ASME B107.41-2004
(Revision of ASME B107.41M-1997)

Nail Hammers: Safety Requirements

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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NAIL HAMMERS: SAFETY REQUIREMENTS

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The next edition of this Standard is scheduled for publication in 2009. There will be no addenda issued to this edition.

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FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of The American Society of Mechanical Engineers, was reorganized as an ASME Standards Committee and its title was changed to Hand Tools and Accessories. In 1996, the B173 Committee, which had published an earlier version of this Standard as B173.1, merged with the B107 Committee and the B107 Committee scope was expanded to include safety considerations.

The purpose of this standard is to define essential safety considerations specifically applicable to nail hammers, to specify test methods to evaluate performance relating to the defined safety considerations, and to indicate limitations of safe use.

Principal changes in this edition of the Standard are the allowance of any material that meets the performance and safety requirements specified and the addition of a spalling test.

The format of this standard is in accordance with *The ASME Codes & Standards Writing Guide 2000*. Requests for interpretations of the technical requirements of this Standard should be expressed in writing to the Secretary, B107 Committee, at the address below.

Suggestions for the improvement of this Standard are welcome. They should be addressed to The American Society of Mechanical Engineers, Secretary, B107 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

The requirements of this Standard become effective at the time of publication. This revision was approved as an American National Standard on May 25, 2004.

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Hand Tools and Accessories

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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

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The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

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NAIL HAMMERS: SAFETY REQUIREMENTS

1 SCOPE

This Standard provides performance and safety requirements for nail hammers that are intended specifically for use in driving or pulling unhardened nails and ripping apart or tearing down wooden components. It is intended to serve as a guide in selecting, testing, and using the hand tools covered herein. It is not the purpose of this Standard to specify the details of manufacturing.

This Standard is also meant to serve as a guide in developing manuals and posters and for training personnel to work safely.

This Standard may be used as a guide by state authorities or other regulatory bodies in the formulation of laws or regulations. It is also intended for voluntary use by establishments that use or manufacture the tools covered.

The methods employed to ensure compliance with this Standard shall be determined by the proper regulatory or administrative authority.

2 REFERENCES

The following is a list of publications referenced in this Standard.

ANSI Z87.1-1989(R1998), Practice for Occupational and Educational Eye and Face Protection (includes supplement and partial revision ANSI Z87.1A-1991)

ANSI Z535.4-1998, Product Safety Signs and Labels

Publisher: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036

ASTM E 18-00, Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM F 1667-1995, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

Guide to Hand Tools—Selection, Safety Tips, Proper Use and Care

Publisher: Hand Tools Institute (HTI), 25 North Broadway, Tarrytown, NY 10591

3 DEFINITIONS

See Fig. 1 as applicable.

bell: the portion of the hammerhead directly behind the striking face.

chamfer: the bevel or equivalent radius encircling the perimeter of the striking face.

claw: the two-pronged portion of the hammerhead directly opposite the striking face.

claw bevel: when provided, the angled portion of the nail slot.

equivalent: alternative designs or features that will provide an equal degree of safety and performance.

eye: an opening or aperture located between the claw and the striking face into which the handle is inserted, if the handle is separate.

hammerhead: the portion of the hammer exclusive of the handle.

handle: the portion that protrudes from the hammerhead and by which the tool is held.

handle grip: material securely attached to the grip end of some styles of hammer handles.

hardness: the condition of the hammerhead resulting from heat treatment.

neck: the portion of the hammerhead between the eye and the bell.

safety message: the information imprinted on or affixed to the hammer that is intended to promote safety.

serrations: when provided, the geometric pattern of grooves on the striking face.

shall: indicates mandatory requirements of this Standard.

should: indicates if a provision is of an advisory nature, and is stated as a recommendation.

sides (or *cheeks):* the outside surfaces of the hammerhead, on either side of the eye, located between the head and the neck and the claw.

spalling: chipping or separation of material.

striking face: the portion of the hammerhead, exclusive of the neck, bell, and chamfer, located on the side of the eye opposite from the claw.

striking face crown: the convex shape or radius of the striking face.

top of hammer: the portion of the hammerhead opposite the handle entry.

wedged hammer: a hammer that has the handle secured to the hammerhead by inserting a device to expand the handle within the eye.

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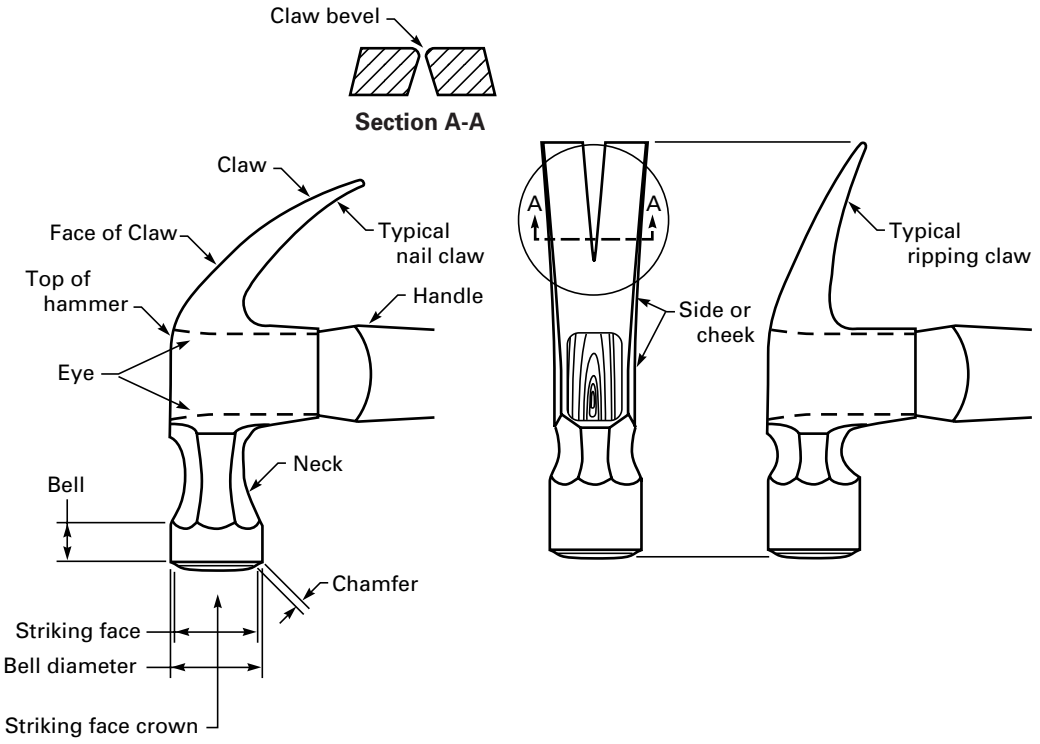
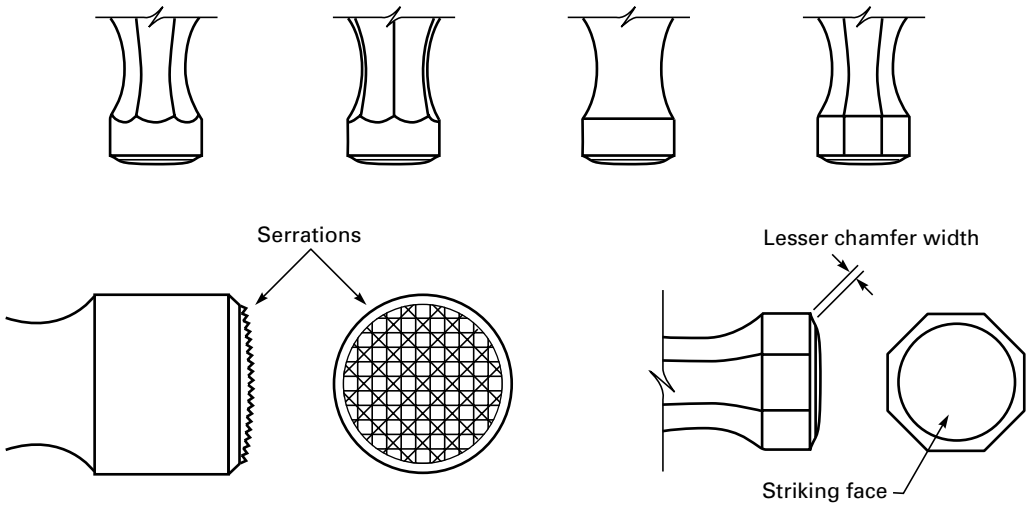


(a) Typical Nail Hammer



(b) Equivalent Shapes of Hammer Neck and Bell

Fig. 1 Nail Hammer Nomenclature

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4 REQUIREMENTS

4.1 Design

Nail hammers shall have a striking face on one end of the hammerhead for use in driving unhardened nails and a claw on the opposite end for use in pulling both headed and headless unhardened nails, or ripping apart or tearing down wooden components.

4.1.1 The striking face shall have a smooth or serrated convex shape.

NOTE: Hammers with serrations on the striking face are intended for driving unhardened nails. The serrated face reduces the incidence of bending or dislodging of nails.

4.1.2 The striking face shall have a chamfer of approximately 45 deg (or equivalent radius) around the perimeter with a width approximately equal to one-tenth of the diameter of the bell, as measured across the chamfer angle or the lesser chamfer width for bell shapes other than circular (see Fig. 1). For example, if the bell diameter equals 1 in. (25 mm), then the chamfer width equals approximately 0.1 in. (2.5 mm).

4.1.3 Hammers shall pass the tests specified in para. 5.

4.1.4 The head and handle shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury on the user when handling the hammer.

4.2 Materials

The materials used in the manufacture of hammers shall be such as to produce hammers conforming to the requirements specified herein.

4.3 Mechanical Properties

(a) The striking face shall be hardened and tempered to 45 HRC to 60 HRC.

(b) Hammer claws shall be hardened to 40 HRC to 55 HRC for a minimum distance of 0.75 in. (19.1 mm) from the tip end.

5 TESTS

Many tests required herein are inherently hazardous, and adequate safeguards for personnel and property shall be employed in conducting such tests.

Separate (new) hammers shall be used for each of the tests. Failure to meet the requirements of any one of the tests indicates that the hammers do not comply with this Standard.

5.1 Hardness Determination Test

Hardness determination with respect to the head and claw shall be made in accordance with ASTM E 18.

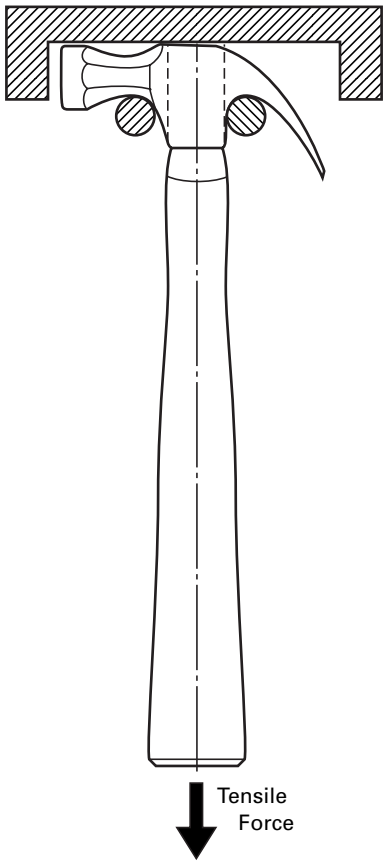

Fig. 2 Typical Tensile Force Test

5.2 Striking and Tensile Force Test

Prior to tensile force testing, sample hammers shall be subjected to the following striking test:

(a) The tool shall withstand twenty blows at a head velocity of 45 ft/sec to 55 ft/sec (approximated by a person of average build, 160 lb to 180 lb).

(b) The test shall be conducted at room temperature.

(c) This velocity shall be achieved with the hammer held or fixtured at the normal gripping area.

(d) The blows shall be struck against the smooth, flat, or slightly convex surface of a rigidly supported steel object that has a minimum diameter of 3.0 in. (76 mm), a minimum length of 2.0 in. (51 mm), and a hardness of 92 HRB to 105 HRB or equivalent.

The hammerhead shall not permanently deform, crack, or break. Handles shall not separate from the hammerhead, crack, or break. Following the striking test, the head and handle shall not separate under the tensile force specified in paras. 5.2.1 or 5.2.2 (see Fig. 2). The striking face shall not mushroom, chip, crack, or spall when subjected to the striking test.

NOTE: The striking test is so severe that a degree of permissible deformations of serrations on the striking face of hammers can be anticipated.

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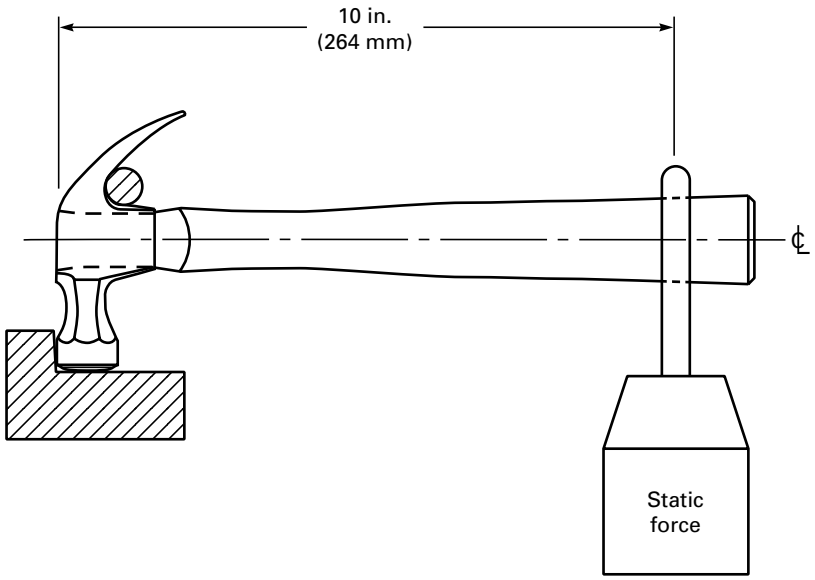

Fig. 3 Typical Static Force Test

5.2.1 Nonwedged hammers shall withstand the following tensile force:

Hammerhead Weight, oz (g)	Static Tensile Force, lbf (N)
Less than 13 (369)	750 (3 340)
13 (369) and over	2,250 (10 000)

5.2.2 Wedged hammers shall withstand the following tensile force:

Hammerhead Weight, oz (g)	Static Tensile Force, lbf (N)
Less than 13 (369)	400 (1 780)
13 (369) and over	1,000 (4 450)

5.3 Static Force Test

The hammerhead shall be locked securely in test fixture with the striking face down and the handle extended in the horizontal plane. A static force shall be applied vertically at a point on the handle measuring 10.0 in. (254 mm) from the top of the hammer (see Fig. 3). The force shall be shown in Table 1. Handles shall not break, loosen, or otherwise fail.

Table 1 Static Force Test

Hammerhead Weight, oz (g)	Static Force, lbf (N)
Up to 7 (198)	60 (267)
Over 7 (198) but not over 13 (369)	125 (556)
Over 13 (369) but not over 16 (454)	150 (667)
Over 16 (454) but not over 20 (567)	175 (779)
Over 20 (567) but not over 24 (680)	200 (890)
Over 24 (680) but not over 28 (794)	225 (1 001)
Over 28 (794)	250 (1 112)

5.4 Claw Test

The nail pulling claws shall not permanently deform, crack, or break under the test specified in paras. 5.4.1, 5.4.2, and 5.4.3. Handles shall not separate from the hammerhead, loosen, crack, or break.

5.4.1 Two nails, as specified for the respective hammerhead weight in Table 2, shall be driven through sound planks or boards of a suitable softwood (such as yellow pine) of the thickness specified in Table 2. The nails should be spaced so as not to interfere with the pulling operation. The head shall be driven flush with the plank on one side. The protruding end of the nail on the other side of the plank shall in turn be gripped with the claw, and the handle quickly and forcibly moved to pull the nail through the board. As each pulling test is begun, the face of the claw shall be in contact with the surface of the board where the nail protrudes, and during the pulling stroke, contact of the hammerhead with the board shall be maintained by moving the hammer handle through an arc until the striking face of the hammer touches the board.

5.4.2 Two nails, as specified for the respective hammerhead weight in Table 3, shall be driven into either hardwood (such as oak) or sound pine joists, beams, or layers of planks, of such thickness that the pointed end of the nail does not protrude. The head end of the nail shall protrude an amount sufficient to enable the nail body to be gripped under the head with the claw, so that the claw face is in contact with the wood where the nail head protrudes. Each nail shall be withdrawn up

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Table 2 Claw Test Parameters

Hammerhead Weight		Designation of Finishing Nail Size (Bright Finish)	Board Nominal Thickness	
oz	g		in.	mm
Up to 13	Up to 369	F 1667 NL FHS-05 (Corresponds to 6*d*)	0.5	12.7
Above 13 but less than 16	Above 369 but less than 454	F 1667 NL FHS-05 (Corresponds to 6*d*)	1.0	25
16 and over	454 and over	F 1667 NL FHS-09 (Corresponds to 10*d*)	1.5	38

Table 3 Claw Test Parameters

Hammerhead Weight		Designation of Finishing Nail Size (Bright Finish)
oz	g	
Up to 13	Up to 369	F 1667 NL CMS-07B (Corresponds to 8*d*)
Above 13 but less than 16	Above 369 but less than 454	F 1667 NL CMS-11B (Corresponds to 16*d*)
16 and over	454 and over	F 1667 NL CMS-12B (Corresponds to 20*d*)

to the limit of possible movement of the handle by applying the necessary force.

5.4.3 Ripping Hammers. The static force test procedure shall be used for this test. The load shall be increased to 125% of the static test load, or until failure of the hammer handle, whichever occurs first. The handle shall not fail below the static force test load. The claw shall not fail.

5.5 Spalling Test

The tool shall withstand ten blows at a head velocity of 45 ft/sec to 55 ft/sec [approximated by a person of average build, 160 lb to 180 lb (73 kg to 82 kg)]. The test shall be conducted at room temperature. The blows shall be struck against the smooth flat surface of a rigidly supported steel object that has a minimum diameter of 3.0 in. (76 mm), a minimum length of 2.0 in. (51 mm), and a minimum hardness of 55 HRC, 92 HRB to 105 HRB or equivalent. The face of the struck object shall be set to an angle of 10 deg to 20 deg with respect to the striking face. No spalling of the striking face shall occur.

5.6 Grip Test

5.6.1 Solvent Resistance Test. Grips shall be fully immersed in the test fluids specified (new sample grips shall be used for each test fluid) for 15 min to 20 min at room temperature, removed, and let stand for 24 hr to 28 hr. Test fluids are SAE J1703 brake fluid, gasoline, ethylene glycol, and ethyl alcohol. There shall be no significant swelling nor surface attack of the material being tested. Grips shall be tested while attached to the hammer handle.

5.6.2 Following the Solvent Resistance Test. Hammers shall be secured by hand and the grip twisted at the normal hand grip position in alternating directions. Five alternating twisting motions shall be performed, after which there shall be no grip looseness or separation from the handle.

5.6.3 Following twisting, grips shall be tested per the following:

(a) Mechanically bonded grips shall be tensile force tested using the values in para. 5.2.2 (for wedged and nonwedged hammers) or 500 lbf (whichever is less) applying the force only to the grip (using a woven wire cuff or other suitable device). The grip shall not loosen or separate from the handle.

(b) Chemically bonded grips shall be cut longitudinally so that a segment may be pulled. The segment shall separate from the handle such that some of the grip material that was pulled shall remain adhered to the handle.

6 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of striking tools and shall emphasize the necessity to wear, and ensure the use of, safety goggles or equivalent eye protection. The publication *Guide to Hand Tools—Selection, Safety Tips, Proper Use and Care* provides guidelines for the safe use of these tools.

(a) A nail hammer should always be struck squarely with the striking face parallel with the surface being struck. Glancing blows, overstrikes, and understrikes should be avoided.

(b) Nail hammers are special-purpose tools designed and intended only for the specific use of driving or pulling unhardened nails, and ripping apart or tearing down wooden components.

(c) To avoid possible eye or other bodily injury, nail hammers shall not be used to strike hard or hardened objects such as rocks, bricks, concrete, masonry nails,

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chisels, hatchets, axes, splitting wedges, mauls, other hammers, and other steel tools.

(d) The claw ends shall be used only for pulling unhardened nails and ripping apart or tearing down wooden components. The sides or cheeks (see Fig. 1) should not be used for striking or pounding.

(e) To avoid injury from possible flying objects, safety goggles or equivalent eye protection conforming to ANSI Z87.1 shall be worn by the user and by all persons in the immediate area in which any nail hammer or other striking tool is being used.

(f) The hammerheads shall be inspected prior to each use and their use discontinued at the first sign of chipping, mushrooming, or cracking of any portion.

(g) No area, section, or portion of the hammer shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(h) Handles shall be inspected prior to each use and those damaged shall be replaced. Replacements shall withstand the test requirements in paras. 5.2 through 5.4. Handles of tools shall be free of splinters or cracks and shall be kept tight in the head of the tool.

(i) When provided, handle grips that have loosened from the handles shall be tightened or replaced.

(j) Each hammer shall be stamped, labeled, or otherwise marked by the manufacturer with the following safety message and symbols or equivalent:

WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

This tool can be made to chip if struck against a hardened nail or other hard object. Use this hammer to drive and pull common nails only. Flying chips can result in eye or other bodily injury.

This safety message shall be located in a position that will not interfere with the quality or performance of the hammer.

The above safety message shall also appear on replacement handles.

The principles set forth in ANSI Z535.4 shall be used as the guide for alternate, equivalent methods of labeling.

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