



Standard Test Methods for Nails¹

This standard is issued under the fixed designation F 680; 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 These test methods cover procedures for the testing of nails. The test or tests selected, and the requirements for compliance, will be as specified in the applicable product standard. Performance tests for nail withdrawal and lateral load capability are not included as they are covered by Test Methods D 1761.

1.2 The tests described are as follows:

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1.3 *This standard does not purport to address all of the safety problems, 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.*

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

2. Referenced Documents

2.1 ASTM Standards:

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron or Steel Articles with Zinc or Zinc-Alloy Coatings²

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products³

A 428/A 428M Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles²

D 1761 Test Methods for Mechanical Fasteners in Wood⁴

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁵

F 547 Terminology of Nails for Use with Wood and Wood-Base Materials⁶

F 592 Terminology of Collated and Cohered Fasteners and Their Application Tools⁶

3. Terminology

3.1 Definitions—For definitions of terms used in this test method, refer to Terminology F 547 and F 592.

4. Significance and Use

4.1 When specified, the tests selected for application shall be performed to assure conformance with requirements stipulated in the product specification.

5. Dimensional Tests

5.1 Dimensions to be evaluated include, but shall not be limited to length, stock diameter, diameter or major dimensions of head, straightness, head concentricity to shank, and length of point. For mechanically deformed nails, angle, depth, and configuration of deformations shall be measured as specified. Other dimensional characteristics shall be measured when required. Any suitable measuring means may be applied.

6. Tension Test

6.1 Nails are not subject to tension testing. However, wire used to make the nails may be tested as required by prior agreement or to affect mill product control. The testing of wire is covered in the general section of Test Methods A 370 and Supplement IV, Round Wire Products.

7. Conventional Bend Test

7.1 This test is used as a means of testing the ductility of certain types of nails or of the wires used in the manufacture of nails. The angle of bend and the mandrel diameter will be specified in the product specification. The cold bending shall be performed by any hand or power device that will deform the sample closely about a mandrel of specified diameter through the required angle without causing damage to the nail surface. The sample shall be considered to have failed if fracture occurs prior to attainment of the required minimum bend angle. Unless otherwise specified, the conventional bend test shall not

¹ These test methods are under the jurisdiction of ASTM Committee F16 on Fasteners and are the direct responsibilities of Subcommittee F16.05 on Driven and Other Fasteners.

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² *Annual Book of ASTM Standards*, Vol 01.06.

³ *Annual Book of ASTM Standards*, Vol 01.03.

⁴ *Annual Book of ASTM Standards*, Vol 04.10.

⁵ *Annual Book of ASTM Standards*, Vol 03.01.

⁶ *Annual Book of ASTM Standards*, Vol 01.08.

be applied to annularly threaded nails or to the region of a nail exhibiting gripper marks.

8. Impact Bend Test

8.1 The impact test is primarily applicable to the testing of pallet nails to assess their suitability for that application. The testing device is shown in Fig. 1 and its operation is described in Annex A1. For any given diameter, the data from this test can be correlated with Rockwell hardness used to specify the mechanical properties of the nail. The impact bend test is intended as a convenient test that may be used in manufacturing and consumer quality monitoring of mechanical properties. However, in the case of dispute, the Rockwell hardness test, supplemented by the conventional bend test, will be considered the governing test.

9. Rockwell Hardness Test

9.1 This test is used to measure the hardness of heat-treated nails. Prepare flat surfaces by grinding or filing. Take care not to alter the tempered hardness of the nail during preparation of the flats. The width of the prepared flat shall be sufficient to prevent edge bulge adjacent to each hardness impression. The

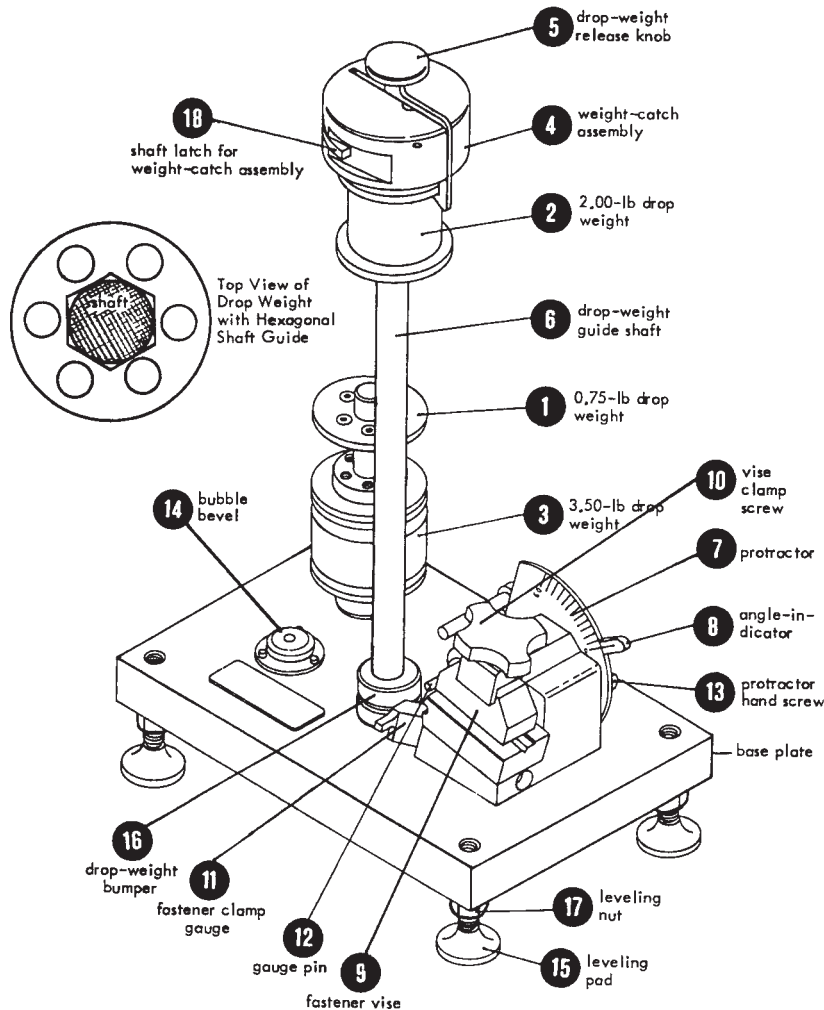
thickness at the test section shall be sufficient to avoid a bulge or other visible markings on the surface opposite to the impression. Hardness can be determined using a shank having prepared parallel surfaces. Determine the hardness in accordance with Test Methods E 18. Usually three readings are made on a nail and these readings are averaged for the final result.

9.2 An alternate method for determining Rockwell hardness is to cut the nail off about 1/2 in. (13 mm) from the head. Grind the top of the head to remove scale and obtain a flat surface. Grind the transversely cut end flat, using proper precautions not to alter the tempered hardness of the nail. Place the sample head down on the anvil of the hardness testing machine and determine the hardness on the transverse section.

10. Coating Weight Test

10.1 This test deals with zinc, aluminum, and copper-clad coatings only and does not deal with other metallic coatings such as cadmium.

10.2 Cut the heads and points from samples of zinc-coated or aluminum-coated nails selected for testing. Take a sufficient number of such specimens to provide a total length over 12 in.



NOTE—This device is available from The National Wooden Pallet and Container Assn., 1625 Massachusetts Ave., Washington, DC 20036

FIG. 1 A Typical Impact Bend Tester for the Impact Bend Testing of Nails

(300 mm), preferably about 24 in. (600 mm). Since the density of the steel is known (0.2836 lb/in.³(0.1276 kg/m³)), it is not necessary to use a specific total length of specimens.

10.3 Determine the weight of zinc coating in accordance with Test Method A 90.

10.4 Determine the weight of aluminum coating in accordance with Test Method A 428.

10.5 Determine the thickness of coating of copper-clad nails by one of the following three methods:

10.5.1 Accurately measuring the diameter of the wire before and after removing the cladding by any suitable means.

10.5.2 Cutting off the wire, grinding one end smooth, etching the exposed cross section to differentiate between core and cladding, and measuring under suitable magnification.

10.5.3 Using electrical indicating instruments.

10.6 Calculate the weight of the copper cladding from the thickness as measured above or determine the weight of the cladding by chemically stripping the copper and accurately weighing the wire sample before and after stripping.

11. Coating Adherence Test for Zinc-Coated Nails

11.1 Determine the adherence of the zinc coating to the surface of the base metal by cutting or prying with the point of a stout knife, applied with considerable pressure in a manner tending to remove a portion of the coating. The adherence shall be considered inadequate if the coating flakes off in the form of a layer or skin so as to expose the base metal in advance of the knife point. Testing carried out at edges or corners (points of lowest coating adherence) shall not be used to determine adherence of coating. Likewise, removal of small particles of the coating by paring or whittling shall not be used to determine failure.

12. Precision and Bias

12.1 The precision and bias of these tests have not been determined at this time.

ANNEX

(Mandatory Information)

A1. OPERATION OF THE IMPACT BEND TESTER (FIG. NO. 1)

A1.1 *Scope*—The test is applicable to nails with shank diameters of 0.106 in. (2.7 mm) to 0.135 in. (3.4 mm) and lengths of 1½ in. (38 mm) to 3 in. (76 mm) and with or without deformations.

A1.2 Hold the nail to be tested in a chuck in such a way that it cantilevers ¹⁵/₃₂ in. (12 mm) at an angle of 80° to the vertical. Hit its head after the free-fall drop of a 3.50-lb (1.58-kg) weight from a 15⁷/₁₆ in. (392 mm) height, thereby applying 54.0 in.·lbf (6.1-J potential or 4.52-J kinetic) energy to the head of the inclined nail. As a result of this impacting, soft nails are bent readily without breaking and non-ductile nails fail abruptly partially or completely while being bent only a few degrees. The test includes recording the bend angle of the tested nail as well as the number and type of failure, if any.

A1.3 The impact bend test device, shown in Fig. 1, shall consist of a 0.750-in. (19.0-mm) diameter shaft, along which the 3.50-lb (1.58-kg) drop weight slides to hit the head of the nail. A protractor shall be used to measure the angle of the tested nail.

A1.4 Measure the dimensions of the nails prior to testing. Replace chuck inserts with worn edges with new ones. Position the specimen properly between the chuck inserts in such a way that the specimen protrudes ¹⁵/₃₂ in. (12 mm) from the inserts. Tighten the chuck securely, to prevent the displacement of the nail during application of the impact load, and release the drop weight. Record the type of failure, if any, and the bend angle for each nail and determine the average bend angle for the nails tested.

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