

ASME B107.400-2008
(Incorporation of ASME B107.41, B107.42, B107.53,
B107.54, B107.56, B107.57, and B107.58)

Striking Tools

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**



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This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME B107 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at <http://cstools.asme.org> as they are issued.

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FOREWORD

The American National Standards Committee B107 on Socket Wrenches and Drives was originally under the sponsorship of The American Society of Mechanical Engineers (ASME). It was subsequently reorganized as an ASME Standards Committee and its title was changed to Hand Tools and Accessories. In 1996, the Committee's scope was expanded to include safety considerations.

The purpose of B107.400 is to define essential performance and safety requirements specifically applicable to the various striking tools covered herein. It specifies test methods to evaluate performance related to the defined requirements and safety, and indicates limitations of safe use.

This Standard includes

ASME B107.41, Nail Hammers

ASME B107.42, Hatchets and Axes

ASME B107.53, Ball-Peen Hammers

ASME B107.54, Heavy Striking Tools

ASME B107.56, Body Repair Tools

ASME B107.57, Bricklayers' Hammers and Prospecting Picks

ASME B107.58, Riveting, Scaling, and Tinner's Setting Hammers

In addition to the consolidation of these individual striking tool standards into this Standard, principal changes are the uniform inclusion of performance requirements and test methods that evaluate both performance and safety as well as uniform format for sections on definitions, references, performance requirements, tests, and safety requirements and limitations of use.

Members of the Hand Tools Institute Striking and Struck Tools Standards Committee, through their knowledge and hard work, have been major contributors to the development of the B107 Standards. Their active efforts in the promotion of these standards is acknowledged and appreciated.

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 Secretary, ASME B107 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

ASME B107.41 was approved by the American National Standards Institute on August 4, 2008; ASME B107.42 was approved on December 10, 2008; ASME B107.53 was approved on August 5, 2008; ASME B107.54 was approved on September 4, 2008; ASME B107.56 was approved on December 20, 2007; ASME B107.57 was approved on December 13, 2005; and ASME B107.58 was approved on November 7, 2007.

ASME B107 COMMITTEE

Hand Tools and Accessories

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending committee meetings. Correspondence should be addressed to:

Secretary, B107 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

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.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Interpretations. Upon request, the B107 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B107 Standards Committee.

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 that are necessary to explain the question; however, they should not contain proprietary names or information.

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

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B107 Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B107 Standards Committee.

ASME B107.41

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NAIL HAMMERS

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 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.

cheeks: see *sides*.

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 or 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 neck and the head and 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.

3 REFERENCES

The following is a list of publications referenced in this Standard. The latest available editions shall be used.

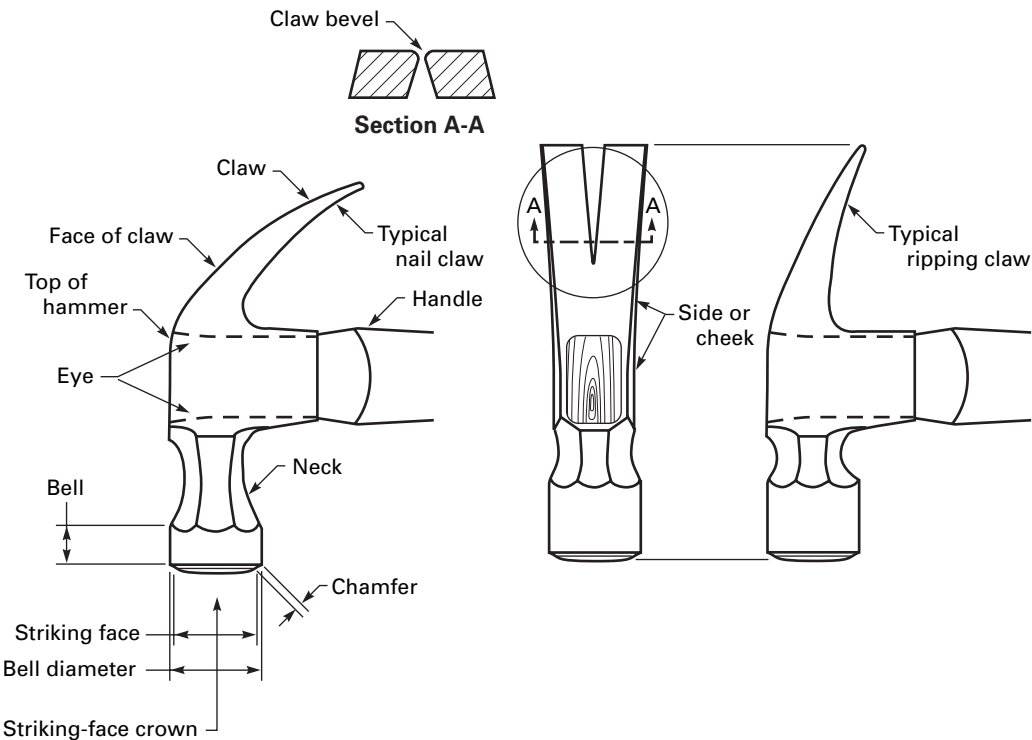
ANSI Z87.1-1989 (R1998), Practice for Occupational and Educational Eye and Face Protection (includes supplement and partial revision ANSI Z87.1A-1991)

ANSI Z535.4-1998, Product Safety Signs and Labels
Publisher: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036

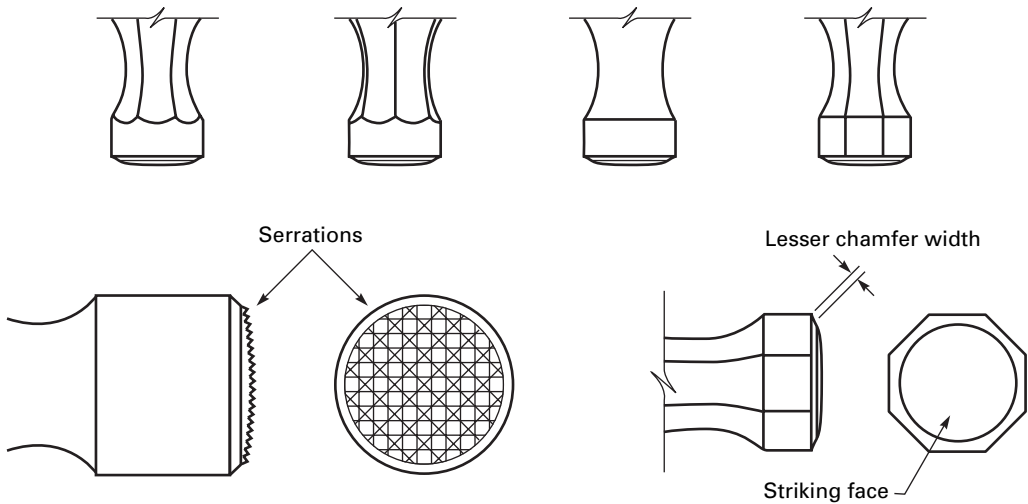
ASTM E 18-00, Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM F 1667-1995, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

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

Fig. 1 Nail Hammer Nomenclature



(a) Typical Nail Hammer



(b) Equivalent Shapes of Hammer Neck and Bell

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

4 PERFORMANCE 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 1.0 in., then the chamfer width equals approximately 0.1 in.

4.1.3 Hammers shall pass the tests specified in section 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.

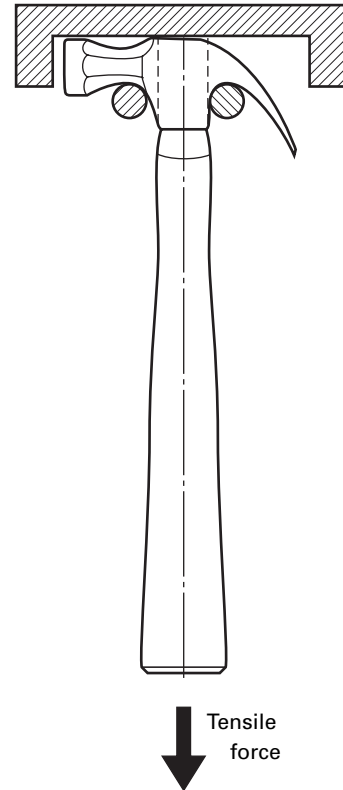
(b) Hammer claws shall be hardened to 40 HRC to 55 HRC for a minimum distance of 0.75 in. from the tip end.

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.

Fig. 2 Typical Tensile Force Test



5.1 Hardness Determination Test

Hardness determination with respect to the head and claw 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 test:

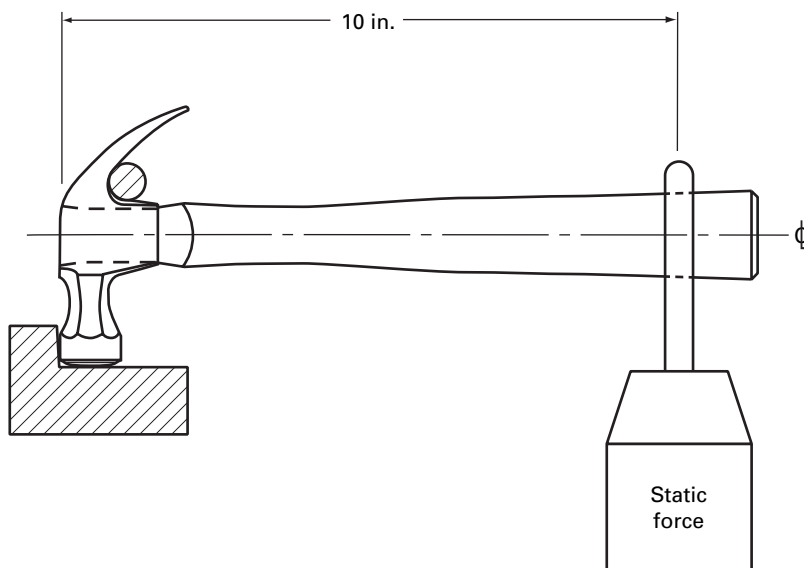
(a) The hammer shall withstand 20 full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the hammer.

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

(c) The blows shall be delivered 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 in., a minimum length of 2 in., 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 para. 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.

Fig. 3 Typical Static Force 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.

5.2.1 Nonwedged hammers shall withstand the following tensile force:

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 force:

Hammerhead Weight, oz	Static Tensile Force, lbf
Less than 13	400
13 and over	1,000

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 in. 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.

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

Table 1 Static Force Test

Hammerhead Weight, oz	Static Force, lbf
Up to 7	60
Over 7 but not over 13	125
Over 13 but not over 16	150
Over 16 but not over 20	175
Over 20 but not over 24	200
Over 24 but not over 28	225
Over 28	250

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

Table 2 Claw Test Parameters: Specified Board Thickness

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

Table 3 Claw Test Parameters: Nonspecified Board Thickness

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

where the nail head protrudes. Each nail shall be withdrawn up 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 full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the hammer. The blows shall be delivered with the hammer held or fixtured at the normal gripping area. 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 in., a minimum length of 2 in., 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 Tests

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, 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 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.

ASME B107.42

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HATCHETS AND AXES

1 SCOPE

This Standard provides performance and safety requirements for hatchets (that are intended specifically for use in driving unhardened nails or striking wood products, or both; cutting, notching, and shaping wood products or wall board products, or both; cutting, spacing, and aligning soft roofing products, and pulling unhardened nails when the tool is provided with a nail slot) and axes (that are intended primarily for use in felling, trimming, and pruning trees; splitting and cutting wood; notching and shaping logs and timbers; driving wooden or plastic stakes; pulling unhardened nails when the tool is provided with a nail slot; or digging when the particular tool is provided with a digging blade).

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 meant to serve as a guide in developing manuals and posters and for training personnel to work safely. It may be used as a guide by state authorities or other regulatory bodies in the formulation of laws or regulations. It is 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 CLASSIFICATION

TYPE I: HATCHETS (see Fig. 1)

Class 1: Lath, shingling, box, wallboard

Class 2: All others

TYPE II: AXES (see Fig. 2)

3 DEFINITIONS

(See Figs. 1 and 2 as applicable.)

bell: when provided, the portion of the hatchet or ax head directly behind striking face.

bit (blade): the broad, tapering portion of the head that terminates in a sharpened cutting edge.

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

cutting edge: the sharpened edge of the bit.

digging blade: the portion of the Pulaski pattern or Mattocks ax head directly opposite the bit, positioned at right angles to the handle axis, and terminating in a sharpened edge (when provided).

equivalent: the word "equivalent" in this Standard shall be interpreted to mean alternative designs or features that will provide an equal degree of safety and performance.

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

face: the flat portion of the ax head directly opposite the bit (when provided).

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

handle grip: when provided, material securely attached to the grip end of some styles of handles.

hardness: the condition of the head resulting from heat treatments.

head: portion of hatchet or ax exclusive of the handle or attachments.

marking gage: when provided, the adjustable measuring device attached to the top edge of the bit.

nail slot: when provided, a V-shaped opening in one non-cutting edge of the bit.

neck: when provided, that portion of the hatchet head between the eye and the bell.

pick: the pointed portion of the fire ax head directly opposite the bit.

poll: when provided, that portion of the hatchet head between the eye and the striking face.

safety message: the information imprinted on or affixed to the hatchet that is intended to promote safety [see also para. 7.1(c)].

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 or is stated as a recommendation.

sides (or cheeks): the outside surface of the head on either side of the eye and the bit.

Fig. 1 Hatchet Nomenclature

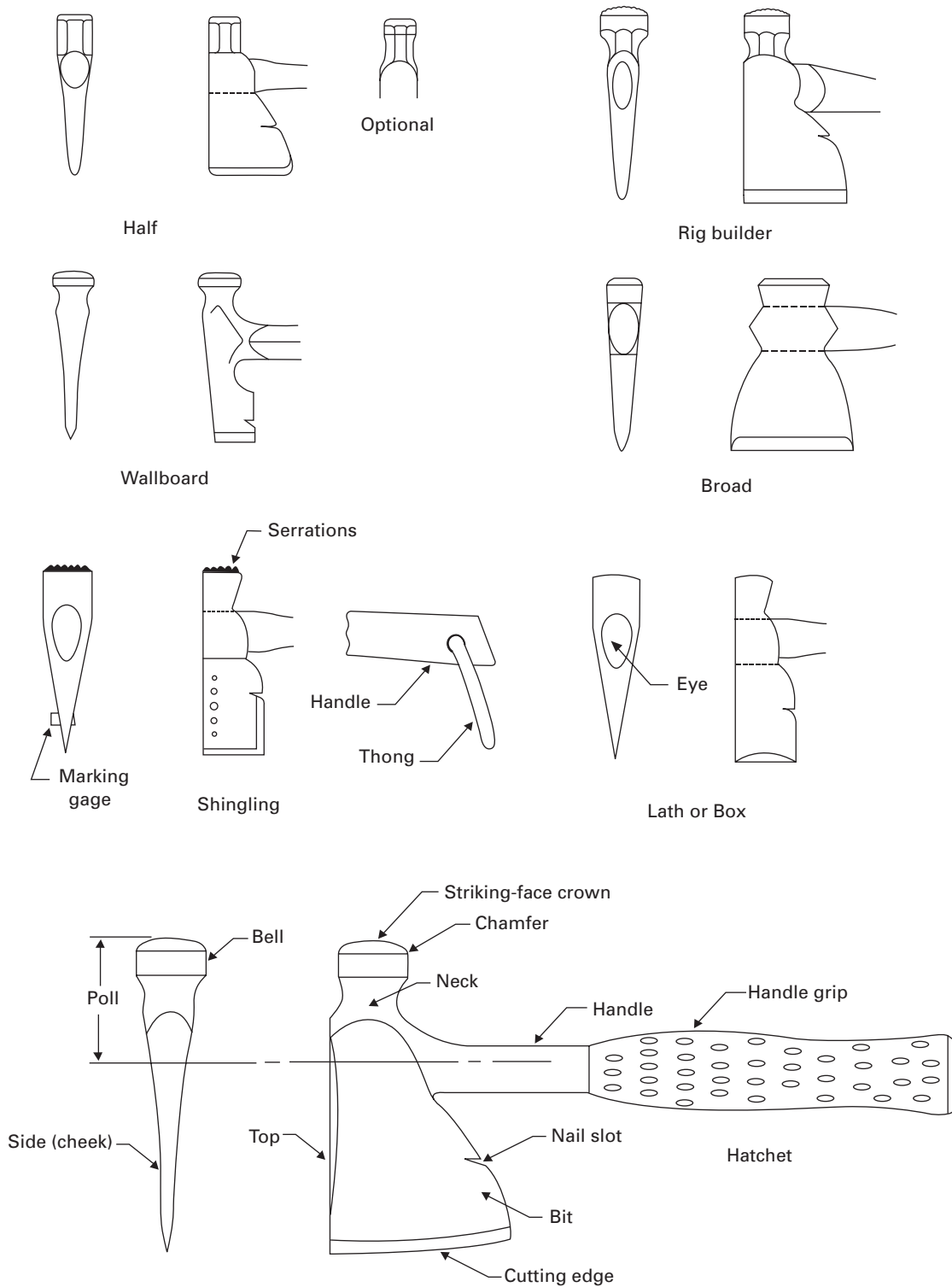
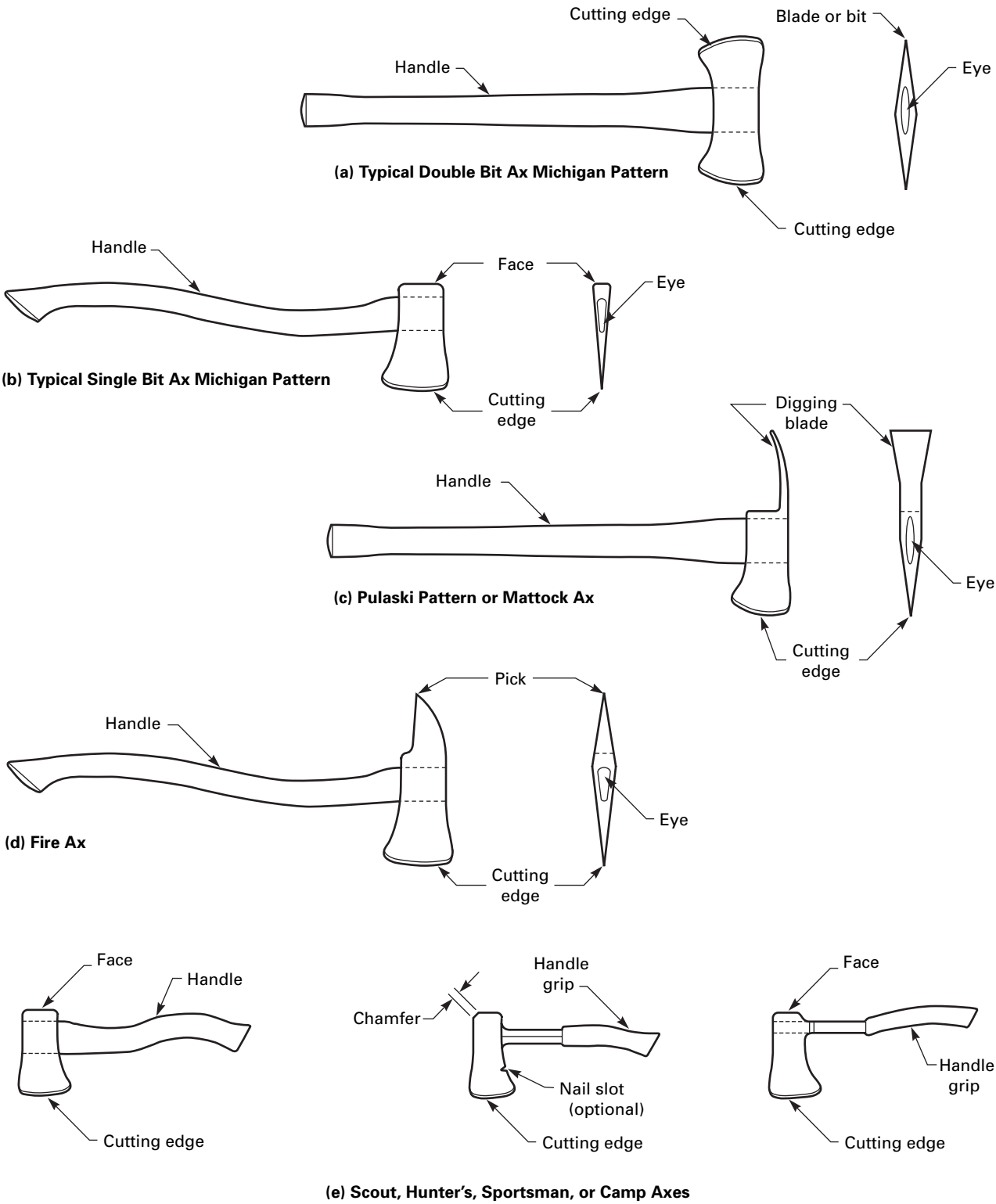


Fig. 2 Ax Nomenclature



striking face crown: when provided, the convex shape or radiuses of the striking face.

thong: when provided, the strap attached to the grip end of the handle.

top: the portion of the head opposite the handle.

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

4 REFERENCES

The following documents are referenced in this Standard. The latest available edition shall be used.

ANSI Z87.1 Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4 Product Safety Signs and Labels

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

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

Publisher: American Society for Testing Materials (ASTM International), 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 10491

5 PERFORMANCE REQUIREMENTS

5.1 Design

(a) Hatchets and axes shall pass the tests specified in section 6 as applicable.

(b) 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.

5.1.1 Type I. Hatchets shall have a striking face on one end of the head for use in driving unhardened nails or striking wood products, or both and a blade or bit on the opposite end for use in cutting, notching, and shaping wood products or wallboard products, or both; cutting, spacing, and aligning soft roofing products; and pulling unhardened nails when the tool is provided with a nail slot.

(a) The striking face shall have a smooth or serrated surface and be convex shape or flat.¹

(b) 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 of

the diameter of the bell or poll as measured across the chamfer angle. For example, if the bell or poll diameter equals 1.0 in., then the chamfer width equals approximately 0.1 in. The chamfer width of tools with approximately square- or rectangular-shaped striking faces shall be approximately one-tenth of the lesser dimension.

5.1.2 Type II. Axes may have a striking face on one end for driving wooden or plastic stakes and a blade or bit on the opposite end for use in felling, trimming, and pruning trees; splitting and cutting wood; notching and shaping logs and timbers; and pulling unhardened nails when the tool is provided with a nail slot; or digging when the particular tool is provided with a digging blade.

(a) A double-bit ax shall have two bits directly opposite each other with the cutting edges running parallel to the handle length. Each bit shall have a taper from the eye section terminating in cutting edges sharpened and ready for use in cutting, notching, splitting, shaping, and trimming wood or wood products.

(b) A single-bit ax shall have a bit on one end of the head and a directly opposed face on the other end, both running parallel to the handle length. The bit shall have a taper from the eye section terminating in a cutting edge sharpened and ready for use in cutting, notching, splitting, shaping, and trimming wood or wood products. The face may be a flat or slightly convex surface for use in driving wooden or plastic stakes. Chamfering of the face is acceptable but not required. A nail slot in the bit is acceptable but not required. If provided, it shall be suitable for pulling unhardened nails.

(c) A fire ax shall have a bit on one end of the head with a cutting edge running parallel to the handle length and a pick on the opposite end. The bit shall have a taper from the eye section terminating in a cutting edge sharpened and ready for use in cutting wood or similar materials. The pick shall have a gradually reducing cross section terminating in a sharp point and ready for use in breaking and dismantling wood or similar materials.

(d) A Pulaski Pattern or Mattock ax shall have a bit on one end of the head with a cutting edge running parallel to the handle length and a digging blade on the opposite end with its edge running at right angles to the handle. The bit shall have a taper from the eye section that terminates in a cutting edge sharpened and ready for use in cutting, notching, splitting, shaping, and trimming wood or wood products. The digging blade shall have a flare from the eye, gradually increasing in width and terminating in a cutting edge sharpened and ready for use in cutting roots and digging fire lanes.

5.2 Materials

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

¹ Hatchets with serrations on the striking face are intended for driving unhardened nails. The serrated face reduces the incidence of bending or dislodging of nails.

5.3 Mechanical Properties

5.3.1 Type I. The striking face shall be hardened and tempered to 45 HRC to 60 HRC. The bit shall be hardened and tempered to 40 HRC to 60 HRC for a minimum distance of 0.5 in. from the cutting edge.

5.3.2 Type II. All bits, picks, or digging blades shall be hardened and tempered to 45 HRC to 60 HRC for a minimum distance of 0.5 in. from the point or edge. The face of the head shall have a maximum hardness of 60 HRC. The eye section of the head shall have a maximum hardness of 40 HRC. The steel directly behind the face, bit, or digging blade shall be a toughened supporting core that gradually decreases in hardness.

5.3.3 Types I and II. Bits, picks, or digging blades shall not chip, crack, fracture, or deform when subjected to the applicable tests specified in para. 6.2, 6.4, or 6.5.

6 TESTS

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

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

6.1 Hardness Determination Test

Hardness determination with respect to faces and bits shall be made in accordance with ASTM E 18.

6.2 Striking and Tensile Force Tests

Prior to tensile force testing, sample hatchets and axes shall be subjected to the following striking test.

6.2.1 Type I. The tool shall withstand 20 full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the hatchet. The test shall be conducted at room temperature. The blows shall be delivered with the tool held or fixtured at the normal gripping area. 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. Handles shall not loosen, separate from heads, crack, or break. The striking face of hatchets shall not mushroom, chip, crack, or spall.²

6.2.2 Type II. The tool shall withstand 20 full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the ax against hard wood material

² The striking test is so severe that a degree of permissible deformation of serrations on the striking face can be anticipated.

that is rigidly supported. The blows shall be delivered with the tool held or fixtured at the normal gripping area. The test shall be conducted at room temperature. Handles shall not loosen, separate from heads, crack, or break. The striking face of axes shall not mushroom, chip, crack, or spall.²

6.2.3 Following the striking test, the sample tools shall be subjected to a tensile force as follows (see Fig. 3):

Type and Class	Tensile Force, lbf
Type I, Class 1	150
Type I, Class 2	500
Type II	1,000

Handles shall not separate from heads, crack, or break.

6.3 Static Force Test

6.3.1 Type I. The hatchet head shall be locked securely in test fixture with the striking face up 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 of the hatchet (see Fig. 4).

6.3.2 Type II. The ax head shall be locked securely in test fixture with the bit down and the handle extended in the horizontal plane. A static force is applied vertically at a point 3 in. from the grip end of the handle (see Fig. 5).

6.3.3 Static Force. The static force shall be as follows:

Type and Class	Static Force, lbf
Type I, Class 1	100
Type I, Class 2	125
Type II	110

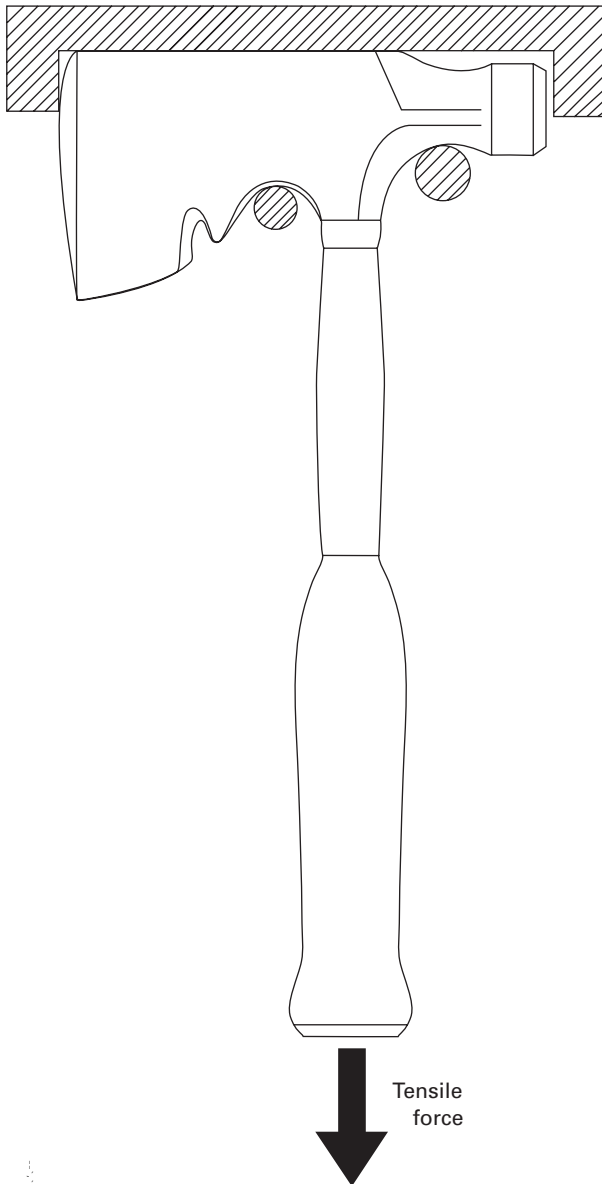
Handles shall not break, loosen, or otherwise fail.

6.4 Impact Test: Type II

The sample ax head shall be locked securely in a test fixture with the head flat on the bench or other flat support with the bit from the lower portion of the eye overhanging the edge of the bench. The bits of the sample heads shall not fracture or deform when subjected to two hard blows with a 3.5 lb to 4.0 lb wooden mallet on each side of that portion of the bit that overhangs the edge of the bench or other flat support (see Fig. 6).

6.5 Spalling Test: Type I

The tool shall withstand ten blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent. 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 in., a minimum length of 2 in., and a minimum hardness of 55 HRC. The face of the struck object shall be set to an angle of 10 deg to 20 deg with

Fig. 3 Typical Tensile Force Test

respect to the striking face. No spalling of the striking face shall occur.

6.6 Grip Tests

6.6.1 Solvent Resistance Test. Grips shall be fully immersed in the test fluids specified 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 sample tool handle.

6.6.2 Following the solvent resistance test, sample tool shall be secured by hand and the grip twisted at the normal hand position in alternating directions producing a torque of 40 lbf-in. to 60 lbf-in. (approximated by a person of average build, 160 lb to 180 lb). Five alternating twisting motions shall be performed. Grips shall not loosen or separate from handle.

6.6.3 Following the twisting test, grips shall be tested per (a) or (b) below.

(a) Mechanically bonded grips shall be tensile-tested using the values for wedged tools in para. 6.2 (for both wedged and nonwedged tools) applying the force only to the grip. 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.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of hatchets and axes, information about which can be found in the HTI publication, *Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care*.

7.1 Safety Requirements

(a) To avoid possible eye or other bodily injury, hatchets and axes shall be used only for the purposes specified in para. 5.1.

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

(c) Each hatchet and ax shall be stamped, labeled, or otherwise marked by the manufacturer with the following symbol and safety message or equivalent:



WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

Fig. 4 Typical Static Force Test for Type I

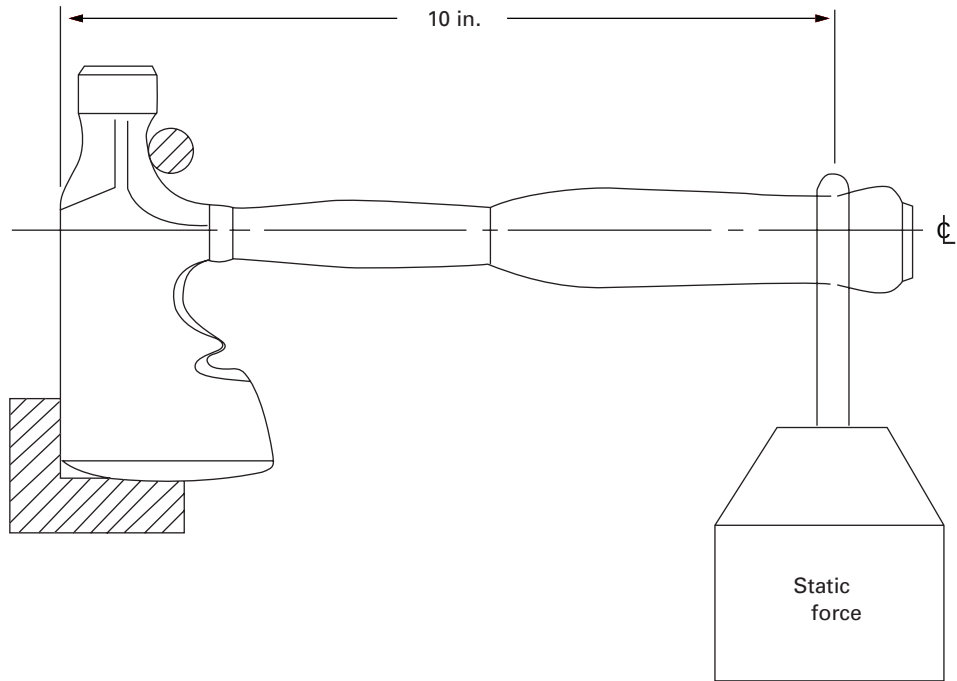


Fig. 5 Typical Static Force Test for Type II

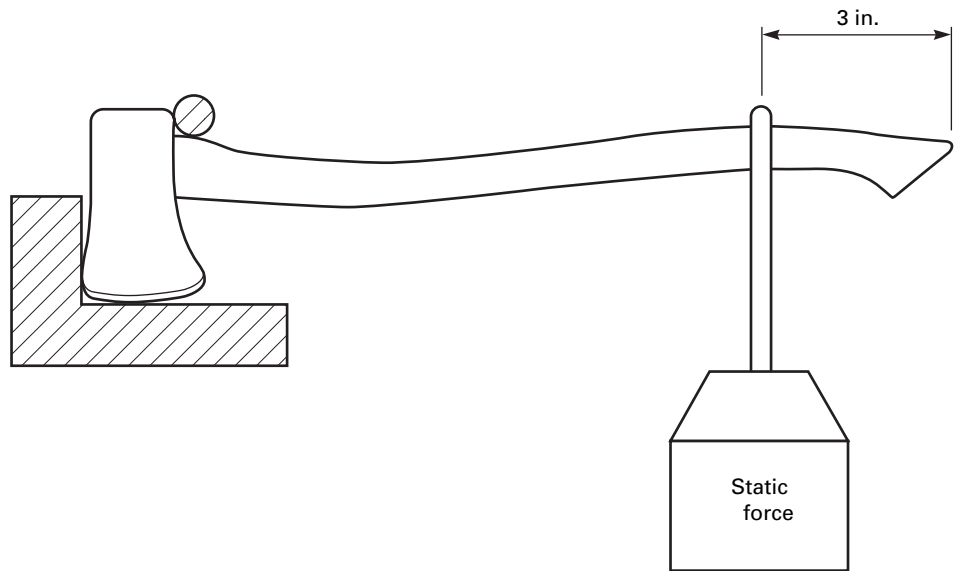
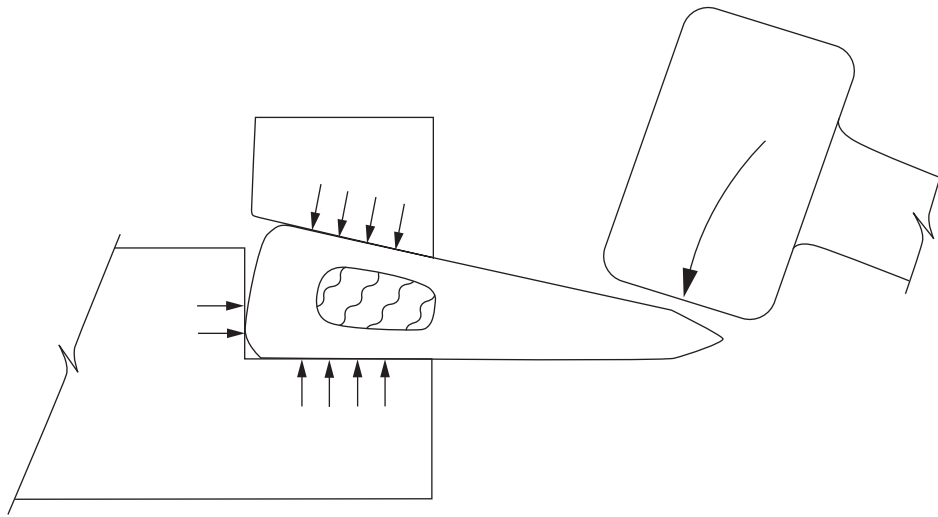


Fig. 6 Impact Test

This safety message shall be located in a position that will not interfere with the quality or performance of the tool. The principles set forth in ANSI Z535.4 shall be used as the guide for alternate, equivalent methods of labeling.

(d) Hatchet and ax heads shall be visually inspected prior to each use and their use discontinued at the first sign of chipping, cracking, or mushrooming of any portion.

(e) Handles shall be free of splinters and cracks and shall be kept tight in the tool. Handles shall be visually inspected prior to each use and damaged handles shall be replaced. Replacements shall withstand the test requirements in paras. 6.2, 6.3, and 6.6 (if applicable).

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

(g) No part of the hatchet and ax head shall be grounded, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer, except that the bit may be properly resharpened [see para. 7.1(h)].

(h) When required, the cutting edge or edges should be resharpened, either by a fine whetstone or by hand-filing with a fine file to avoid deep scratching. Care should be taken to maintain the original contour

of the bit. All filing or whetstone scratches should run at right angles to the cutting edge and should be removed or refined by honing (see redressing instructions as outlined in the *Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care*).

7.2 Limitations of Use

(a) Hatchets are special-purpose tools designed and intended only for cutting wood and equally soft materials with the bits; driving or striking unhardened nails, wood, or equally soft materials with the striking face; and pulling unhardened nails when a nail slot is provided.

(b) Axes are special-purpose tools designed and intended only for the specific purpose of cutting wood and other equally soft materials. When a face is provided, it is intended only for striking wood or other soft materials, such as plastic.

(c) The sides of the head shall not be used for striking or pounding.

(d) When nail slots are provided, they should be used only for pulling unhardened nails.

(e) A hatchet or ax shall not be used as a maul or splitting wedge. It shall not be struck by or against another striking tool.

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BALL-PEEN HAMMERS

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 DEFINITIONS

(See Fig. 1 as applicable.)

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

bell: the portion of the hammerhead 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 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.

necks: the portions of the hammerhead 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 hammerhead on either side of the eye located between the two necks.

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 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.

3 REFERENCES

The following is a list of publications referenced in this Standard. The latest edition shall be used.

ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4, Product Safety Signs and Labels

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

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

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

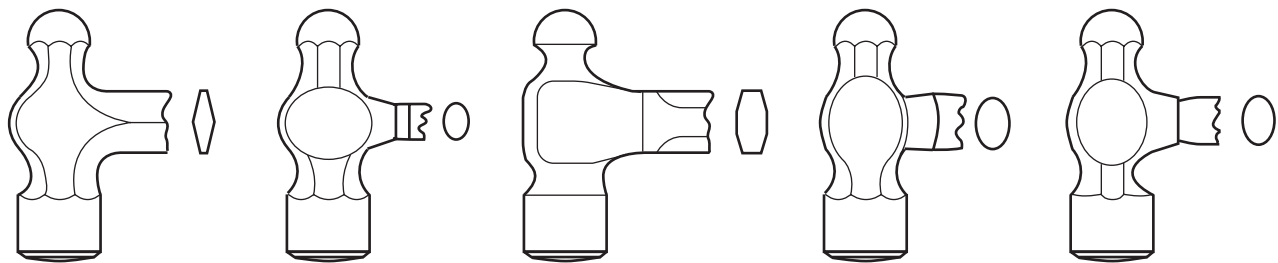
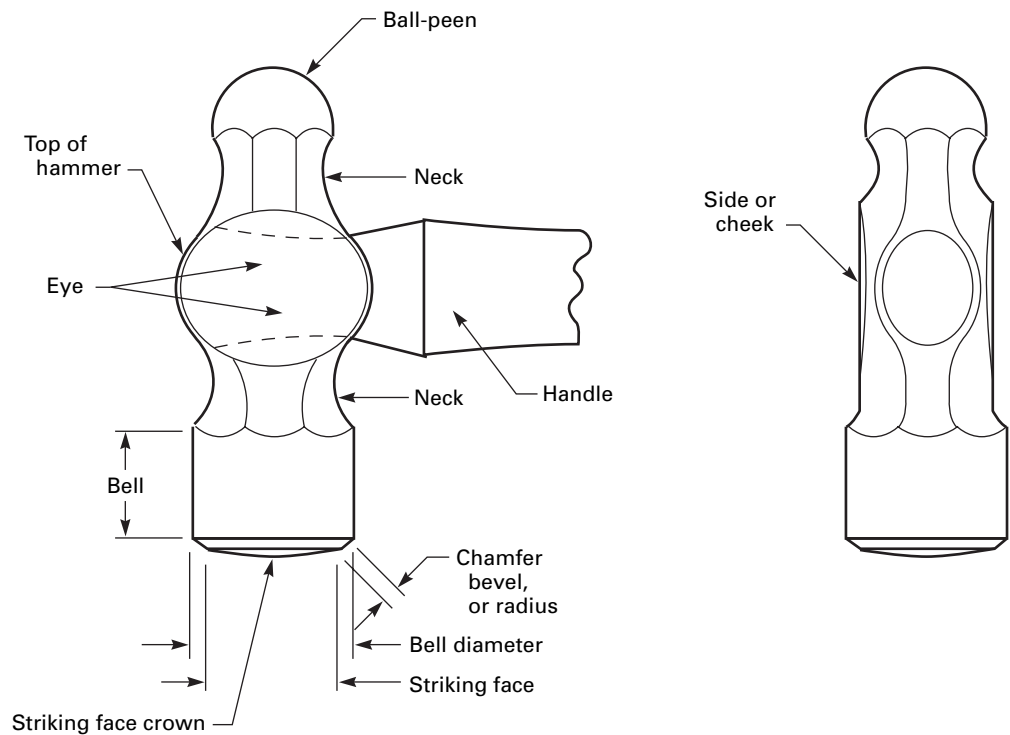
Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care

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

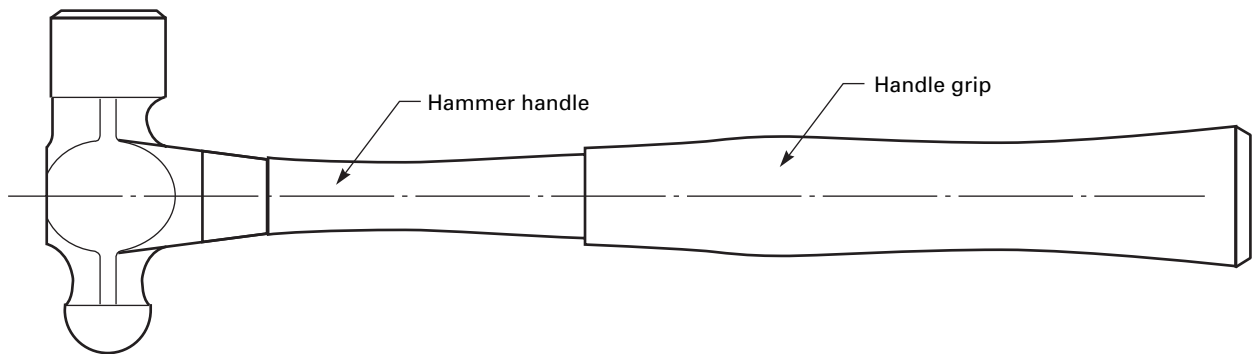
SAE J1703, Motor Vehicle Brake Fluid

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

Fig. 1 Hammer Nomenclature



Equivalent Shapes of Hammer Necks and Eyes



4 PERFORMANCE 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 1.0 in., then the chamfer width equals approximately 0.1 in.

(d) Hammers shall pass the tests specified in section 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.

(c) Steel behind the striking face shall be a toughened supporting core that gradually decreases in hardness.

5 TESTS

Many tests required herein are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests. These tests are designed to evaluate the tools and materials and do not condone the use of the tools in an environment, or in a manner, inconsistent with safe use of the tools.

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 full swinging blows on the striking face and 20 full swinging blows on the ball-peen end by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the hammer. The blows shall be struck 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).

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

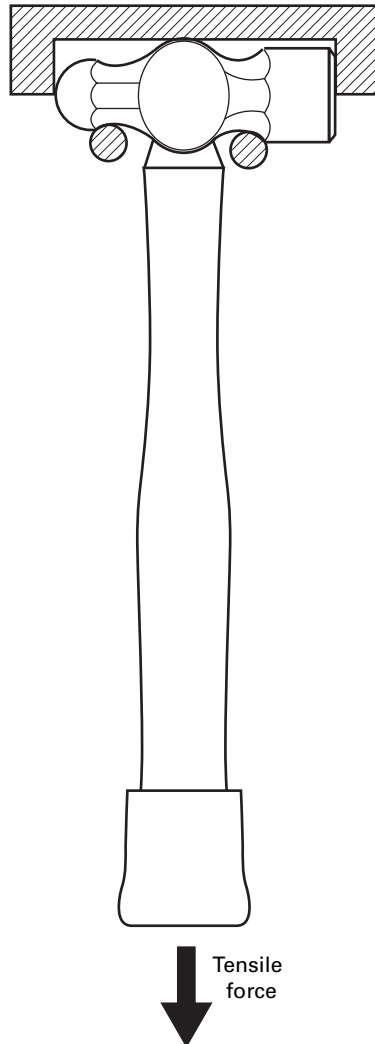
Handles shall not break, loosen, or otherwise fail.

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 hammerhead 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).

Fig. 2 Typical Tensile Force Test

(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 full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use

and weight of the hammer. The blows shall be struck 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.

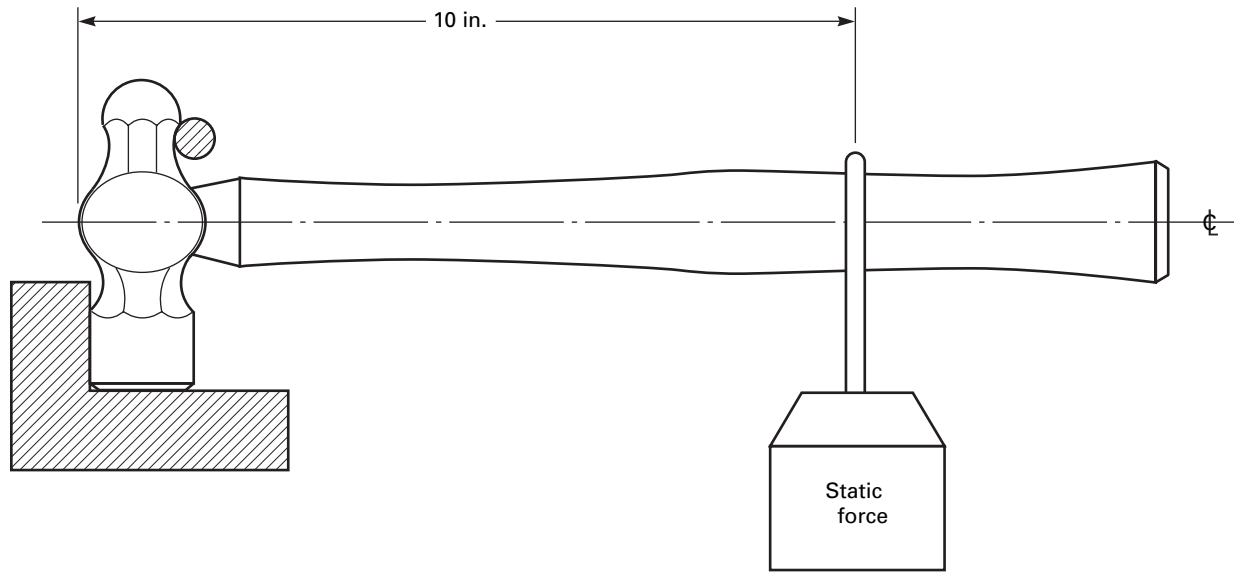
5.5.3 Solvent Resistance Test. Grips shall be fully immersed in the test fluids specified (new sample grips shall be used for each test fluid) for 15 min to 20 min at room temperature, removed, and let stand for 24 hr to 28 hr. Test fluids are SAE J1703 brake fluid, gasoline, ethylene glycol, and ethyl 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

Fig. 3 Typical Static Force Test

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

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.

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HEAVY STRIKING TOOLS

1 SCOPE

This Standard provides performance and safety requirements for heavy striking tools. The names given and intended uses are those generally recognized (see Figs. 1 through 13).

The designs covered by this Standard are not limited to those named or illustrated.

This Standard is intended to serve as a guide in selecting, testing, and using the hand tools covered. Details of design, testing, and use of the tools covered are specified only as they relate to safety. 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 CLASSIFICATION

(a) Blacksmith's Double-Face Sledge (see Fig. 1), Nevada long-pattern striking hammer (see Fig. 2), and Oregon short-pattern striking hammer (see Fig. 3), intended specifically for use in general sledging operations in striking wood, metal, masonry, and stone.

(b) Hand-Drilling Hammer (see Fig. 4), intended specifically for use in striking chisels, punches, star drills, spikes, B107.52 Type I Nail Puller Bars, and hardened nails.

(c) Blacksmith's Cross-Peen Sledge (see Fig. 5), the striking face of which is intended specifically for use in general sledging operations in striking wood, metal, masonry, and stone and the peen face of which is intended specifically for use in bending and peening unhardened metal.

(d) Woodchopper's Maul (see Fig. 6), the bit end of which is intended specifically for splitting logs and the striking face of which is intended specifically for driving metal wood-splitting wedges into logs.

(e) Railroad Spike Maul (see Figs. 7 and 8), intended specifically for use in driving railroad spikes.

(f) Spalling Hammer (see Fig. 9), intended specifically for use in cutting and shaping stone and masonry by first making a score line with the scoring edge and then tapping away the unwanted stone or masonry with the striking face.

(g) Stone Sledge (see Fig. 10), the scoring edge of which is intended specifically for making score lines in stone and masonry and the striking face of which is intended specifically for use in breaking up stone and masonry.

(h) Bush Hammer (see Fig. 11), intended specifically for use in roughing and chipping concrete or stone.

(i) Ship or Boat Maul (see Fig. 12), intended specifically for use in driving bolts (iron, copper rods, or dowels), pins, spikes, and T-nails (wood).

(j) Lineman's or Farrier's Turning Hammer (see Fig. 13), intended specifically for use by telephone and electric utility linemen or by farriers (blacksmiths) in forming and shaping horseshoes.

3 DEFINITIONS

(See Figs. 1 through 14 as applicable.)

blade: the broad tapering portion of the maul between the eye and the cutting edge of the woodchopper's maul.

chamfer: the bevel or equivalent radius encircling the perimeter of the striking face; also, the bevel on the ends of peening surfaces and scoring edges (see Fig. 14).

cutting edge: the sharpened end of the blade of the woodchopper's maul.

equivalent: The word *equivalent* in this Standard shall be interpreted to mean alternative designs or features that will provide an equal degree of performance and safety.

eye: an opening or aperture in the head into which the handle is inserted if the handle is separate.

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

handle grip: additional material securely attached to the handle to be gripped during use.

peen: the tapered portion of the hammer or sledge between the eye and the scoring edge.

poll: the portion of the hammer, sledge, maul, or bush hammer between the eye and the chamfer or striking face.

Fig. 1 Blacksmith's Double-Face Sledge

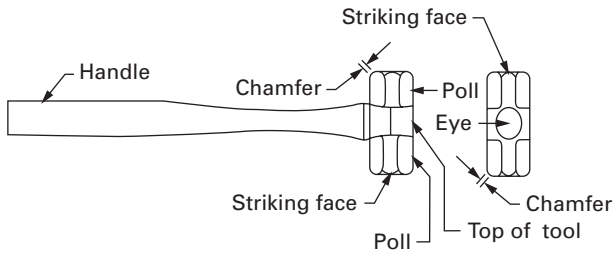


Fig. 5 Blacksmith's Cross-Peen Sledge

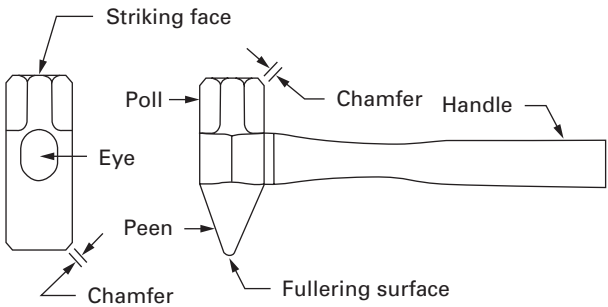


Fig. 2 Nevada Long-Pattern Striking Hammer

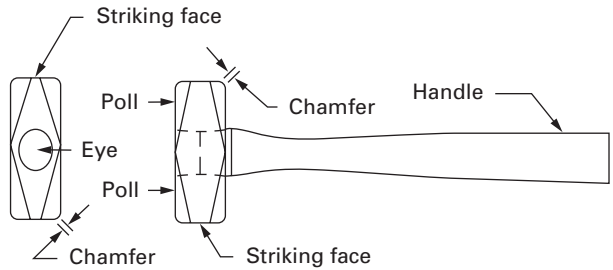


Fig. 6 Woodchopper's Maul

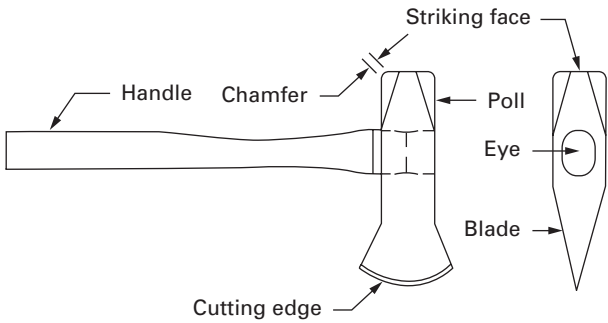


Fig. 3 Oregon Short-Pattern Striking Hammer

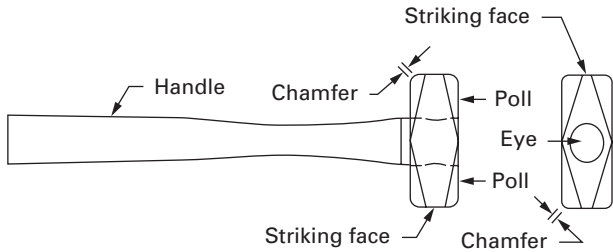


Fig. 7 Railroad Spike Maul, Standard Pattern

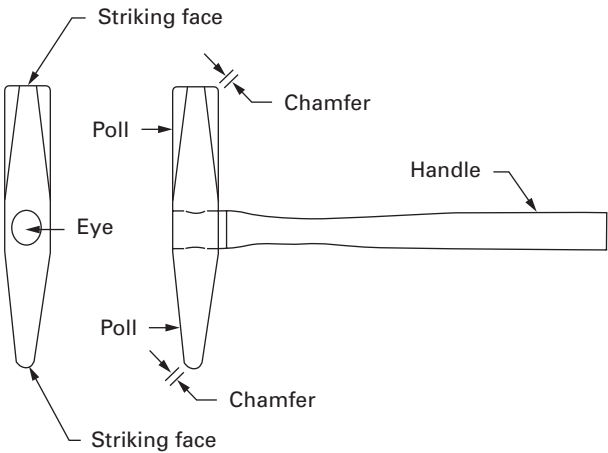


Fig. 4 Hand-Drilling Hammer

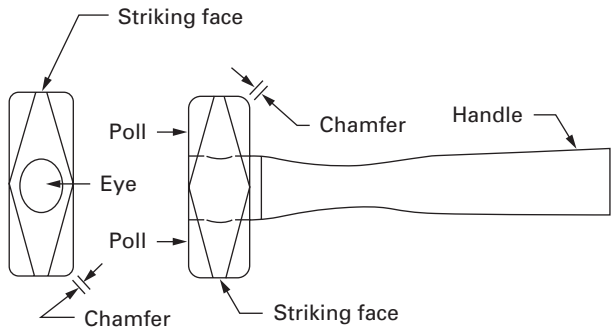


Fig. 8 Railroad Spike Maul, Bell Pattern

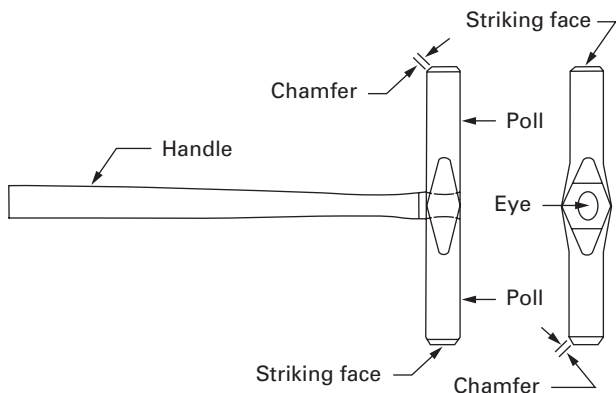


Fig. 11 Bush Hammer

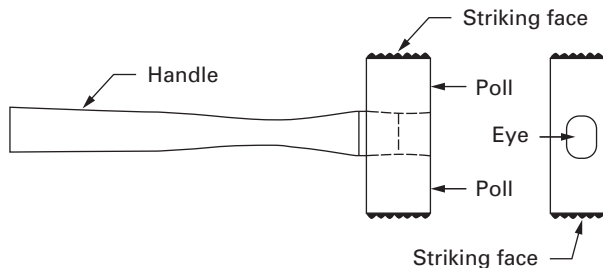


Fig. 9 Spalling Hammer

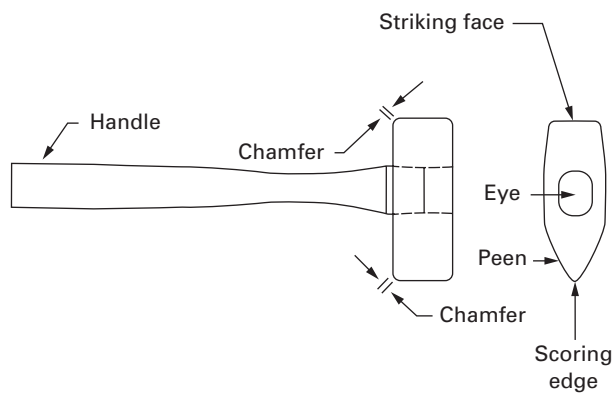


Fig. 12 Ship or Boat Maul

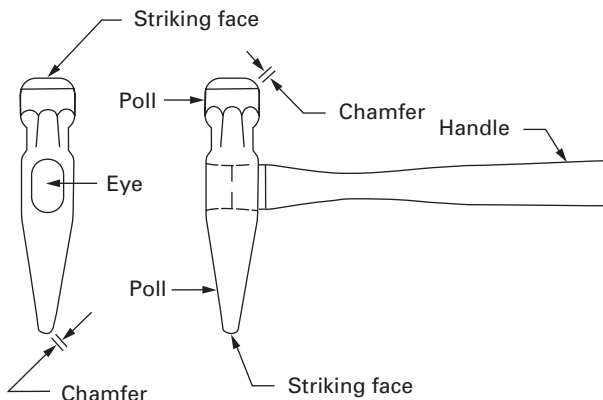


Fig. 10 Stone Sledge

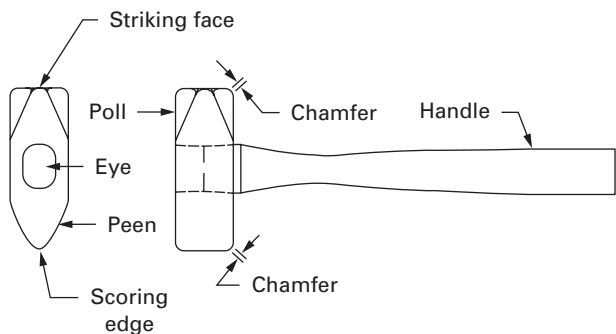


Fig. 13 Lineman's or Farrier's Turning Hammer

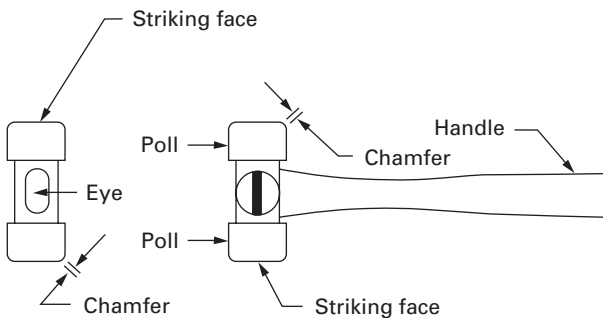
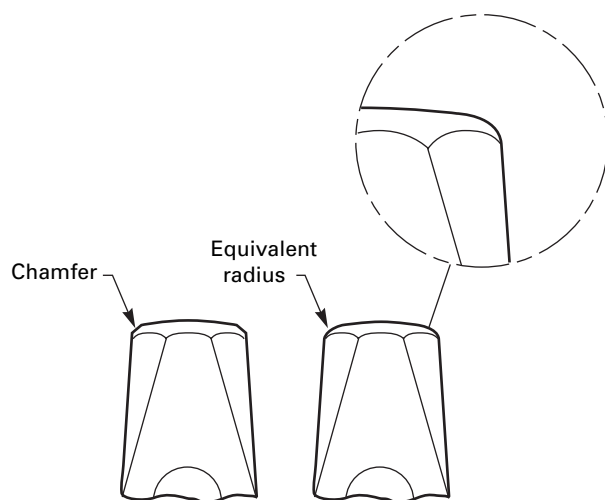


Fig. 14 Chamfer/Equivalent Radius

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

scoring edge: the edge directly opposite the striking face of spalling hammers and stone sledges.

shall: indicates mandatory requirements of this Standard.

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

striking face: the portion of the head, exclusive of the poll and chamfer located either on both ends of the head or on the end of the head opposite a peen or blade.

striking-face crown: exclusive of spalling hammers and bush hammers, the convex shape or radius of the striking face.

4 REFERENCES

The following documents are referenced in this Standard. The most recent editions shall be used.

ANSI Z87.1 Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4 Product Safety Signs and Labels

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

ASME B107.52 Nail Puller Bars and Pry Bars

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM E 18 Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

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

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

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

SAE J1703 Motor Vehicle Brake Fluid

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

5 PERFORMANCE REQUIREMENTS

Tools shall pass the tests in section 6 as applicable.

5.1 Design

Heavy striking tools shall have a striking face on one end while the other end shall have a striking face or a special-purpose shape. Striking faces on all heavy striking tools, except spalling hammers and bush hammers, shall have a striking-face crown.

Striking faces of all heavy striking tools except bush hammers shall have a chamfer of approximately 45 deg or equivalent radius all around the perimeter with a width equal to approximately one-tenth the width across the poll directly behind the chamfer angle. For example, if the width across the poll directly behind the chamfer equals 2.0 in., then the chamfer width would be approximately 0.2 in.

The ends of peening surfaces and scoring edges shall have a chamfer of approximately 45 deg (or equivalent radius).

Tools shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury when handling the tool.

5.2 Materials

The materials used in the manufacture of heavy striking tools shall be such as to produce tools conforming to this Standard.

5.3 Mechanical Properties

Heads shall be free of manufacturing and material defects such as seams, laps, pipes and cold shuts that would jeopardize sound construction.

All striking faces, except for those of wood chopper's mauls (see below), shall be hardened and tempered to 45 HRC to 60 HRC or equivalent. The steel directly behind the striking face shall be a toughened supporting core that gradually decreases in hardness.

The striking faces of woodchopper's mauls shall be hardened and tempered to 44 HRC to 55 HRC or equivalent. The blades shall be hardened and tempered to 45 HRC to 60 HRC or equivalent for a minimum distance of 0.75 in. from the cutting edge.

The peens of blacksmith's cross peen sledges, spalling hammers, and stone sledges shall be hardened and tempered to a hardness of 45 HRC to 60 HRC or equivalent for a minimum distance of 0.5 in. from the peening surface or scoring edge.

6 TESTS

Many tests required herein are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests. These tests are designed to evaluate the tools and materials and do not condone the use of the tools in an environment, or in a manner, inconsistent with safe use of the tools.

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

6.1 Hardness Determination Test

Hardness determinations with respect to striking faces, peens, and blades shall be made on a fixtured tool or on a mounted or unmounted specimen that has been cut from the tool using the wet abrasive or other equivalent method. Any hardness test that utilizes equipment and methods equivalent to Rockwell hardness determination as specified in ASTM E 18 will be acceptable.

6.2 Striking and Tensile Force Test

Sample striking tools shall be subjected to the striking test as specified below. On double-faced tools where both faces are striking faces, both faces shall be tested.

(a) For tools having overall handle lengths of less than 24 in., the sample tool shall withstand 20 full swinging blows by a person of average build, 160 lb to 180 lb, commensurate with the end use and weight of the tool. The test shall be conducted at room temperature. The blows shall be struck with the tool held or fixtured at the normal gripping area. The blows shall be struck against the smooth flat or slightly convex surface of a rigidly supported steel object with a minimum diameter of 3 in., a minimum length of 2 in., and a hardness of 92 HRB to 105 HRB or equivalent.

(b) For tools having overall handle lengths of 24 in. or greater, the sample tool shall withstand 100 full swinging blows by a person of average build, 160 lb to 180 lb, commensurate with the end use and weight of the tool. The test shall be conducted at room temperature. The blows shall be struck with the tool held or fixtured at the normal gripping area. The blows shall be struck on a steel die block, with a hardness of 92 HRC to 105 HRB or equivalent. The test block shall be 10 in. square or larger, with a thickness of at least 8 in.

Following the striking test, assemblies consisting of two or more separate parts (head and handle) shall not loosen or separate when subjected to a static tensile force of 1,000 lbf (see Fig. 15).

Striking faces shall not sink, mushroom, chip, crack, or spall. Handles shall not loosen or separate from the head, crack, or break.

6.3 Static Force Test

Assembled striking tool handles shall not break, loosen, or otherwise fail when subjected to the following static forces and when the striking tool head is locked securely in the test fixture with the striking face down and with the handle extended in the horizontal plane and when the static force is applied vertically at a point on the handle measuring 10 in. from the top of the tool head (see Fig. 16).

Striking tools with a head weight of up to and including 4 lb shall withstand a static force of 150 lbf.

Striking tools with a head weight of greater than 4 lb shall withstand a static force of 250 lbf.

6.4 Grip Tests

6.4.1 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 neither significant swelling nor surface attack of the material being tested. Grips shall be tested while attached to the striking tool handle.

6.4.2 Grip Twisting Test. Following the solvent resistance test in para. 6.4.1, striking tools 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.

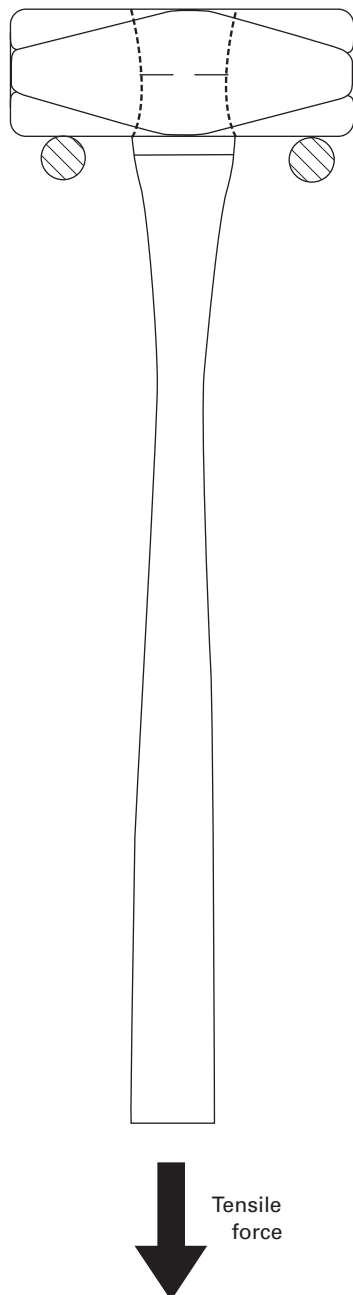
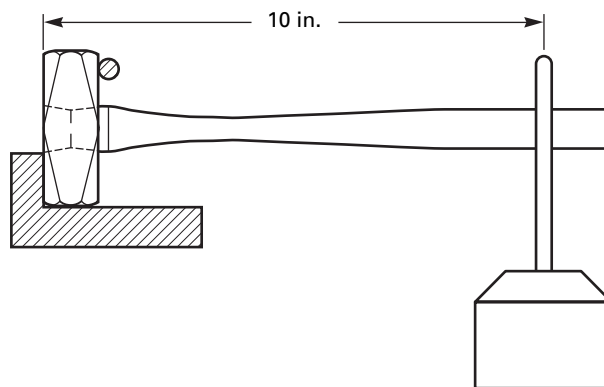
6.4.3 Grip Adhesion Test. Following the test in 6.4.2, grips shall be tested per (a) or (b) below.

(a) Mechanically bonded grips shall be tensile force tested at 500 lbf, 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.

7 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 safe use of these tools.

Fig. 15 Typical Tensile Force Test**Fig. 16 Typical Static Force Test**

7.1 Safety Requirements

(a) 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 where any striking tool is being used to avoid possible eye injury from flying objects.

(b) The heads of heavy striking tools shall be inspected prior to each use and their use discontinued at the first sign of chipping, mushrooming, or cracking.

(c) No area, section, or portion of the striking tool shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer. However, a dull cutting edge should be redressed to its original contour using a hand file or whetstone.¹

(d) Handles shall be inspected prior to each use and damaged handles shall be replaced. Handles of tools shall be free of splinters or cracks and shall be kept tight in the head of the tool. Replacements shall pass the tests in paras. 6.2 and 6.3 and shall be equivalent to the original handle in size and quality.

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

(f) Each striking tool assembly shall be stamped, labeled, or otherwise marked by the manufacturer with the following safety message or equivalent:



WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

This safety message shall be located in a position that will not interfere with the quality or performance of the tool. The above safety message shall also appear on all

¹ It is understood that industrial users with adequate facilities and properly trained personnel may choose to redress or resharpen these tools by other means without altering the metallurgical characteristics of the tools.

replacement handles. Pictorials are an accepted equivalent. The principles set forth in ANSI Z535.4 shall be used as the guide for alternate, equivalent methods of labeling.

7.2 Limitations of Use

(a) To avoid possible eye or other bodily injury, striking tools shall be used only for the purposes specified in section 2.

(b) A blow of a heavy striking tool should always be struck squarely with the striking face parallel with the surface being struck. Glancing blows, overstrikes, and under-strikes should be avoided.

(c) The sides of the polls or peens (see Figs. 1 through 13) shall not be used for striking or pounding.

(d) Heavy striking tools shall not be struck by another striking tool.

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BODY REPAIR TOOLS

1 SCOPE

This Standard provides performance and safety requirements for body repair hammers, dolly blocks, and spoons that are intended specifically for the reshaping of sheet metal panels normally found on bodies and fenders of motor vehicles. They are intended to be used separately or together for these repairs.

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.

2 CLASSIFICATION

- Type I: Body Repair Hammers
- Type II: Body Repair Dolly Blocks
- Type III: Body Repair Spoons

3 DEFINITIONS

dinging: removing minor imperfections in metal; straightening damaged metal whether spoons, hammers, or dolly blocks are used.

equivalent: the word equivalent in this Standard shall be interpreted to mean alternative designs or features that will provide an equal degree of performance and safety.

hardness: the condition resulting from heat treatment.

safety message: the information imprinted on or affixed to the repair hammer, dolly block, or spoon that is intended 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.

3.1 Type I: Body Repair Hammers

(See Figs. 1 and 4 as applicable.)

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

bumping, dinging, finishing face: the area of the hammerhead used to restore the damaged sheet metal panel to its original shape by striking.

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

cheeks: the sides of the hammerhead proximate to the eye.

eye: an opening or aperture in the hammerhead into which the handle is inserted, if the handle is separate.

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

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

neck: the reduced cross section portion of the hammerhead located between the bell and the eye, or the peen and the eye, or both.

peen: the striking surface of the hammerhead located in front of the neck.

pick: the elongated tapered portion of the hammerhead extending from the eye to the point.

point: the striking surface located at the end of the pick.

shrinking: the act of contracting stretched sheet metal by heating and upsetting the stretched metal into the heated spot with the body repair hammer.

shrinking face: the striking surface that is normally serrated. It may be flat or crowned.

striking face: the portion of the hammerhead located in front of the bell and chamfer that contacts the sheet metal during use.

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

striking surface: the surface of a hammerhead, peen, chisel, or pick intended to contact the sheet metal during use.

struck face: the portion of the hammerhead, exclusive of the chamfer, that is intended to be struck with a striking tool during use.

3.2 Type II: Dolly Blocks

(See Fig. 2.)

beading edge: an edge of a dolly block with a rounded apex that is used to raise a bead.

chamfer: the bevel or equivalent radius encircling the perimeter of the working surface.

crown: a broad area of the working surface that is convex in shape.

Fig. 1 Nomenclature for Body Repair Hammers

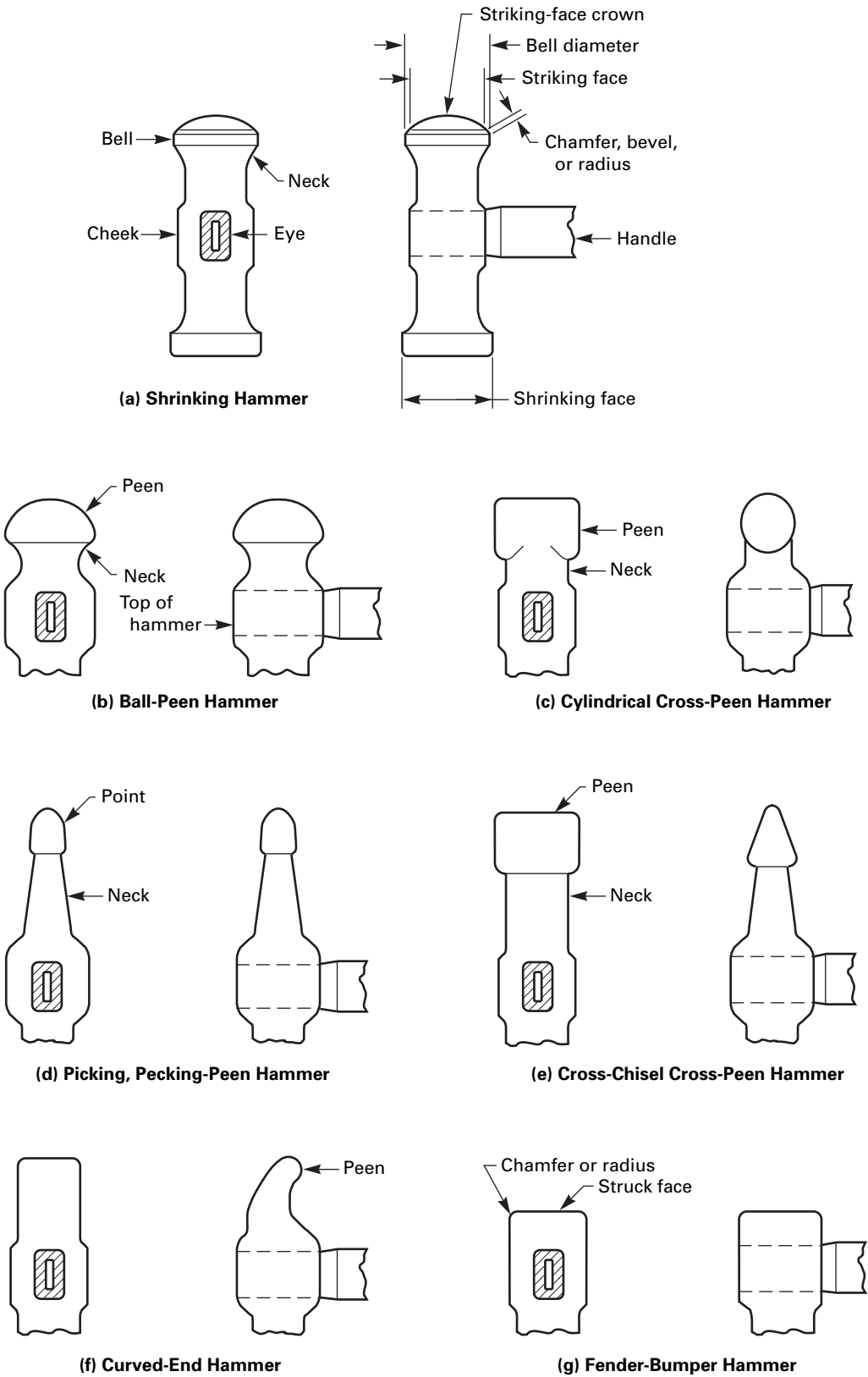


Fig. 2 Nomenclature for Dolly Blocks

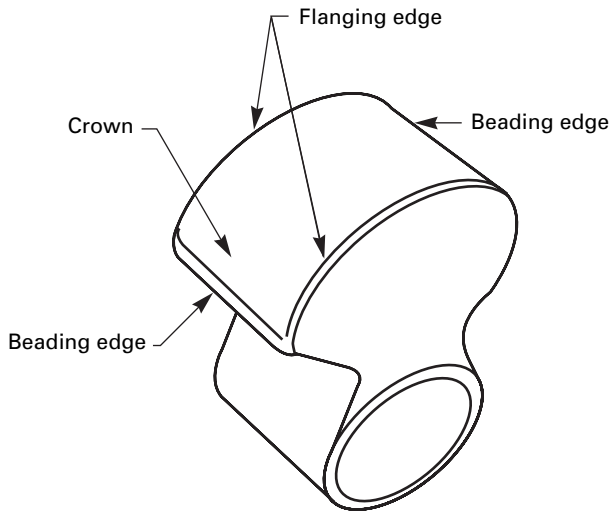
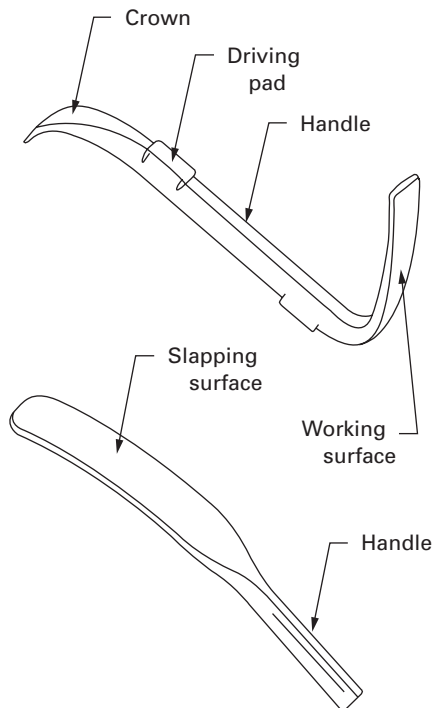


Fig. 3 Nomenclature for Body Spoons



flanging edge: an edge of a dolly block with an approximately right-angle rounded surface that is used to form a flange.

shrinking surface: the working surface that is normally serrated. It may be flat or crowned.

striking surface: the surface of a dolly block intended to contact the sheet metal during use.

working faces: the convex shape or radius of the striking or struck surface of a dolly block.

working surface: the convex or radiused faces of the dolly block intended to contact the sheet metal during use—usually ground, buffed, or otherwise smoothly finished.

3.3 Type III: Body Spoons

(See Fig. 3.)

chamfer: the bevel or equivalent radius encircling the perimeter of the working surface.

crown: a broad area of the working surface that is convex in shape.

driving pad: a raised square or rectangular boss on the spoon handle designed to be struck with a hammer.

handle: the portion that extends beyond the working area and by which the spoon is held.

slapping surface: the portion of the spoon used to forcefully strike the sheet metal.

struck face: a surface of the light dinging spoon (see Fig. 6(a)), generally opposite the working surface, that may be struck by an appropriate striking tool during use; the flat surface of a driving pad on the handle or shank.

working surface: the portion of the spoon intended to contact the sheet metal during use—usually ground, buffed, or otherwise smoothly finished.

4 REFERENCES

The following publications are referenced in this Standard. The latest edition shall be used.

ANSI Z87.1 Occupational and Educational Personal Eye and Face Protection Devices

ANSI Z535.4 Product Safety Signs and Labels

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

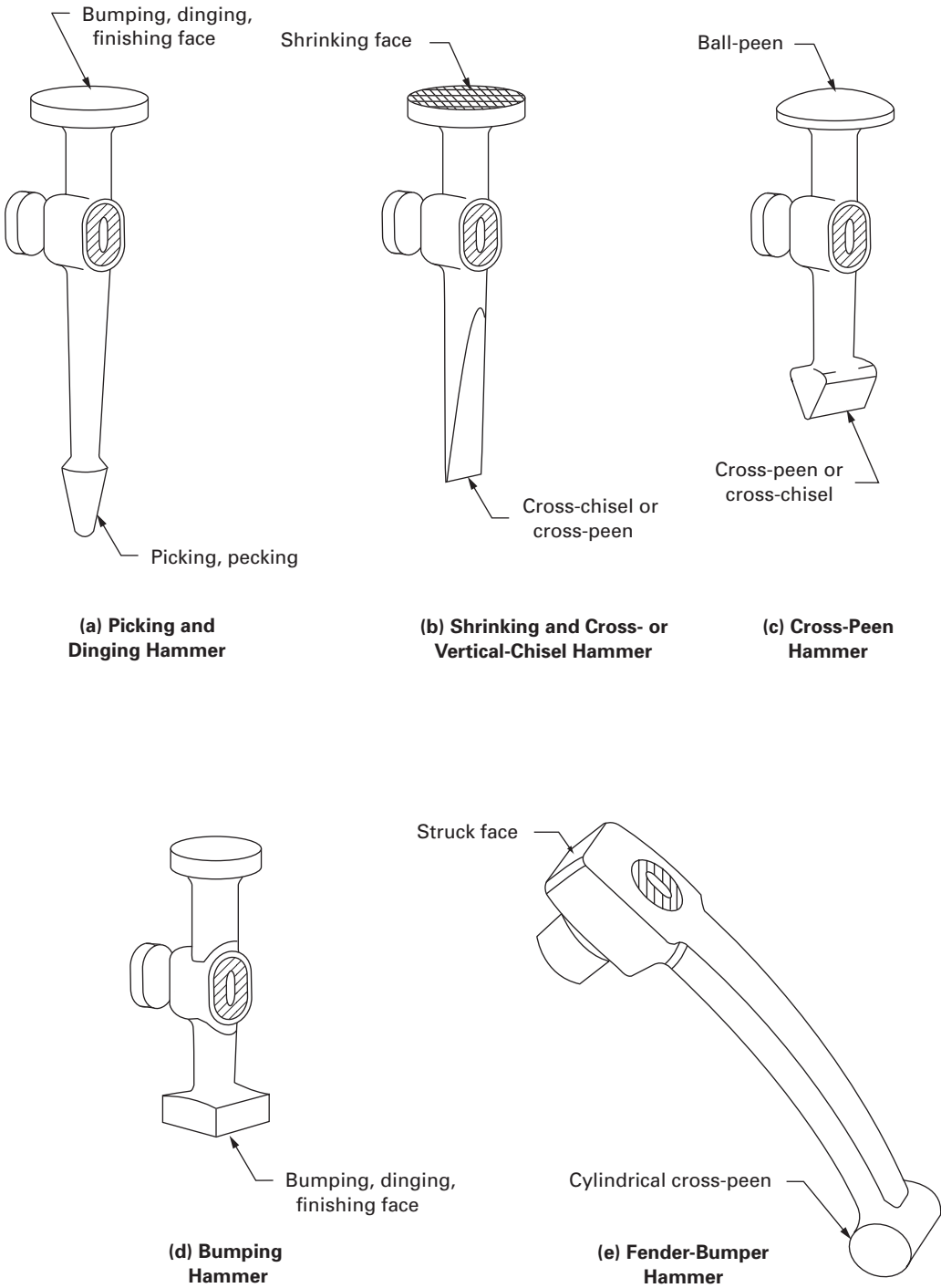
ASTM E 18 Standard Test Methods for Rockwell and Rockwell Superficial Hardness of Metallic Materials

Publisher: American Society for Testing and Materials (ASTM International), 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

Fig. 4 Typical Styles of Body Repair Hammers



5 PERFORMANCE REQUIREMENTS

The illustrations shown herein are descriptive and nonrestrictive, and are not intended to preclude the manufacture of body repair tools that otherwise comply with this Standard. Body repair tools shall withstand the applicable tests in section 6.

5.1 Design

Surfaces shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury when handling the tool.

No engraving, stamping, or other marks shall be impressed on the working surfaces of body repair tools to prevent transferring to sheet metal surfaces.

5.1.1 Type I: Body Repair Hammers. Body repair hammers are designed for striking against sheet metal panels. They shall consist of a hammerhead with one or more striking surfaces and a handle, or as on a fender bumper, one striking surface and one struck face and a handle [see Fig. 4(e)].

5.1.1.1 Striking Surface. The hammerhead striking surfaces may consist of, but are not limited to, any combination of the following styles as shown in Fig. 4.

(a) *Bumping, Dinging, Finishing Face.* Has a smooth, flat, or crowned striking face. The cross section of the bell may be round, square, or polygonal.

(b) *Picking, Pecking End.* Has a pointed or rounded tip called a point at the end of a round or polygonal pick. The axis of the pick may be straight or curved.

(c) *Shrinking Face.* Has a serrated striking face that may be flat or crowned. The cross section at the bell may be round or polygonal.

(d) *Ball-Peen End.* Has a smoothly contoured shape that is approximately hemispherical.

(e) *Cross-Peen, Cross-Chisel End.* Has a wedge or chisel-shaped peen oriented at right angles to the axis of the handle.

(f) *Cylindrical Cross-Peen End.* Has a generally cylindrical-shaped striking part with its axis oriented approximately at a right angle to the axis of the hammerhead and handle.

(g) *Vertical-Peen, Vertical-Chisel End.* Has a wedge or chisel-shaped peen oriented parallel to the axis of the handle.

5.1.1.2 Chamfer. The chamfer on the bumping, dinging, finishing, and other striking faces shall be a minimum of 0.03 in. at approximately 45 deg or equivalent radius.

5.1.1.3 Peen. The peen may have one of the following shapes:

- (a) wedge-shaped (as in a cross-peen or cross- and vertical-chisel)
- (b) cylindrical (as in a cylindrical cross-peen)
- (c) rounded (as in a ball-peen)

5.1.1.4 Handle. The handle shall be of any design, including ergonomic, that will withstand the appropriate tests specified in paras. 6.2 and 6.3.

5.1.2 Type II: Dolly Blocks. Dolly blocks are designed for straightening, bumping, shrinking, and finishing sheet metal panels during the repair of damaged motor vehicle body and fender sections. They are intended for use with or without body repair hammers, but shall not be struck directly with a hammer.

Dolly blocks may possess a combination of contoured surfaces.

Some styles of dolly blocks and their functions are listed here (see Fig. 5). The names given are those generally recognized in the body repair industry. The styles covered by the Standard are not limited to those named or illustrated.

(a) *General-Purpose, Crowned.* For use on crowned panels and flat portions of body panels.

(b) *General-Purpose, Anvil.* For various curves and contours of body, door panels, and deep-skirted fenders.

(c) *General-Purpose, Rail.* For bumping, dinging, straightening, and finishing various portions of body door panels and fenders. A general-purpose rail dolly block has two beading and flanging edges.

(d) *Bead.* The working surfaces are suitable for use on long-curved fenders, beads, and flanges.

(e) *Heel.* The working surfaces are suitable for use on sharp corners and large radius portions of panels.

(f) *Toe.* Has a flat face and flat edge for use in dinging flat surfaces. The crowned and curved contours are suitable for use on odd crowns and contours.

(g) *Wedge.* The shape is suitable for use behind brackets, braces, and reinforcements.

(h) *Shrinking.* Has a flat or curved striking surface that is normally serrated.

(i) *Angle.* For use on various angles, crosses, and curves.

5.1.3 Type III: Spoons. Body spoons are designed variously for dispersing the force of a hammer blow over a wider area, for wedging and prying between panels, for striking against sheet metal panels in confined spaces, or for use as a dolly in hard-to-reach areas. They are characterized by an integral handle or shank of a size, shape, and length to provide a comfortable balance and utility to the working end of the spoon.

Spoons may have a combination of contoured surfaces.

Some styles of spoons and their uses are listed here (see Fig. 6). The names are typically used in the body repair industry. The styles covered by this Standard are not limited to those named or illustrated.

(a) *Light-Dinging Spoon.* Light low-crown spoon for distributing the force of a hammer blow over a wider area or greater length of a ridge. Not made for prying.

Fig. 5 Typical Styles of Dolly Blocks

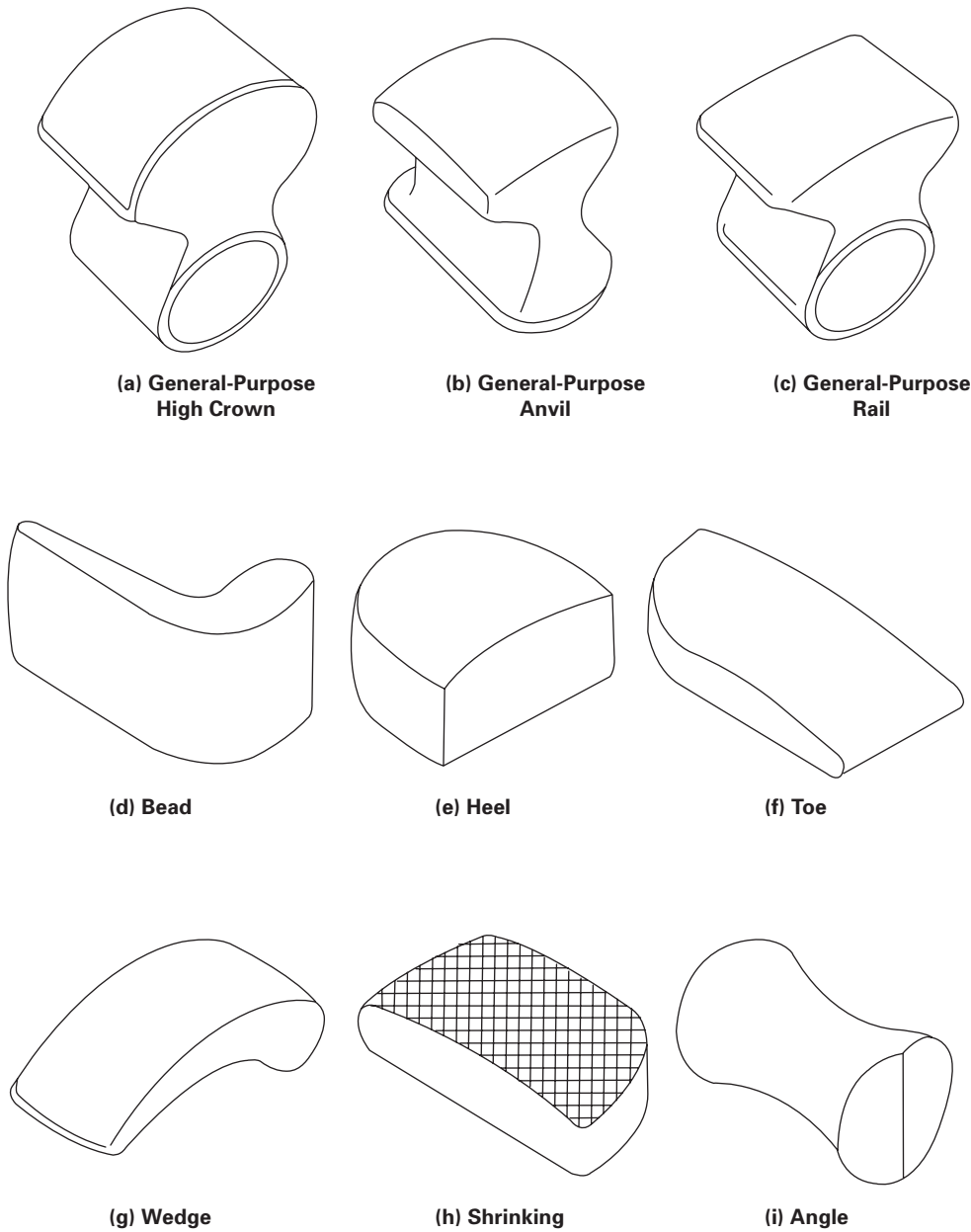
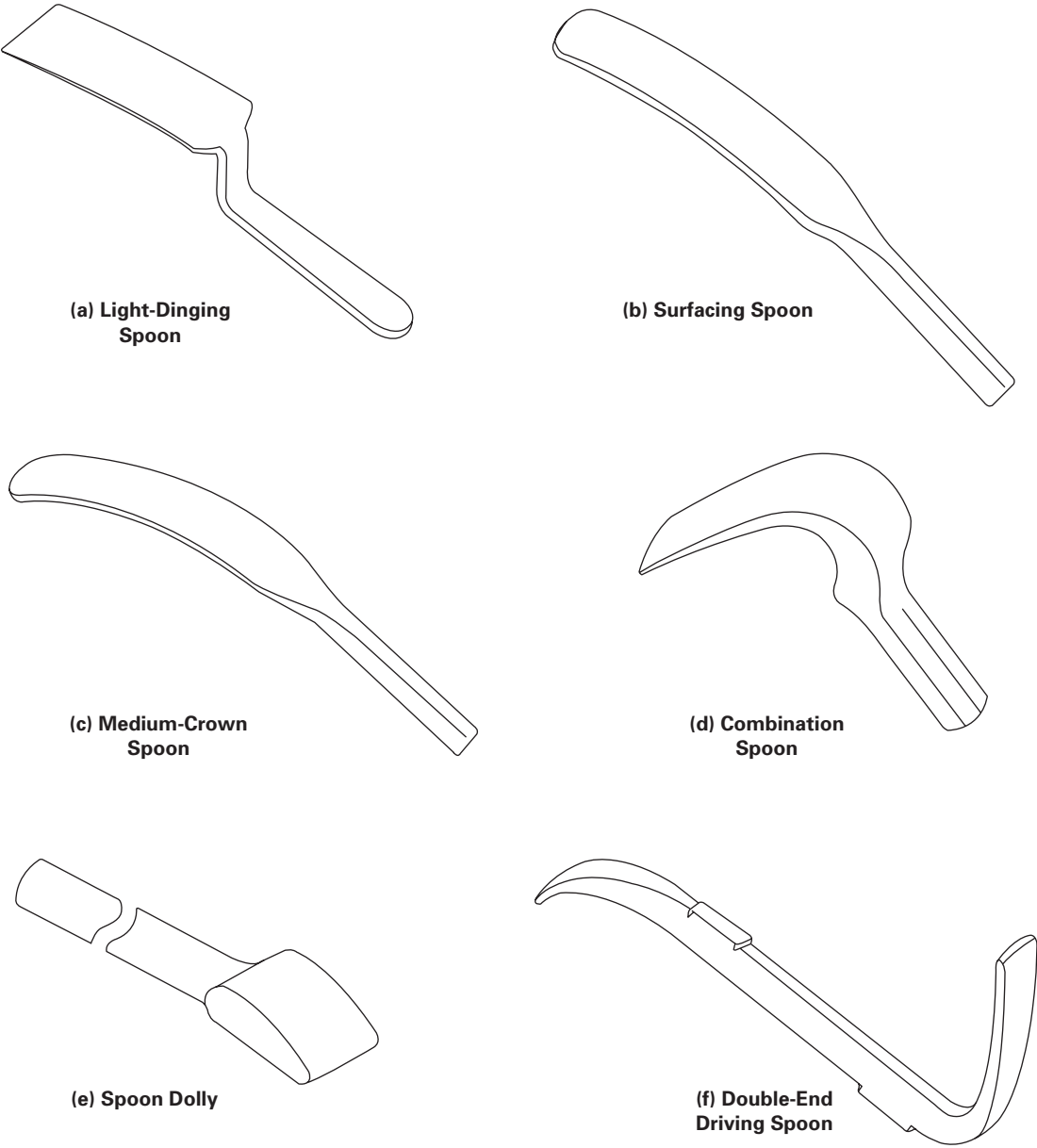


Fig. 6 Typical Styles of Body Spoons



(b) *Surfacing Spoon*. Low-crown spoon for spring hammering, slapping, and finishing.

(c) *Medium-Crown Spoon*. For reducing high ridges or prying. High crown versions are also available.

(d) *Combination Spoon*. Heavy-duty, general-purpose, high-crown spoon with an offset handle. Can be used as a dolly.

(e) *Spoon Dolly*. The long handle permits use in difficult-to-reach areas. Use as a spoon, dolly, or pry, and for caulking.

(f) *Double-End Driving Spoon*. Can be driven between panels. Use as a pry or spoon. Bevel edge tips.

5.2 Materials

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

5.3 Hardness

5.3.1 Type I: Body Repair Hammers. The striking faces and peen ends of body repair hammerheads shall be hardened and tempered to 48 HRC to 60 HRC or equivalent. The struck face of fender bumper body repair hammerheads shall not exceed 45 HRC or equivalent.

5.3.2 Type II: Dolly Blocks. The hardness of dolly blocks shall be 40 HRC to 52 HRC or equivalent.

5.3.3 Type III: Spoons. The hardness of body repair spoons shall be 38 HRC to 48 HRC or equivalent.

6 TESTS

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

Separate (new) samples shall be used for each of the tests.

6.1 Hardness Test

Hardness determination shall be made per ASTM E 18.

6.2 Striking and Tensile Force Test—Type I

Prior to tensile force testing, sample body repair hammers shall be subjected to a preconditioning striking test as specified in para. 6.2.1, 6.2.2, or 6.2.3 as applicable, using the following test setup:

A rigidly supported steel bar, with a minimum diameter of 6 in., a minimum height of 3 in., and a hardness of 92 HRB to 105 HRB or equivalent, shall be used to support a 26-gage (0.0179 in.) steel metal panel that fully covers the steel bar (see Fig. 7).

The hammer handle shall not splinter, break, loosen, or separate. The striking faces, points, peens, or chisel

ends of body repair hammerheads shall not sink, mushroom, chip, crack, or spall.¹

Swinging blows shall be struck by a person of average build, 160 lb to 180 lb, commensurate with the end use and weight of the tool. The blows shall be struck with the hammer held or fixtured at the normal gripping area. The test shall be conducted at room temperature.

6.2.1 Dinging, finishing, bumping, and ball-peen hammer ends shall withstand twenty full swinging blows through a 90-deg arc.

6.2.2 Pecking, cylindrical cross-peen, cross-peen, cross-chisel, and shrinking hammer ends shall withstand twenty full swinging blows through a 45-deg arc.

6.2.3 Fender-bumper body repair hammers shall be subject to the preconditioning striking test that uses the same test setup as shown in Fig. 7. The cylindrical cross-peen shall be held against the sheet metal with the handle extending horizontally. The striking face of a 16-oz ball-peen hammer shall be used to subject the struck face of the fender-bumper hammer to twenty full swinging blows through a 90-deg arc. The fender-bumper hammerhead shall not chip, crack, spall, or mushroom.

Following the preconditioning striking test, the hammerhead shall not loosen or separate from the handle when subjected to a static tensile force of 400 lbf.

6.3 Static Force Test—Type I

Samples of the assembled body repair handles shall not break, loosen, or otherwise fail when subjected to a static force (see Fig. 8) of 25 lbf while

(a) the hammerhead is locked securely in the test fixture with the striking face down and the handle extended in a horizontal plane.

(b) a static force of 25 lbf is applied vertically at a point on the handle measuring 10 in. from the top of the hammer.

6.4 Grip Tests

6.4.1 Solvent Resistance Test. Grips shall be fully immersed in the test fluids specified 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 sample tool handle.

6.4.2 Following the solvent resistance test, sample tool shall be secured by hand and the grip twisted at the normal hand position in alternating directions producing a torque of 40 lbf-in. to 60 lbf-in. (approximated

¹ The striking test is so severe that a degree of permissible deformation of serrations on the striking face of hammers can be anticipated.

Fig. 7 Striking Test Setup for Body Repair Hammers

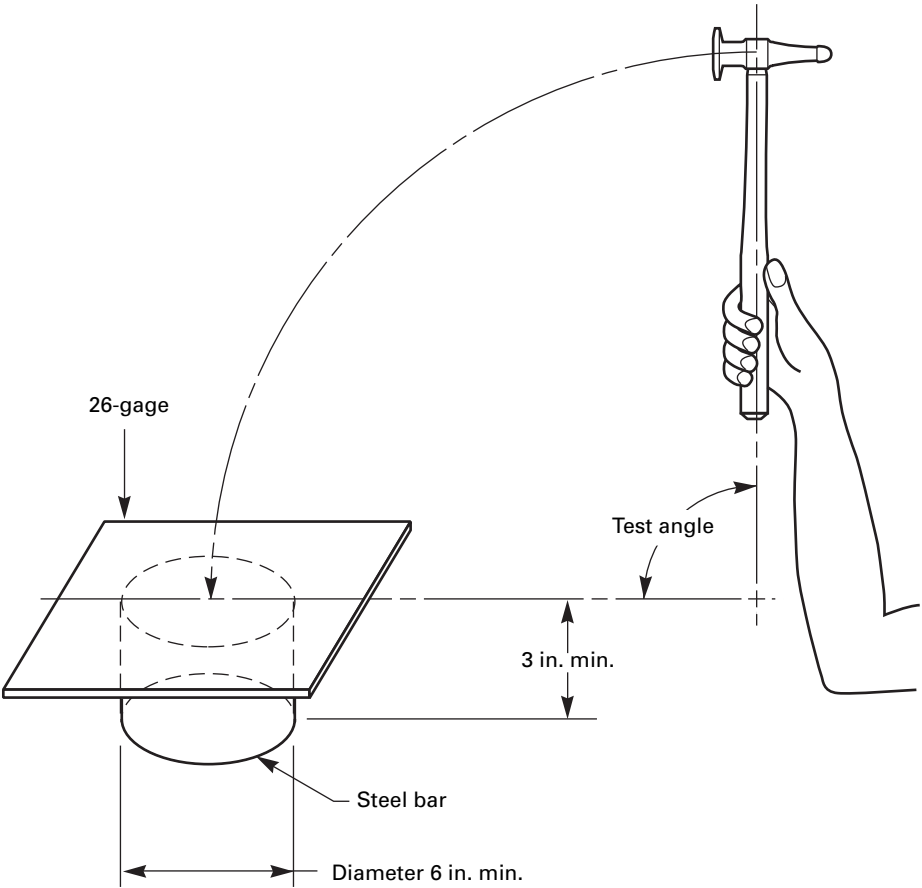
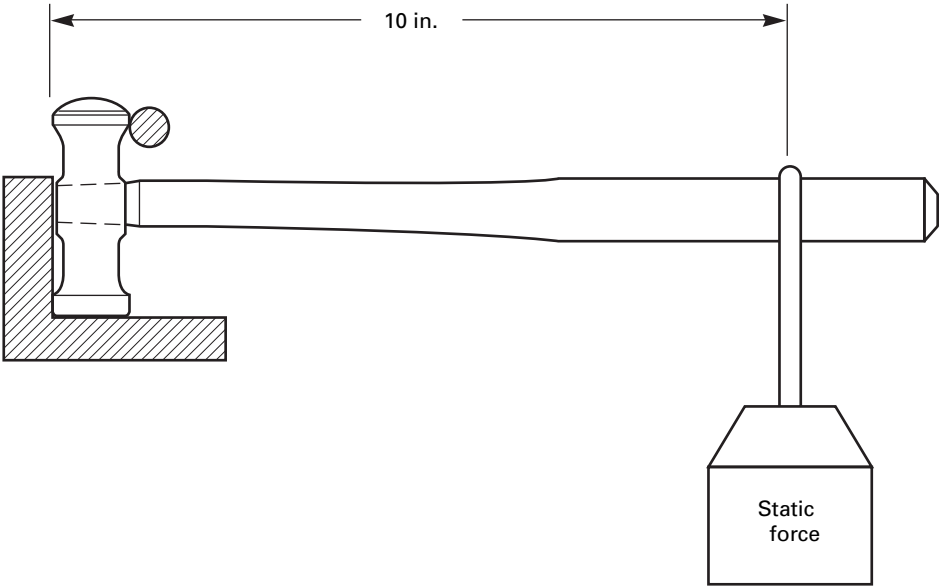


Fig. 8 Typical Static Force Test



by a person of average build, 160 lb to 180 lb). Five alternating twisting motions shall be performed. Grips shall not loosen or separate from handle.

6.4.3 Following the twisting test, grips shall be tested per (a) or (b) below as applicable.

(a) Mechanically bonded grips shall be tensile tested using the values for wedged tools in para. 6.2 (for both wedged and nonwedged tools) applying the force only to the grip. 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.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of body repair 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) Body repair hammers, dolly blocks, and spoons are special-purpose tools designed and intended only for use in straightening, shaping, shrinking, picking, and finishing damaged sheet metal panels normally found on bodies and fenders of motor vehicles. They are intended to be used separately or together for these repair procedures.

(b) Dolly blocks shall not be struck directly by any type of hammer or other striking tool.

(c) To avoid possible eye or other bodily injury, body repair hammers, spoons, and dolly blocks shall not be used to strike objects other than sheet metal panels.

(d) The cheeks or necks of body repair hammers and the handles or edges of spoons shall not be used for striking or pounding.

(e) To avoid possible injury from 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 striking tool is being used.

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

(g) Handles shall be inspected prior to each use and those damaged shall be replaced. Handles shall be free of splinters or cracks and shall be kept tight in the tool. Replacements shall withstand the test requirements specified in paras. 6.2 and 6.3 and shall be equivalent to the original handle in size and quality.

(h) No area section or portion of the body repair hammerhead, spoon, or dolly block shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer, except for dolly blocks as indicated in para. 7(i).

(i) Dolly blocks shall be inspected prior to each use and discontinued at the first sign of chipping or cracking. Any mushrooming of the working surface of the dolly block from tool usage shall be promptly redressed to the original contour by the use of a whetstone or file.²

(j) Finishing or dinging hammers should be used for final shaping of damaged area only after roughing out procedure to get inside the damaged area with a heavy hammer, or other tool such as a dolly block, and beat or push the whole area out roughly to shape. Heavy body hammers or dolly blocks should be used for roughing out.

(k) Each body repair hammer and replacement handle, spoon, and dolly block shall be stamped, labeled, or otherwise marked with the following safety message or equivalent:



WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

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

² It is understood that industrial users with adequate facilities and properly trained personnel may choose to redress or resharpen these tools by other means without altering the metallurgical characteristics of the tools.

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BRICKLAYERS' HAMMERS AND PROSPECTING PICKS

1 SCOPE

This Standard provides performance and safety requirements for bricklayers' hammers that are intended specifically for use in setting and cutting (splitting) bricks, masonry tile, chipping mortar from bricks, and also of prospecting picks that are intended specifically for use in pulling samples from the ground. It is intended to serve as a guide in selecting, testing, and using the hand tools covered. It is not the purpose of this Standard to specify the details of manufacturing.

The 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 formation 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 DEFINITIONS

(See Figs. 1 and 2 as applicable.)

bell (poll): the portion of the hammerhead directly behind the face.

bevel: the underside of the cutting edge (bit) of the bricklayers' hammer.

blade: the tapered portion of the bricklayers' hammerhead directly opposite the face.

chamfer: the angled flat surface or equivalent radius encircling the perimeter of the face of the bricklayers' hammer and prospecting picks and at both ends of the cutting edge of the bricklayers' hammer.

cheeks: see *sides*.

cutting edge (bit): the edge directly opposite the face of the bricklayers' hammerhead at the extreme end of the blade.

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

eye: an opening or aperture in the bricklayers' hammer or prospecting pick located between the blade or pick and the face into which the handle is inserted if the handle is separate.

face: the portion of the bricklayers' hammerhead or prospecting pick head, exclusive of the bell and chamfer, located on the end of the head opposite from the blade or pick end.

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

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

hardness: the condition of the hammerhead or pick head resulting from heat treatment.

neck: on some bricklayers' hammers of alternative design (see Fig. 1), the portion of the hammerhead between the bell and the hammer eye.

pick: the portion of the prospecting pick directly opposite the face.

safety message: the information imprinted on or affixed to the hammer that is intended 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: outside surfaces of the hammerhead, on either side of the eye, located between the blade and chamfer or neck on bricklayers' hammers and the pick end and chamfer on prospecting picks; also called *cheeks*.

top of hammer or pick: the portion of the hammer or prospecting pick head opposite the handle entry.

3 REFERENCES

The following documents are referenced in this Standard. The latest edition shall be used.

ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4, Product Safety Signs and Labels

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

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

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

Fig. 1 Bricklayers' Hammers

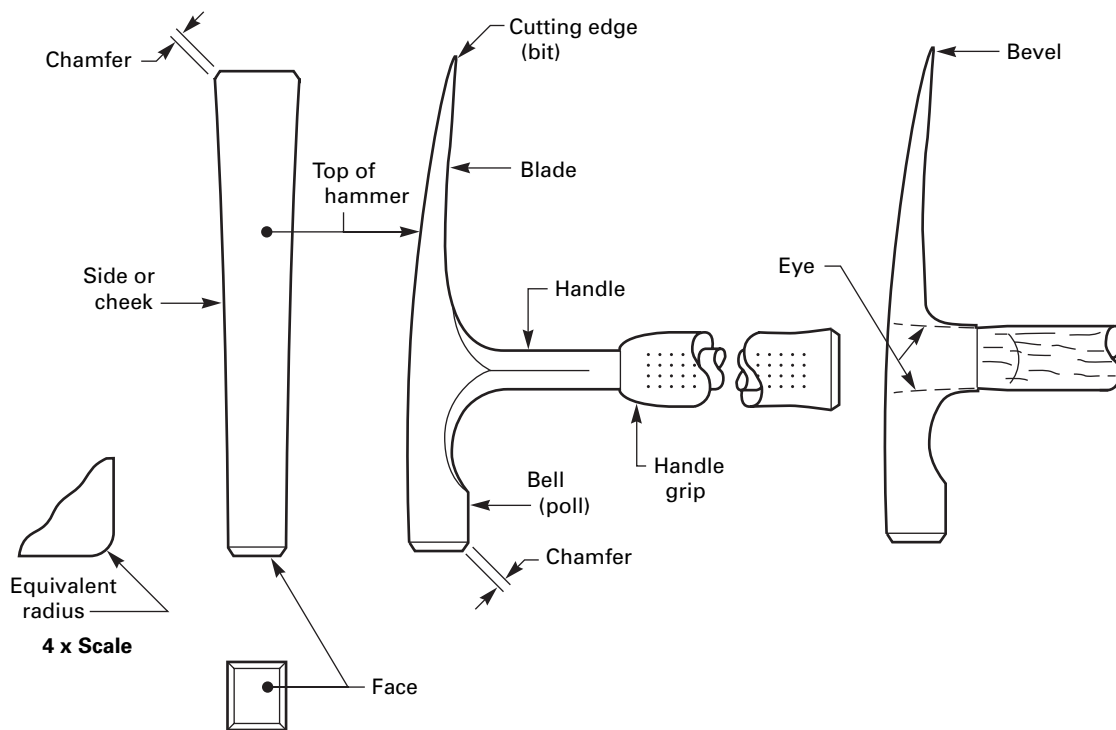
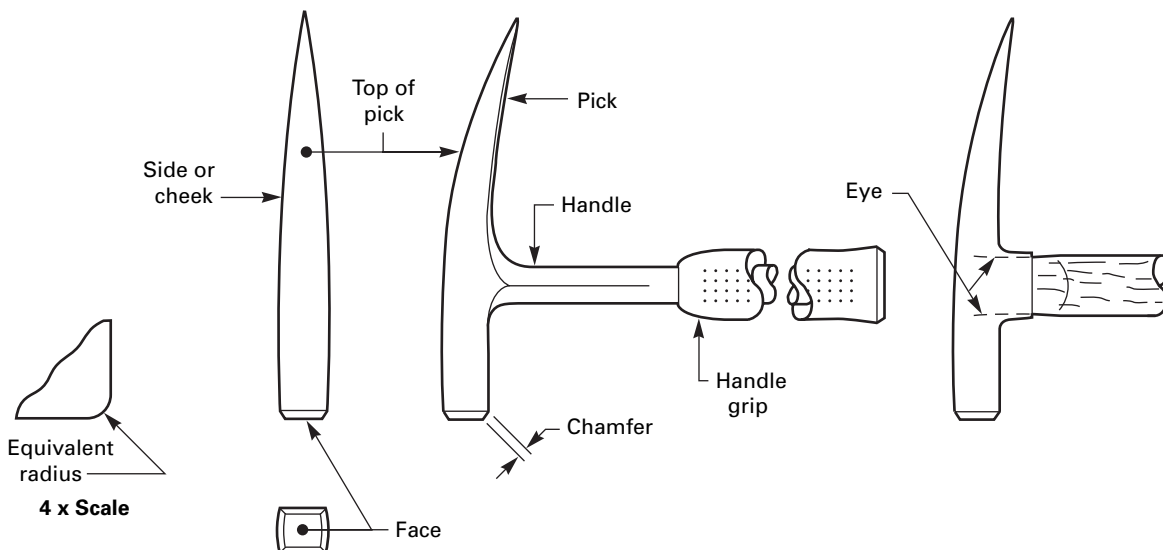


Fig. 2 Prospecting Pick



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

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

SAE J1703 Motor Vehicle Brake Fluid

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

4 PERFORMANCE REQUIREMENTS

4.1 Design

Bricklayers' hammers shall have a face on one end of the head and a cutting edge on the opposite end for use in setting and cutting (splitting) bricks, masonry tile, concrete tile, and concrete blocks and for chipping mortar from bricks. Prospecting picks shall have a face on one end of the head and a pick on the opposite end of the head for use in pulling samples from the ground.

4.1.1 The faces of the heads shall be flat.

4.1.2 The faces shall have a chamfer of 45 deg (or equivalent radius) all around the perimeter with the width equal to approximately 0.06 in.

4.1.3 The underside of the cutting edge or bit of the bricklayers' hammer shall have a bevel of approximately 30 deg to 45 deg. The two outer corners of the cutting edge shall have a chamfer of approximately 45 deg or equivalent radius.

4.1.4 Handles shall be of any design, including ergonomic, that can withstand the tests specified in paras. 5.2 and 5.3.

4.1.5 The head and handle shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury on the user while handling the bricklayers' hammer or prospecting pick.

4.2 Materials

The materials used in the manufacture of bricklayers' hammers and prospecting picks shall be such as to produce tools conforming to the requirements specified herein.

4.3 Mechanical Properties

4.3.1 The faces of the hammerheads and pick heads shall be hardened and tempered to a hardness of 45 HRC to 60 HRC or equivalent. The material directly behind the face shall be a toughened supporting core, gradually decreasing in hardness.

4.3.2 The blade of the bricklayer's hammer and the pick end of the prospecting pick shall be hardened to a hardness of 45 HRC to 60 HRC or equivalent for a minimum distance of 0.75 in. from the bit end and the pick end, respectively.

4.3.3 The face, blade, and pick end shall not sink, mushroom, chip, crack, or spall when subjected to the striking test specified in para. 5.2.

4.3.4 Handles shall not loosen or separate from the head, crack, or break when subjected to the tests specified in paras. 5.2 and 5.3.

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) samples shall be used for each of the tests. Failure to meet the requirements of any of the tests indicates the bricklayers' hammer or prospecting pick is not in compliance with this Standard.

5.1 Hardness Determination Test

Hardness determination with respect to faces, blades, and picks shall be made in accordance with ASTM E 18.

5.2 Striking and Tensile Force Test

Prior to tensile force testing, sample tools shall be subjected to the following striking test. The tools shall withstand 20 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). The test shall be conducted at room temperature. This velocity shall be achieved with the hammer held or fixtured at the normal gripping area.

The tool¹ shall be struck against the smooth, slightly convex surface of a rigidly supported steel object with a minimum diameter of 3 in. and a minimum length of 2 in., the hardness of which shall be equivalent to 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. The striking face shall not mushroom, chip, crack, or spall when subjected to the striking test.²

Following the striking test, assemblies consisting of two or more separate parts (head and handle) shall not loosen or separate when subjected to the static tensile forces of

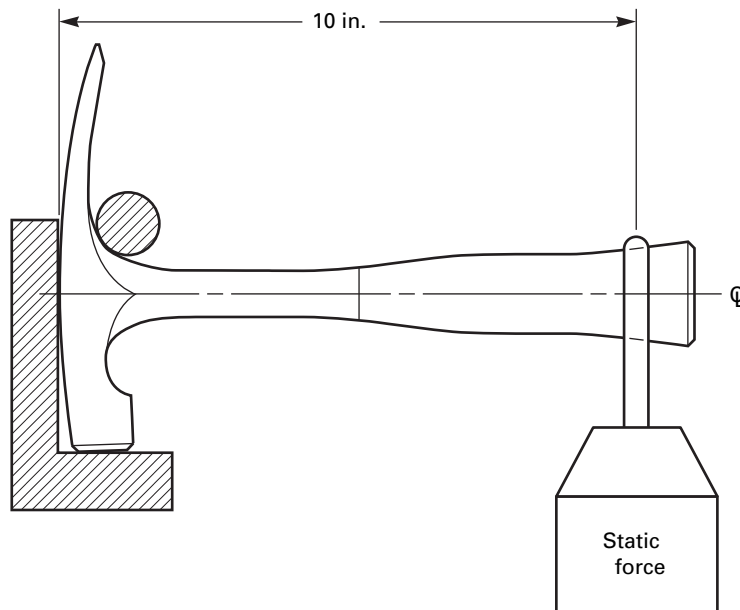
- (a) 400 lbf on tools with head weights of less than 20 oz
- (b) 1,000 lbf on tools with head weights of 20 oz and greater

5.3 Static Force Test

The hammerhead or pick head shall be locked securely in test fixture with the face down and the handle extended in the horizontal plane. A static force shall be

¹ The tool face is flat. Thus, the struck surface should be convex. Striking flat surface against flat surface should be avoided.

² The striking test is so severe that a degree of permissible deformations or serrations on the striking face of hammers can be anticipated.

Fig. 3 Typical Static Force Test

applied vertically at a point on the handle measuring 10 in. from the top of the hammer (see Fig. 3). The force shall be as follows:

- (a) 80 lbf on tools with head weights of less than 20 oz
- (b) 100 lbf on tools with head weights of 20 oz and greater

Handles shall not break, loosen, or otherwise fail.

5.4 Grip Test

5.4.1 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 or pick handle.

5.4.2 Following the Solvent Resistance Test, hammers and picks 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.

5.4.3 Following twisting, grips shall be tested per (a) or (b) below.

(a) Mechanically bonded grips shall be tensile-force tested using the values in para. 5.2 (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) To avoid possible eye or other bodily injury, bricklayers' hammers and prospecting picks shall be used only for the purposes specified in section 1 and shall not be used to strike hard or hardened objects such as masonry nails, brick chisels or sets, hatchets, axes, splitting wedges, mauls, other hammers, and other steel tools or be struck by any striking tool or other hardened object.

(b) 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 a bricklayers' hammer or prospecting pick or any striking tool is being used to avoid injury from possible flying objects.

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

(d) No area, section, or portion of the head of a bricklayers' hammer or prospecting pick shall be ground,

welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer except that a dull cutting edge or pick end may be redressed to its original contour using a hand file or whetstone.

(e) Handles shall be inspected prior to each use and damaged handles shall be replaced. Handles shall be free of splinters or cracks and shall be kept tight in the head of the tool. Replacements shall withstand the test requirements specified in paras. 5.2 and 5.3 and shall be equivalent to the original handle in size and quality.

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

(g) Instructors or employers shall stress proper use and safety in the use of bricklayers' hammers and prospecting picks 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 safe use of these tools.

(h) Each bricklayers' hammer or prospecting pick 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 safety message shall be located in a position that will not interfere with the quality or performance of the tool. It shall also appear on all replacement handles.

Pictorials are an accepted equivalent. The principles set forth in ANSI Z535.4 shall be used as the guide for alternative, equivalent methods of labeling.

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RIVETING, SCALING, AND TINNER'S SETTING HAMMERS

1 SCOPE

This Standard provides performance and safety requirements for riveting, scaling, and tinner's setting hammers that are used in specific applications.

(a) Riveting hammers are intended specifically for driving, spreading, and setting unhardened rivets in hardened materials (also called tinner's or machinist's riveting hammers).

(b) Scaling hammers are intended specifically for removing scale, paint, welding flux, rust, or other similar flaking material from the surface of unhardened metal (also called chipping hammers).

(c) Tinner's setting hammers are intended specifically for closing, forming, and peening sheet metal (also called peening hammers).

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 the 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 DEFINITIONS

(See Figs. 1, 2, and 3 as applicable.)

bevel: the angular portion on scaling and tinner's setting hammers adjacent to the bit or peen edge.

bit: the portion of the scaling hammer at the extreme end of the bevel.

chamfer: the bevel or equivalent radius of riveting and tinner's setting hammers encircling the perimeter of the striking face; also refers to the bevels on the ends of the peen faces, peen edges, or bits of hammers.

eye: an opening or aperture in the head into which the handle is inserted if the handle is separate.

handle: the portion that protrudes from the 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 hammerhead resulting from heat treatment.

peen: the portion between the eye and peen face on riveting hammers, between the eye and peen edge on tinner's setting hammers, or between the eye and bevels on scaling hammers.

peen edge: the portion of tinner's setting hammers directly opposite the striking face.

peen face: the portion of rivet hammers directly opposite the striking face.

poll: the portion between the eye and striking face chamfer on riveting hammers and tinner's setting hammers.

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

shall: indicates mandatory requirements of this Standard.

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

spalling: chipping or separation of material.

striking face: the portion of the hammerhead, exclusive of the poll and chamfer, directly opposite the peen face or peen edge.

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

3 REFERENCES

The following documents form a part of this Standard to the extent specified herein. The latest edition shall be used.

ANSI Z87.1 Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4 Product Safety Signs and Labels

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

ASTM E 18 Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

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

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

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

Fig. 1 Riveting Hammer Nomenclature

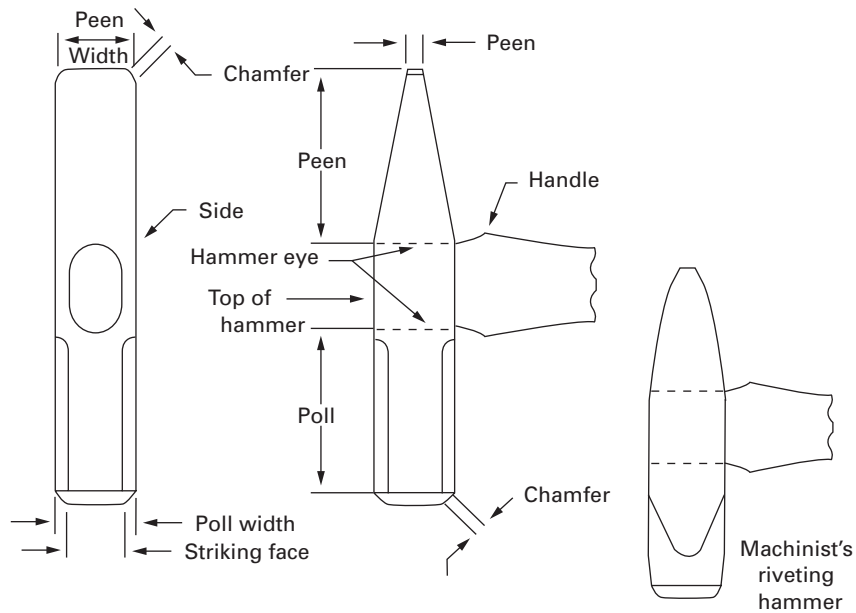


Fig. 2 Scaling Hammer Nomenclature

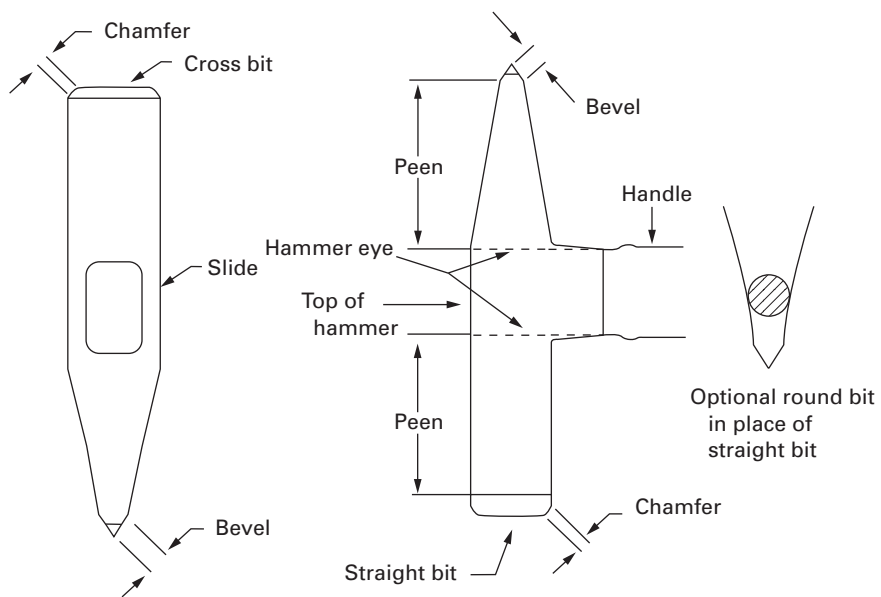
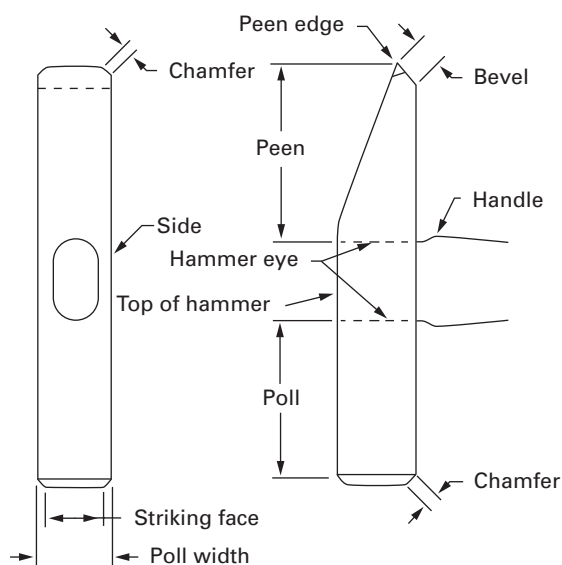


Fig. 3 Tinner's Setting Hammer Nomenclature

SAE J1703 Motor Vehicle Brake Fluid

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

4 PERFORMANCE REQUIREMENTS

Hammers shall be capable of passing tests specified in paras. 5.2 through 5.6.

4.1 Design

Riveting, scaling, and tinner's setting hammers shall have a special purpose shape on one end and either a striking face or another special purpose shape on the opposite end. Both ends shall be designed for the specific purposes specified in section 1. Various typical styles are referred to and are shown in Figs. 1, 2, and 3.

4.1.1 The striking face shall have a chamfer of approximately 45 deg (or equivalent radius) all around the perimeter, with a width equal to approximately one-tenth across the poll width as measured across the chamfer angle. For example, if the width across the poll directly behind the chamfer equals 1.0 in, then the chamfer width equals approximately 0.1 in.

4.1.2 The striking face of the tinner's setting hammer shall be flat. The striking faces of riveting hammers shall be flat or slightly convex.

4.1.3 The peen face of riveting hammers shall be rounded.

4.1.4 The ends of peen faces, peen edges, or bits shall have a chamfer of approximately 45 deg or equivalent radius.

4.1.5 Handles shall be of any design, including ergonomic, that can withstand the tests specified in paras. 5.3, 5.4, and 5.6 (if applicable).

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

4.2 Materials

4.2.1 The materials used in the manufacture of hammers shall be such as to produce hammers conforming to the requirements of this Standard.

4.2.2 Hammerheads shall be free of manufacturing and material defects such as seams, laps, pipes, and cold shuts that would jeopardize sound construction. They shall conform to the requirements for mechanical properties specified in para. 4.3 and shall withstand the striking test specified in para. 5.3 and the spalling test specified in para. 5.5.

4.3 Mechanical Properties

4.3.1 The striking face, peen face, peen edge, and bit shall be hardened and tempered to a hardness of 45 HRC to 60 HRC or equivalent. The material directly behind these areas (poll) shall be a toughened supporting core gradually decreasing in hardness.

4.3.2 The hammer striking face shall not mushroom, chip, crack, or spall when subjected to the test specified in paras. 5.3 and 5.5.

4.3.3 Handles shall not loosen or separate from the hammerhead, crack, or break when subjected to the tests specified in paras. 5.3 and 5.4.

5 TESTS

Many tests required herein are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests. These tests are designed to evaluate the tools and materials and do not condone the use of the tools in an environment or in a manner inconsistent with safe use of the tools.

5.1 General

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 are not in compliance with this Standard.

5.2 Hardness Determination Test

Hardness determination with respect to the striking faces, peens, and bits shall be made on a fixtured hammer or on a mounted or unmounted specimen that has been cut from the hammer using the wet abrasive or other equivalent method. Any hardness test will be

acceptable that utilizes equipment and method equivalent to Rockwell hardness determination as specified in ASTM E 18.

5.3 Striking and Tensile Force Tests

Prior to tensile force testing, sample hammers shall be subjected to the striking test specified in paras. 5.3.1 and 5.3.2.

5.3.1 The tool shall withstand twenty full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and weight of the tool. The test shall be conducted at room temperature. The blows shall be struck with the hammer held or fixtured at the normal gripping area.

5.3.2 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 equivalent to a hardness of 92 HRB to 105 HRB.¹

Following the striking test, assemblies consisting of two or more separate parts (head and handle) shall not loosen or separate (see Fig. 4) under the minimum tensile forces shown below.

Hammerhead Weight, oz	Static Tensile Force, lbf
Less than 16	300
16 and over	800

5.4 Static Force Tests

5.4.1 Test Procedure. While the hammerhead 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 (see Fig. 5).

5.4.2 Samples. Samples of the assembled hammer handles shall not break, loosen, or otherwise fail when subjected to the static force test. The minimum testing loads or bending forces are dependent on the nominal head weight and are shown in the following table:

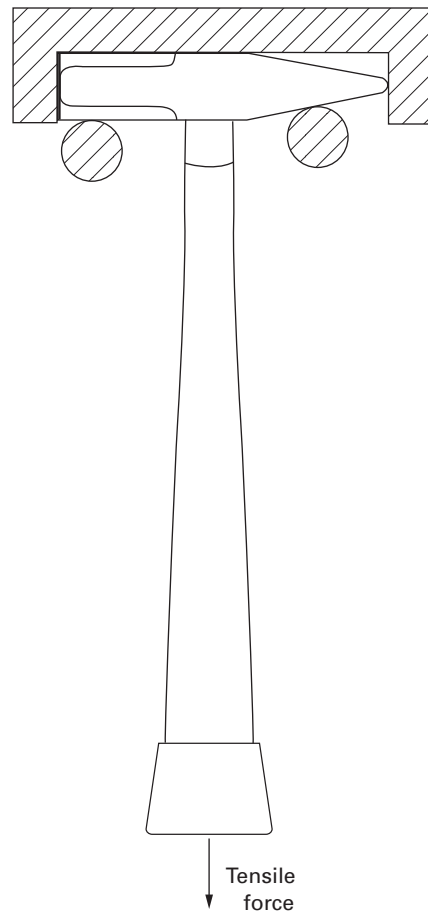
Hammerhead Nominal Weight, oz	Static Test Force, lbf
7	25
12	60
16	80
Over 16	125

5.5 Spalling Test

The tool shall withstand ten full swinging blows by a person of average build, 160 lb to 180 lb, or the mechanical equivalent, commensurate with the end use and

¹ The severity of the test is such that a degree of permissible deformation such as denting of the bit of scaling hammers is anticipated.

Fig. 4 Typical Tensile Force Test

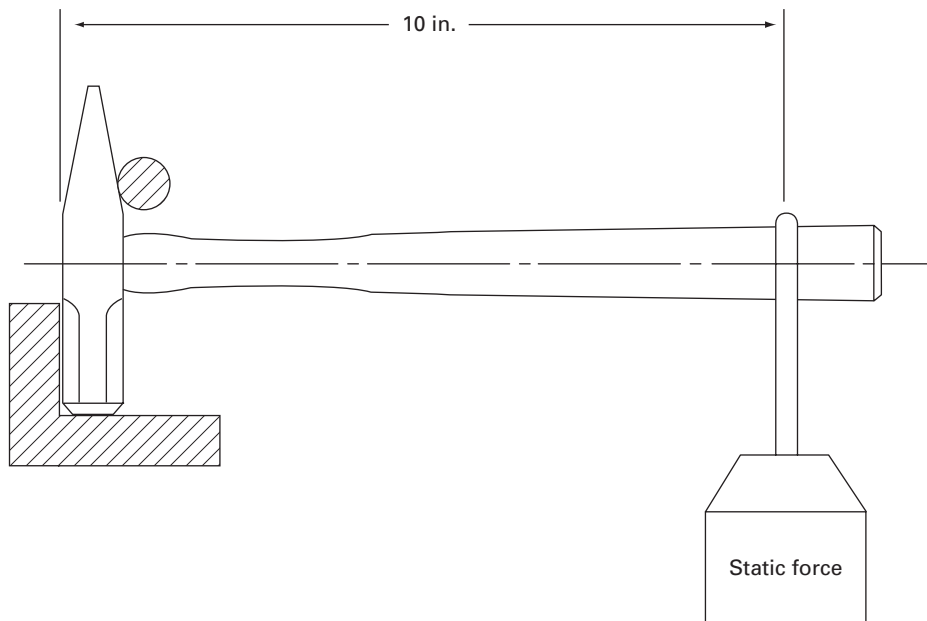


weight of the tool. The test shall be conducted at room temperature. The blows shall be struck against the smooth flat surface of a rigidly supported steel object that has a minimum diameter of 3 in., a minimum length of 2 in., and a minimum hardness of 55 HRC. The face of the struck object shall be 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 Tests

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 or 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.

Fig. 5 Typical Static Force Test

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 (a) or (b) below.

(a) Mechanically bonded grips shall be tensile force tested using the values in para. 5.3. (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 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) To avoid possible eye or other bodily injury, the hammers covered herein shall be used only for the purposes specified in section 1.

(b) The sides of the polls or peens (see Fig. 1) shall not be used for striking or pounding.

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

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

(e) No area, section, or portion of a hammer shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer, except that a dull peen edge or bit may be redressed to its original contour using a hand file or a whetstone.²

(f) Handles shall be inspected prior to each use and those damaged shall be replaced. Replacements shall be capable of withstanding the test requirements in paras. 5.3, 5.4, 5.5, and 5.6 and shall be equivalent to the original handle. Handles of tools shall be free of splinters or cracks and shall be kept tight in the head of the tool.

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

² It is understood that industrial users with adequate facilities and properly trained personnel may choose to redress or re-sharpen these tools by other means without altering the metallurgical characteristics of the tools.

(h) 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

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. This safety message or the equivalent shall appear on all 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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