min maximum (free spindle speed).

10.3.2 A *Vice*, or similar device to support the stud during the test.

10.4 *Materials:*

10.4.1 *Kraft Paper*, 0.010 in. (0.25 mm) thick.

10.4.2 *Steel Stud*—One section of 0.033-in. thick stud (0.84-mm), 1 section of 0.0598-in. (1.5-mm) thick stud and with a hardness of 65 HRB, and 1 section of 0.105-in. (2.7-mm) thick stud and with a hardness of 80 HRB.

10.4.3 *Gypsum Wallboard*—Specification C 36, Type X, 5/8 in. (16 mm) thick.

10.4.4 *Screw Specimens*, to be tested.

10.4.5 *Diamond Mesh Metal Lath*, 2.5/lb/yd<sup>2</sup>.

10.5 *Procedure for Performance Tests:*

10.5.1 Using the screw specimen, attach gypsum board or metal lath to center of a flange of a steel stud which has been securely and rigidly supported.

10.5.1.1 Grasp the metal lath with locking pliers and pull steadily in a plane parallel to the plane of the lath. Observe whether the lath tears before it slips out from under the screw head.

10.5.1.2 With the drill propelling the screw at 2500 r/min maximum (free spindle speed), exert a total pressure of 30 lbf (135.5 N) (dead weight plus applied force).

10.6 *Precision and Bias*—No statement is made regarding the precision and bias of this test method, since the result of the test method is reported in nonnumerical terms.

## 11. Inspection

11.1 Inspection of steel drill screws shall be agreed upon by the purchaser and the producer or supplier as part of the purchase agreement.

## 12. Rejection and Rehearing

12.1 Rejection of steel drill screws that fail to conform to the requirements of this specification shall be reported to the producer or supplier promptly and in writing within 10 working days from receipt of shipment by the purchaser. Notice of rejection shall contain a specific statement as to the respects in which the screws have failed to conform to the requirements of this specification. In case of dissatisfaction with the results of the test, and at the request of the producer or supplier, such notice of rehearing shall be supported by results of a test conducted by a mutually agreeable independent laboratory.

## 13. Certification

13.1 When specified in the purchase agreement, the producer or supplier shall furnish a report certifying that, at time of shipment, the screws were in compliance with the requirements of this specification.

#### 14. Packaging and Marking

14.1 Screws shall be packaged in substantial commercial containers constructed so as to preserve the contents in good condition and to ensure acceptance and safe delivery by common or other carriers, at the lowest rate, to the point of delivery.

14.2 The containers shall be so constructed that the contents can be partially removed without destroying the container's ability to serve as a receptacle for the remainder of the contents.

14.3 Individual packages and shipping containers shall be marked with the type and length of screw and the name of the manufacturer or distributor.

#### 15. Keywords

15.1 steel drill screw; steel self-drilling tapping screw

### SUMMARY OF CHANGES

- (1) Revised par. 3.2.1.
- (2) Revised par. 5.2.1.2.
- (3) Revised par. 5.2.1.3.
- (4) Revised par. 10.1.1.

- (5) Revised par. 10.2.1.
- (6) Revised par. 10.3.1.
- (7) Revised par. 10.5.1.2.
- (8) Revised Keywords.

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