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(Revision of ASME B107.53M-1998)

Ball Peen Hammers: Safety Requirements

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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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 B173.2, merged with the B107 Committee, and the B107 Committee scope was expanded to include safety considerations.

The purposes of this Standard are to define essential safety considerations specifically applicable to ball peen 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, and suggestions for the improvement of this Standard 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. ASME B107.53-2004 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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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.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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BALL PEEN HAMMERS: SAFETY REQUIREMENTS

1 SCOPE

This Standard provides performance and safety requirements for ball peen hammers. Ball peen hammers have a striking face on one end of the head for use in striking punches and chisels, and a ball peen on the opposite end for use in riveting, shaping, and straightening unhardened metals. This Standard 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 intended to serve as a guide for the development of 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
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, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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

SAE J1703-JAN95, Motor Vehicle Brake Fluid

Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

3 DEFINITIONS

See Fig. 1 as applicable.

ball peen: the rounded portion of the hammer head directly opposite the striking face.

bell: the portion of the hammer head directly behind the striking face.

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

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

eye: an opening or aperture located between the ball peen and 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 hammer head 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 hammer head resulting from heat treatment.

necks: the portions of the hammer head located between the bell and the eye, and the ball peen and the eye.

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

shall: indicates mandatory requirements of this Standard.

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

sides (or cheeks): outside surfaces of the hammer head on either side of the eye located between the two necks.

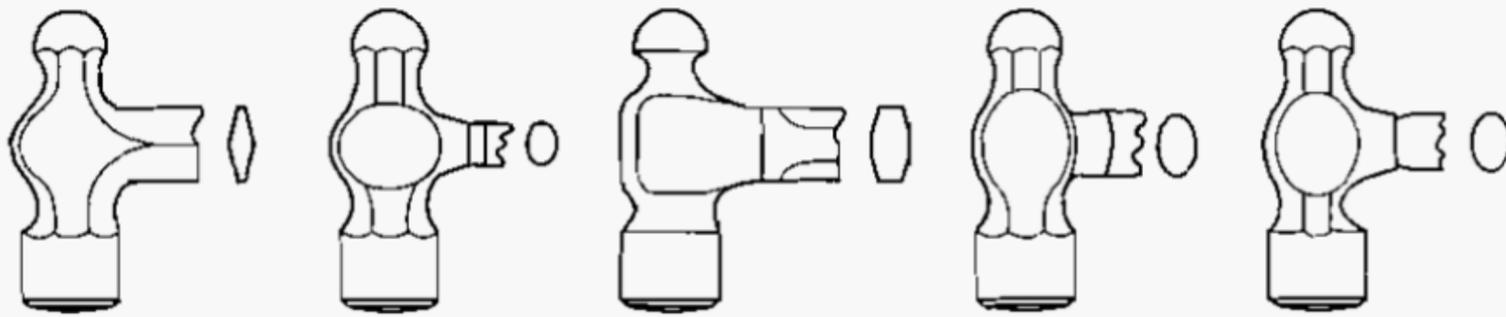
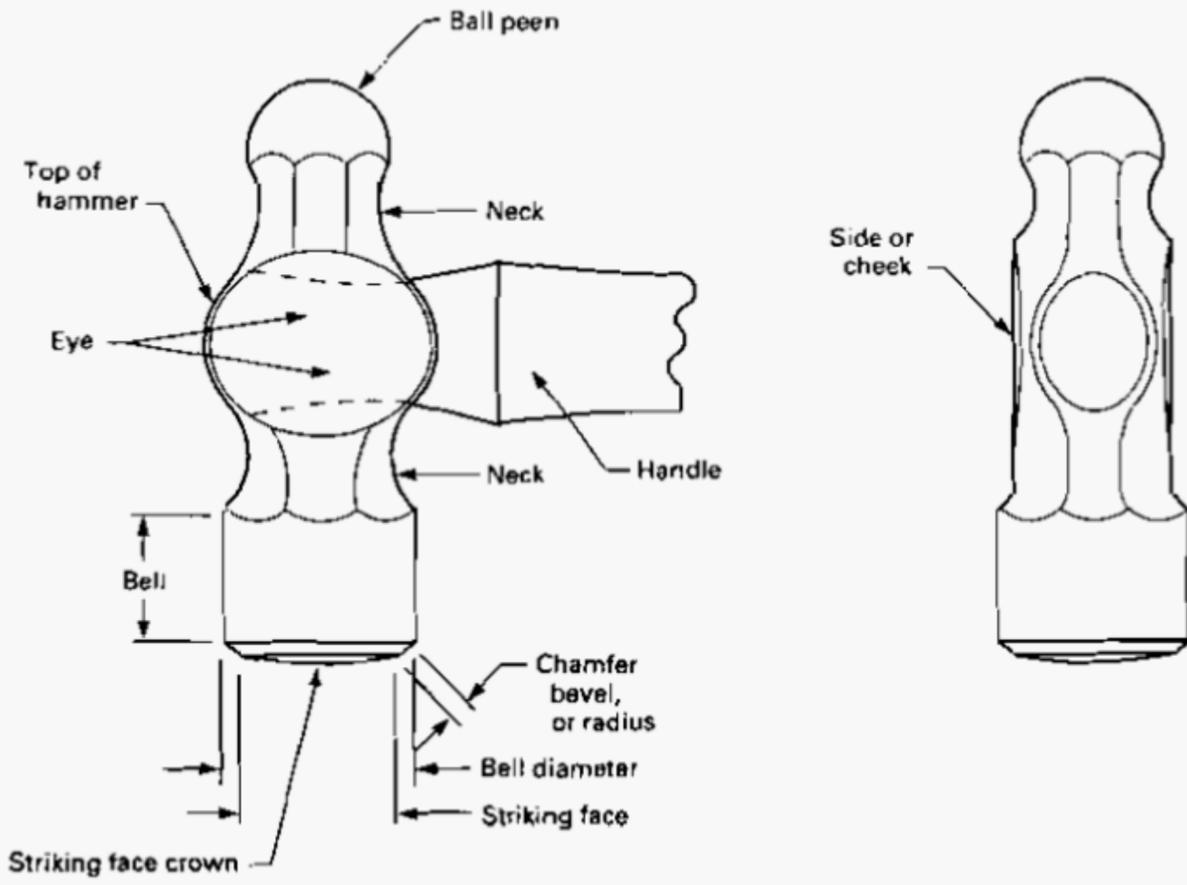
spalling: chipping or separation of material.

striking face: the portion of the hammer head, exclusive of the neck, bell, and chamfer, located on the side of the eye opposite from the ball peen.

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

top of hammer: the portion of the hammer directly opposite the handle.

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



Equivalent Shapes of Hammer Necks and Eyes

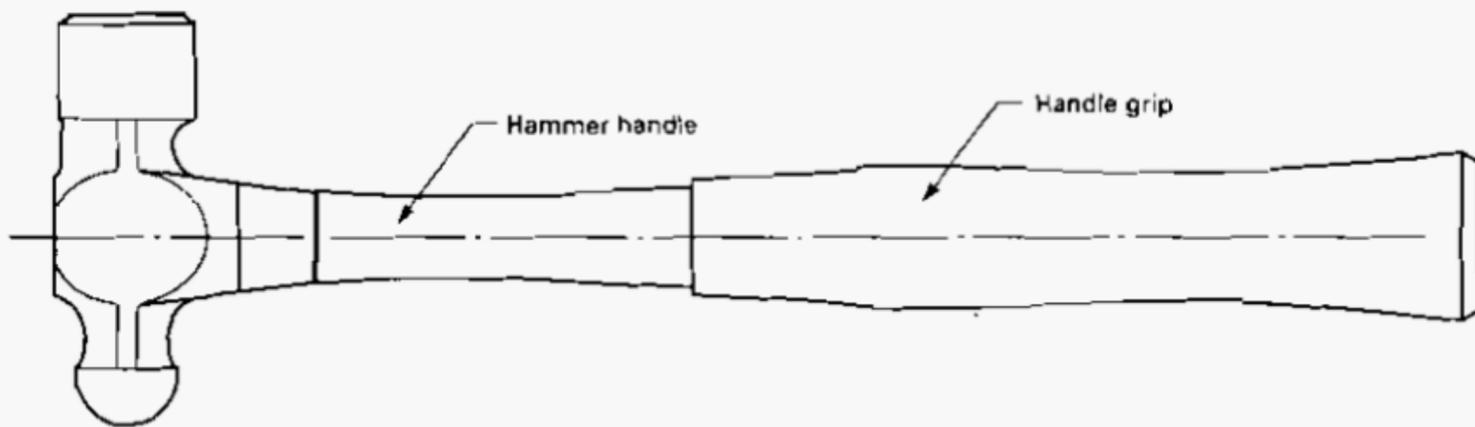


Fig. 1 Hammer Nomenclature

4 REQUIREMENTS

4.1 Design

Ball peen hammers shall have a striking face on one end of the head for use in striking punches and chisels, and a ball peen on the opposite end for use in riveting, shaping, and straightening unhardened metals.

(a) The striking face shall have a convex shape.

(b) The ball peen shall have a smoothly contoured shape that is approximately hemispherical.

(c) The striking face shall have a chamfer of approximately 45 deg (or equivalent radius) around the perimeter with a width equal to approximately one-tenth the diameter of the bell as measured across the chamfer angle. For example, if the bell diameter equals 1 in., then the chamfer width equals approximately 0.10 in.

(d) Hammers shall pass the tests specified in para. 5.

(e) 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 as such 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 or equivalent.

(b) The ball peen shall be hardened and tempered to 45 HRC to 60 HRC or equivalent.

5 TESTS

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

Sample hammers shall be tested and shall conform to the requirements of all applicable tests specified in paras. 5.1 through 5.5. Separate (new) samples shall be used for each of the tests. Failure to meet the requirements of any one of the tests indicates the hammers do not comply with this Standard.

5.1 Hardness Determination Test

Hardness determination with respect to the face and ball peen shall be made in accordance with ASTM E 18.

5.2 Striking and Tensile Force Test

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

(a) The tool shall withstand 20 swinging blows on the striking face and 20 swinging blows on the ball peen end at a head velocity of 45 ft/sec to 55 ft/sec (approximated by a person of average build, 160 lb to

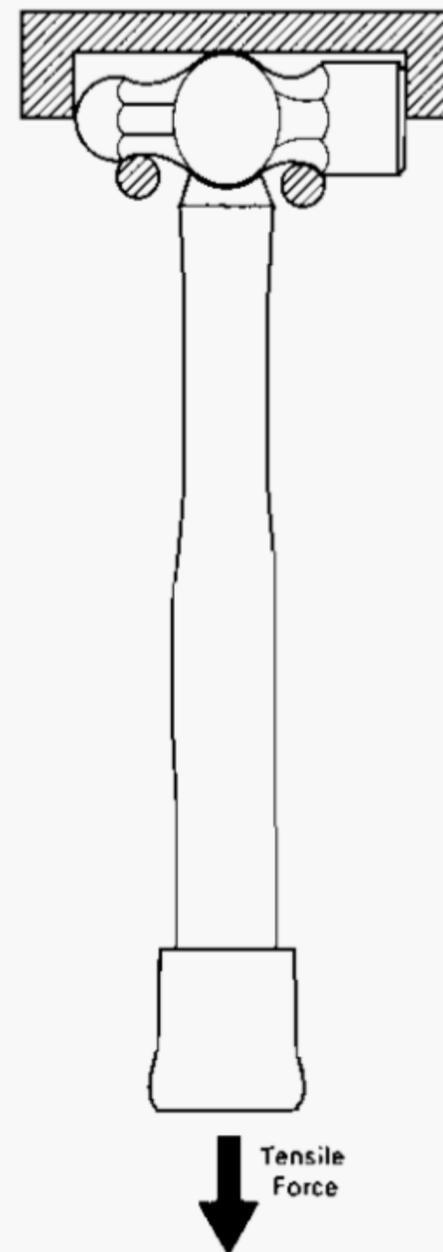


Fig. 2 Typical Tensile Force Test

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

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

(c) 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 in., a minimum length of 2 in., and a hardness of 92 HRB to 105 HRB or equivalent.

(d) The striking face and ball peen shall not sink, mushroom, chip, crack, or spall.

Following the striking test, the head and handle shall not loosen or separate when subjected to tensile force testing. The hammers shall be tested using the static tensile forces specified in para. 5.2.1 for chemically bonded assemblies or one-piece hammers and those specified in para. 5.2.2 for wedged assemblies (see Fig. 2).

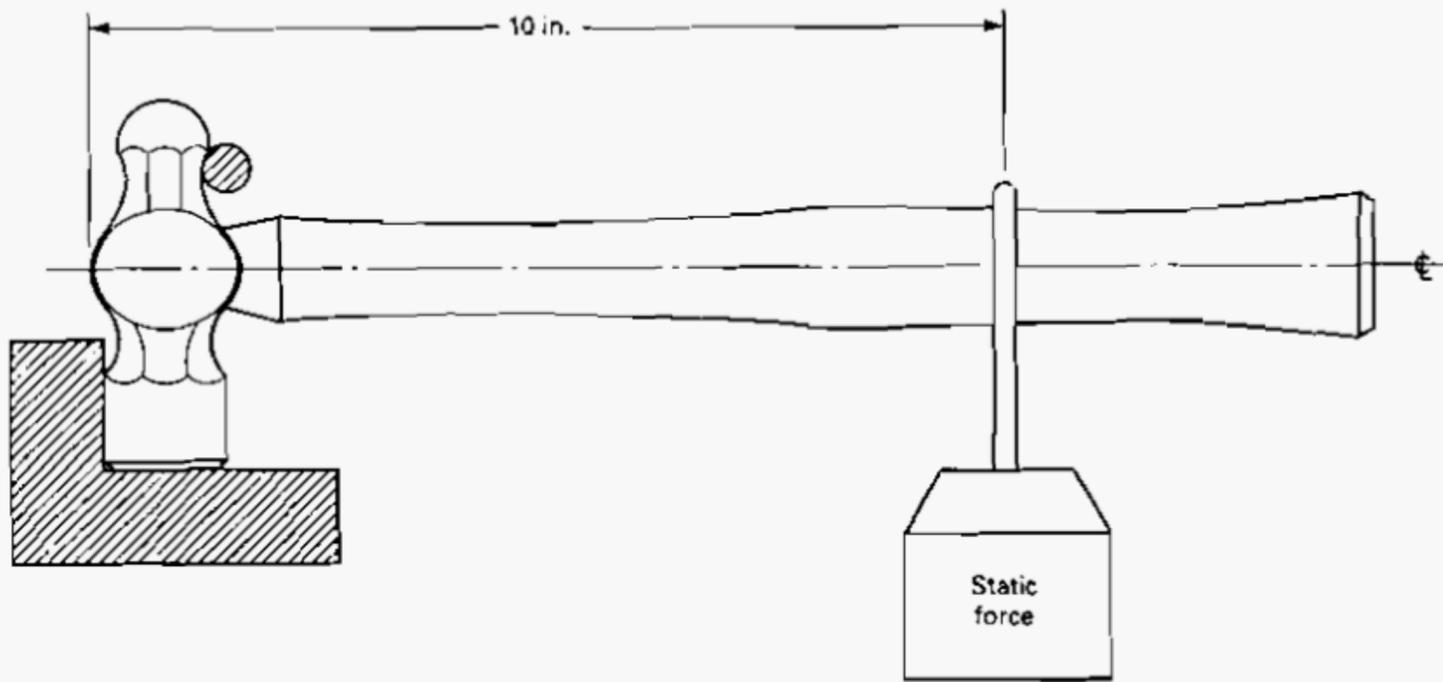


Fig. 3 Typical Static Force Test

5.2.1 Nonwedged hammers shall withstand the following tensile forces:

Hammerhead Weight, oz	Static Tensile Force, lbf
Less than 13	750
13 and over	2,250

5.2.2 Wedged hammers shall withstand the following tensile forces:

Hammerhead Weight, oz	Static Tensile Force, lbf
Up to and including 6	200
Over 6 and less than 20	400
20 and over	1,000

Handles shall not break, loosen, or otherwise fail.

5.3 Static Force Test

Assembled hammer handles shall not break, loosen, or otherwise fail when subjected to the static force test. The following test procedure shall be used:

(a) While the hammer head is locked securely in the 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 in. from the top of the hammer.

(b) An exception shall be that the force be applied 9 in. from the top of the hammer for the 2 oz hammer (see Fig. 3).

(c) The testing loads or bending forces are dependent on the head weight and are shown in the following:

Hammerhead Weight, oz	Static Tensile Force, lbf
Up to and including 2	10
Over 2 but not over 6	15
Over 6 but not over 8	40
Over 8 but not over 12	60
Over 12 but not over 16	80
Over 16 but not over 20	100
Over 20 but not over 32	150
Over 32	175

Handles shall not break, loosen, or otherwise fail.

5.4 Spalling Test

(a) The tool shall withstand ten swinging 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). This velocity shall be achieved with the hammer held or fixtured at the normal gripping area.

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

(c) The blows shall be struck against the smooth flat surface of a rigidly supported steel object that has a minimum diameter of 3 in., a minimum length of 2 in., and a minimum hardness of 55 HRC.

(d) 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.

5.5 Grip Test

5.5.1 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.

5.5.2 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 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.

5.5.3 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.

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 need 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 ball peen hammer blow should always be struck squarely with the striking face parallel with the surface being struck. Glancing blows, overstrikes, and understrikes should be avoided.

(b) Ball peen hammers are special-purpose tools designed and intended for riveting, shaping, and straightening unhardened metals. Ball peen hammers of the proper size may be used for striking the struck faces of chisels and punches. When striking a struck tool (chisel or punch), the striking face of the ball peen

hammer shall have a diameter not less than 0.375 in. larger than the struck face of the tool being struck.

(c) To avoid possible eye or other bodily injury, ball peen hammers shall not be used to strike hard or hardened objects such as rocks, concrete, hatchets, hammers, axes, splitting wedges, mauls, and other striking tools.

(d) The sides or cheeks (see Fig. 1) should not be used for striking or pounding.

(e) 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 ball peen hammer or other striking tool is being used to avoid injury from possible flying objects.

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

(g) Handles shall be inspected prior to each use and those damaged shall be replaced or their use discontinued. Handles of tools shall be free of splinters or cracks and shall be kept tight in the head of the tool. Replacements shall withstand the test requirements in paras. 5.2, 5.3, and 5.5 as applicable.

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

(i) Hammers with loose handle grips shall not be used.

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



WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

This tool can be made to chip if struck against another tool or other hard object, possibly resulting in eye or other bodily injury.

Pictorials are an accepted equivalent. 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.

AMERICAN NATIONAL STANDARDS FOR HAND TOOLS

Socket Wrenches, Hand (Inch Series)	B107.1-2002
Socket Wrenches, Extensions, Adaptors, and Universal Joints, Power Drive (Impact) (Inch Series)	B107.2-2002
Driving and Spindle Ends for Portable Hand, Impact, Air, and Electric Tools (Percussion Tools Excluded)	B107.4M-1995
Socket Wrenches, Hand (Metric Series)	B107.5M-2002
Adjustable Wrenches	B107.8-2003
Handles and Attachments for Hand Socket Wrenches — Inch and Metric Series	B107.10M-1996
Pliers: Diagonal Cutting and End Cutting	B107.11-2002
Nut Drivers (Spin Type, Screwdriver Grip) (Inch Series)	B107.12-1997
Pliers: Long Nose, Long Reach	B107.13-2003
Hand Torque Tools	B107.14M-1994
Flat Tip Screwdrivers	B107.15-2002
Shears (Metal Cutting, Hand)	B107.16M-1998 (R2004)
Gages, Wrench Openings, Reference	B107.17M-1997
Pliers: Wire Twister	B107.18-2003
Pliers, Retaining Ring	B107.19-2004
Pliers (Lineman's, Iron Worker's, Gas, Glass, Fence, and Battery)	B107.20M-1998
Wrench, Crowfoot Attachments	B107.21-1998
Electronic Cutters	B107.22M-1998
Pliers, Multiple Position, Adjustable	B107.23M-1997
Locking Pliers	B107.24-2002
Pliers: Performance Test Methods	B107.25-2002
Pliers: Multiple Position, Electrical Connector	B107.27-2003
Electronic Torque Instruments	B107.28M-1997
Electronic Tester, Hand Torque Tools	B107.29M-1998
Cross Tip Screwdrivers	B107.30-2002
Screwdrivers, Cross Tip Gaging	B107.31M-1997
Socket Wrenches, Impact (Metric Series)	B107.33M-2002
Socket Wrenches for Spark Plugs	B107.34-2003
Nut Drivers (Spin Type, Screwdriver Grip) (Metric Series)	B107.35M-1997
Pliers: Locking, Clamp, and Tubing Pinch-Off	B107.36-2002
Pliers: Wire Cutters/Strippers	B107.37-2003
Electronic Pliers	B107.38M-1998
Nail Hammers: Safety Requirements	B107.41-2004
Hatchets: Safety Requirements	B107.42M-1997 (R2004)
Wood-Splitting Wedges	B107.43-2002
Glaziers' Chisels and Wood Chisels	B107.44-2002
Ripping Chisels and Flooring/Electricians' Chisels	B107.45-2002
Stud, Screw, and Pipe Extractors: Safety Requirements	B107.46-2004
Metal Chisels: Safety Requirements	B107.47M-1998
Metal Punches and Drift Pins: Safety Requirements	B107.48M-1998
Nail Sets: Safety Requirements	B107.49M-1998
Brick Chisels and Brick Sets: Safety Requirements	B107.50M-1998
Star Drills: Safety Requirements	B107.51-2001
Nail-Puller Bars: Safety Requirements	B107.52M-1998
Ball Peen Hammers: Safety Requirements	B107.53-2004
Heavy Striking Tools: Safety Requirements	B107.54-2001
Axes: Safety Requirements	B107.55M-2002
Body Repair Hammers and Dolly Blocks: Safety Requirements	B107.56-1999
Bricklayers' Hammers and Prospecting Picks: Safety Requirements	B107.57-2001
Riveting, Scaling, and Tinner's Setting Hammers: Safety Requirements	B107.58M-1998
Slugging and Striking Wrenches	B107.59-2002
Wrenches	B107.100-2002

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