ASME B107.410-2008

Struck Tools

Incorporation of ASME B107.43, ASME B107.44, ASME B107.46, ASME B107.48, ASME B107.49, ASME B107.50, ASME B107.52, and ASME B107.59

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

ASME
SETTING THE STANDARD

ASME B107.410-2008

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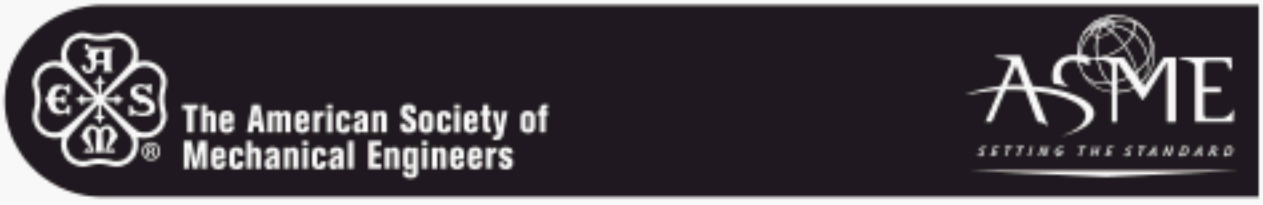

Date of Issuance: July 11, 2008

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 document. 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.

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

CONTENTS

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 B107.410 is to define essential performance and safety requirements specifically applicable to the various struck 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 B107.43, Wood-Splitting Wedges

ASME B107.44, Chisels — Glaziers', Wood, Ripping, Flooring/Electricians' that consolidates revisions to ASME B107.44, Glaziers' Chisels and Wood Chisels: Safety Requirements and ASME B107.45, Ripping Chisels and Flooring/Electricians' Chisels

ASME B107.46, Stud, Screw, and Pipe Extractors: Safety Requirements

ASME B107.48, Metal Chisels, Punches, and Drift Pins

ASME B107.49, Nail Sets

ASME B107.50, Brick Chisels, Brick Sets, and Star Drills that consolidates revisions to ASME B107.50M, Brick Chisels and Brick Sets: Safety Requirements and ASME B107.51, Star Drills: Safety Requirements

ASME B107.52, Nail-Puller Bars and Pry Bars that consolidates and revises ASME B107.52M, Nail-Puller Bars: Safety Requirements and ASME B107.60, Pry Bars

ASME B107.59, Slugging and Striking Wrenches

In addition to the consolidation of struck tools into these Standards, 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 B107.43 was approved by the American National Standards Institute on September 16, 2002; ASME B107.44 was approved on March 9, 2007; ASME B107.46 was approved on May 25, 2004; ASME B107.48 was approved on March 14, 2005; ASME B107.49 was approved on October 5, 2004; ASME B107.50 was approved on September 11, 2007; ASME B107.52 was approved on August 17, 2007; and ASME B107.59 was approved on July 12, 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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CORRESPONDENCE WITH THE B107 COMMITTEE

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 B107.43

WOOD-SPLITTING WEDGES

1 SCOPE

This Standard provides performance and safety requirements for splitting wedges that are used specifically for splitting wood. 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.

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

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 NORMATIVE REFERENCES

The following documents form a part of this Standard to the extent specified herein. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below. Copies of the publications may be obtained from publishers as indicated.

ANSI Z87.1-1998, Practice for Occupational Educational Eye and Face Protection

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

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

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

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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. 1 Wood-Splitting Wedge Nomenclature

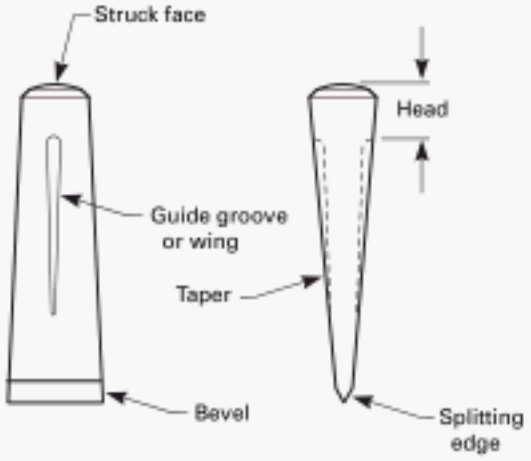
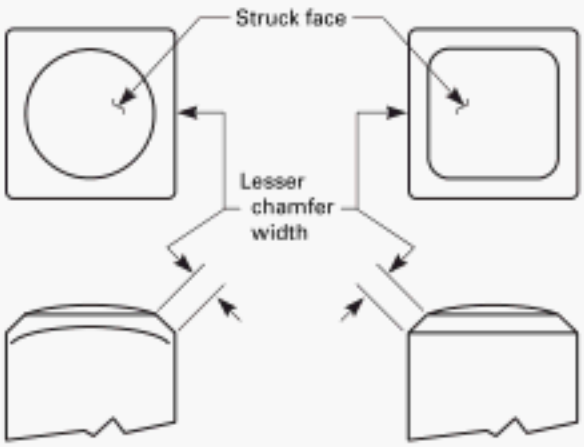


Fig. 2 Nomenclature and Alternate Head Designs for Square Head Wedges



3 DEFINITIONS

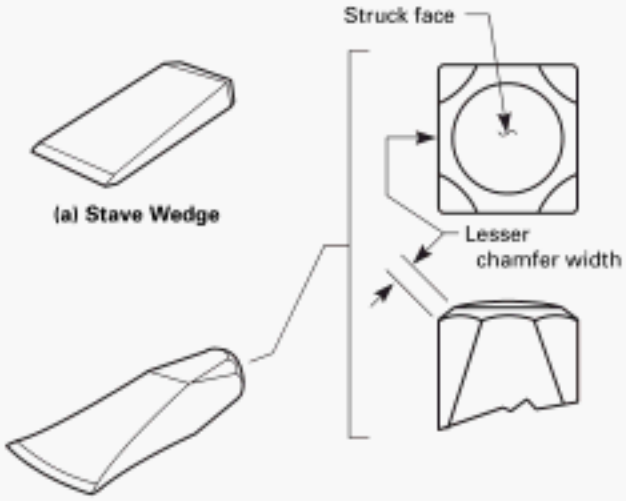
See Figs. 1, 2, and 3 as applicable.

bevel: the angular portion of the wedge adjacent to the splitting edge and extending to the taper.

chamfer: the angled flat surface or equivalent radius of the wedge encircling the perimeter of the struck face.

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

Fig. 3 Stave and Oregon Splitting Wedges



guide grooves or wings: when provided, the long, narrow impressions or protrusions located on opposite sides of the taper.

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

head: the portion of the wedge between the struck face and the taper.

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

shall: characterizes mandatory requirements of this Standard.

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

splitting edge: the edge formed by the bevel directly opposite the struck face.

struck face: the portion of the wedge located adjacent to the head directly opposite the splitting edge.

taper: the portion of the wedge with a gradually reducing cross-sectional area, located between the head and the bevel.

4 REQUIREMENTS

4.1 Design

Wood-splitting wedges shall have a splitting edge and taper for splitting wood, and a struck face to be struck by the appropriate striking tool. An *appropriate striking tool* shall mean a sledge or woodchopper's maul with a striking face not less than 0.375 in. (9.50 mm) larger in diameter than the struck face of the wood-splitting wedge.

Typical styles of wood-splitting wedges are shown in Figs. 1, 2, and 3, and their uses are listed below. The names are those generally recognized; however, styles are not limited to those named or illustrated.

Style	Applications
Square head	Splitting logs and wood products
Oregon splitting	Splitting logs and wood products
Stave wedge	Splitting narrow strips of wood, such as barrel staves

(a) The struck face shall have a flat or convex shape.

(b) The struck face of all wedges shall have a chamfer of approximately 45 deg (or equivalent radius) around the perimeter, with the lesser width equal to approximately one-tenth of the minimum head width. For example, if the minimum head width equals 2 in. (50.8 mm), then the lesser chamfer width will equal approximately 0.2 in. (5 mm).

(c) All wedges shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury on the user when handling the tool.

(d) Wedges shall pass the tests outlined in section 5.

4.2 Materials

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

4.3 Mechanical Properties

The hardness of the wood-splitting wedges shall not exceed 35 HRC or equivalent.

5 TESTS

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

Separate (new) wedges shall be used for each test. Failure to meet the requirements of either test indicates that the wedges do not comply with this Standard.

5.1 Hardness Determination Test

Hardness determination shall be made on a fixtured wood-splitting wedge 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 will be acceptable that uses equipment and methods equivalent to Rockwell hardness determination as specified in ASTM E 18.

5.2 Struck Face Test

The wedge shall be vertically mounted and supported with the splitting edge resisting directly on a mild steel plate of not less than 0.75 in. (19.1 mm) thickness. The steel plate shall be rigidly supported on an anvil or other similar device of sufficient mass to resist deflection. Prior to conducting this test, care should be taken to blunt the splitting edge to ensure that the impact energy is

not expended in deformation of the splitting edge. A steel weight of 10 lb (4.5 kg) with a striking face hardness of 45 HRC to 60 HRC shall be dropped unrestricted from a height of 5.0 ft (1.5 m) onto the wedge a minimum of five times. Typically, the weight is cylindrical and is dropped through a seamless tube slightly larger than the diameter of the weight. The weight shall be dropped in such a manner that each drop applies the full force squarely to the struck face of the wedge.

The struck face shall not crack or chip. Normal deformation of the struck face shall be permitted.[1]

6 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

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

(a) Wood-splitting wedges are special-purpose tools designed and intended only for use in splitting wood.

(b) Wood-splitting wedges shall not be struck with an ax or hatchet.

(c) A blow from an appropriate striking tool shall be struck squarely, with the striking face parallel with a struck face of the wedge. Glancing blows, overstrikes, and understrikes should be avoided.

An *appropriate striking tool* shall be a sledge or woodchopper's maul with a striking face not less than 0.375 in. (9.53 mm) larger in diameter than the struck face of the wood-splitting wedge.

(d) Safety goggles or equivalent eye protection conforming to ANSI Z87.1 shall be worn by the user and all persons in the immediate area where any wedge is being used to avoid possible eye injury from flying objects.

(e) A woodchopper's maul or an ax shall always be used to make a starting notch in the wood to be split.

(f) Wedges shall be inspected prior to each use, and their use discontinued at the first sign of chipping or cracking of any portion of the struck face or cutting edge.

(g) No part of the wedge shall be ground, welded, treated by reheating, or otherwise altered from the original conditions as furnished by the manufacturer, except as indicated in paras. 6(h) and 6(i).

(h) Dulling of the splitting edge may occur from tool usage. It shall be reshaped or redressed to the original contour only by the use of a whetstone or hand file.[2]

(i) Any mushrooming of the struck face from tool usage shall be promptly redressed to the original contour by use of a hand file.[2]

(j) Each wedge shall be permanently stamped or marked by the manufacturer with the following message or the 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 principles given in ANSI Z535.4 shall be used as a guide for alternate, equivalent methods of labeling.

[1] The test is so severe that a degree of permissible deformation, such as denting of the splitting edge and struck face, can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

[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.

ASME B107.44

CHISELS — GLAZIERS', WOOD, RIPPING, FLOORING/ELECTRICIANS'

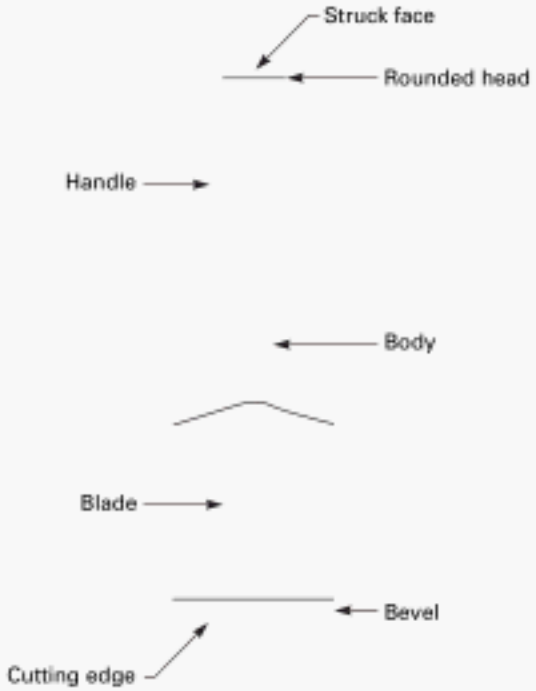
1 SCOPE

This Standard provides performance and safety requirements for glaziers' chisels, wood chisels, ripping chisels, and flooring/electricians' chisels. Glaziers' chisels are intended for installing and removing putty around window panes and for general wood chisel work relating to glazing. Wood chisels are intended for making rough and finish cuts in wood. Ripping and flooring/electricians' chisels are intended for use in cutting wood and light prying, such as cutting the tongue of installed flooring sections and raising and removing floor planks. 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.

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.

Fig. 1 Nomenclature for Glaziers' Chisels



2 DEFINITIONS

See Figs. 1, 2, 3, 4, and 5 as applicable.

bevel: the angular or curved portion of the chisel adjacent to the cutting edge extending to the blade or taper.

blade: the portion of the glaziers' or wood chisel opposite the struck face used for cutting.

body: on glaziers' and wood chisels, the metal portion of the chisel extending from the blade. On ripping and flooring/electricians' chisels, the straight portion of the chisel between the chamfer and the taper.

chamfer: the angled flat surface or equivalent radius between the struck face and the body of the chisel encircling the perimeter of the struck face.

cutting edge: the edge formed by the bevel directly opposite the struck face.

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.

handle: when provided, the portion attached to the body of glaziers' and wood chisels by which the tool is held.

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

nail pulling slot: when provided, the V-shaped slot or opening formed in the taper of certain models of ripping chisels.

permanent set: plastic deformation of the tool as measured per para. 6.5 herein.

rounded head: the equivalent design for the struck face and chamfer portion of the chisel.

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

shall: characterizes mandatory requirements of this Standard.

should: characterizes provisions of an advisory nature, or is stated as a recommendation.

Fig. 2 Nomenclature for All-Steel Wood Chisels

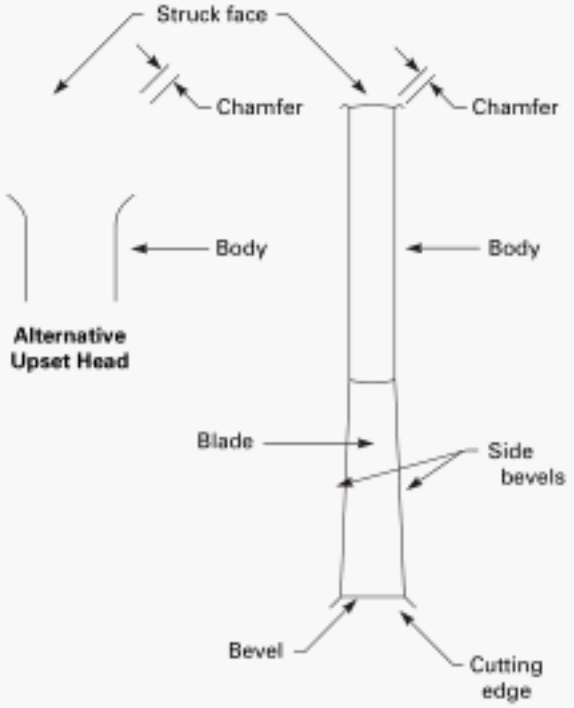
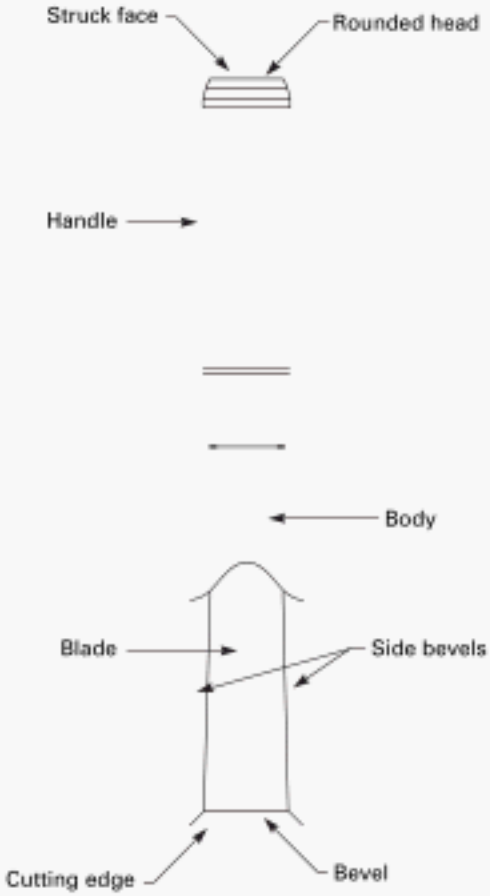


Fig. 3 Nomenclature for Wood Chisels



side bevel: the slanting surface on side edges that decreases blade thickness.

struck face: the portion of the chisel directly opposite the cutting edge.

taper: the portion of the chisel between the body and the bevel with a gradually reducing cross-sectional area.

upset head: when provided, the portion of the chisel body having an enlarged cross-sectional area at the struck end of the tool including and underlying the struck face.

3 REFERENCES

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

ANSI Z87.1-2003, Practice for Occupational and Educational Eye and Face Protection

ANSI Z535.4-2002, Product Safety Signs and Labels

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

ASTM E 18-2005, Standard Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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

4 CLASSIFICATION

(a) Type I: glaziers'
(b) Type II: wood
(c) Type III: ripping
(d) Type IV: flooring/electricians'

5 REQUIREMENTS

The illustrations shown herein are descriptive and nonrestrictive, and are not intended to preclude the manufacture of chisels that otherwise comply with this Standard.

5.1 Design

Chisels shall have a cutting edge on one end and a struck face on the opposite end to be struck by a hammer of the appropriate type and size. The appropriate hammer shall have a striking face not less than 0.375 in. larger in diameter than the struck face of the chisel.

Fig. 4 Nomenclature for Ripping Chisels

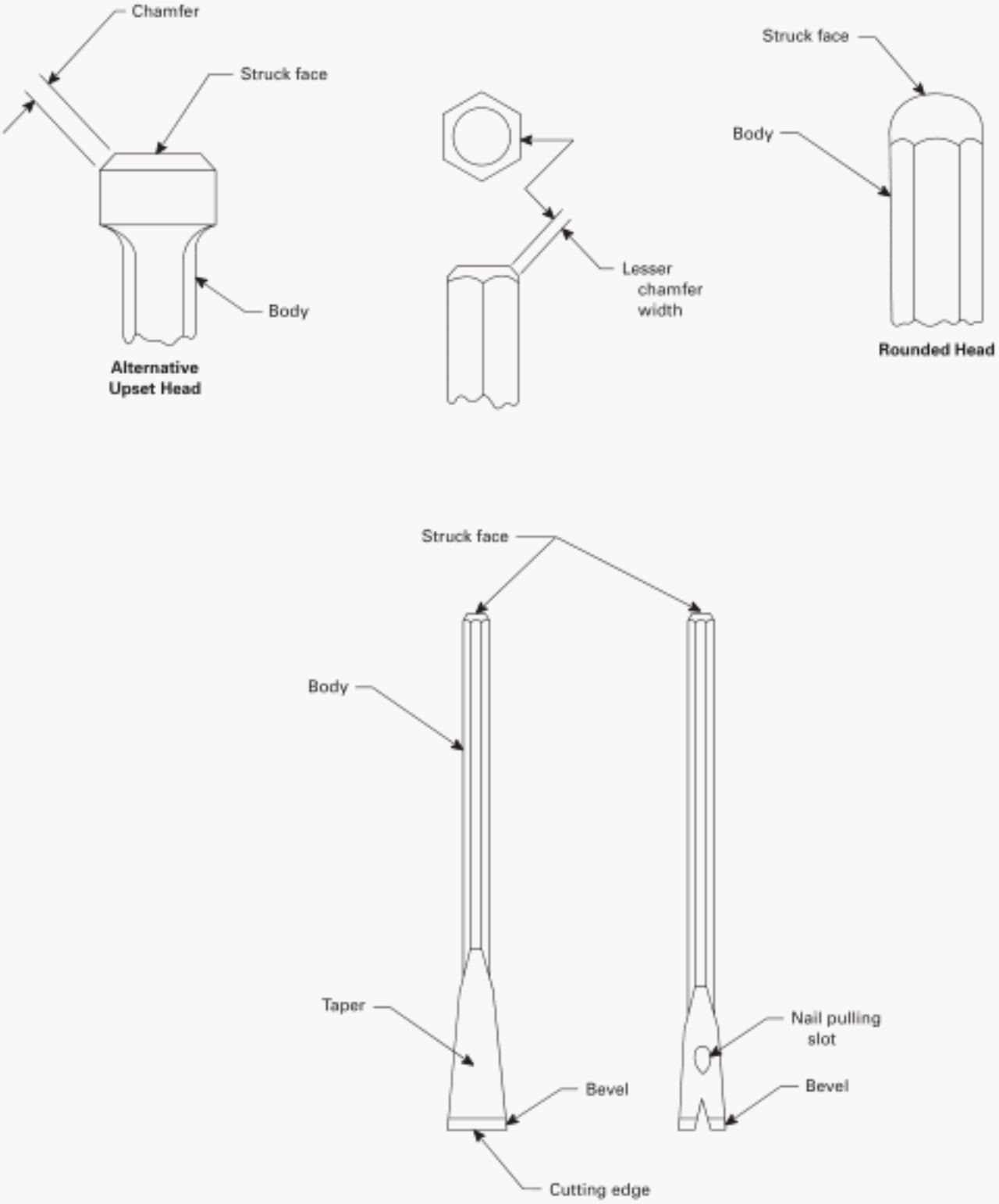
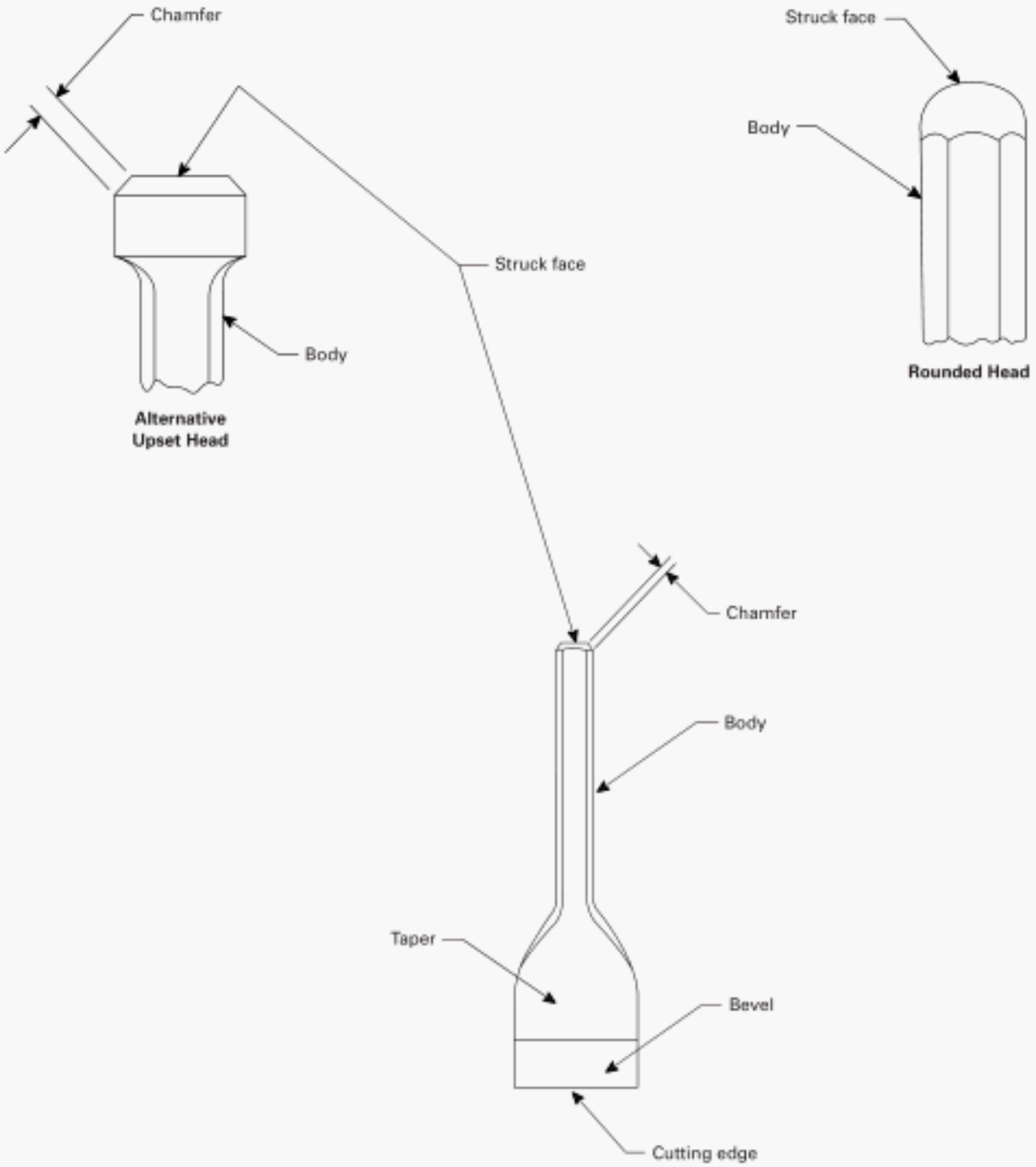


Fig. 5 Nomenclature for Flooring/Electricians' Chisels



The names given in this Standard are those generally recognized. The types covered by this Standard are listed as follows and shown in Figs. 1, 2, 3, 4, and 5:

(a) glaziers' chisel: for installing and removing putty around window panes and for general wood chisel work relating to glazing.

(b) wood chisel: for making rough and finish cuts in wood.

(c) ripping chisels: used as a lever for light prying in dismantling wood construction and removing nails.

(d) flooring/electricians' chisels: used for cutting high spots and tongues from subflooring and removing installed floor sections. These chisels are also used for making cutouts for electrical outlet boxes.

5.1.1 The struck face shall have a convex shape or a flat surface with a chamfer of approximately 45 deg (or an equivalent radius) around the perimeter with the lesser width (see Fig. 2) equal to approximately one-tenth of the body stock size. For example, if the body stock size equals 1 in., then the lesser chamfer width should equal approximately 0.1 in.

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

5.1.3 Chisels shall pass the applicable tests in section 6.

5.2 Materials

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

5.3 Mechanical Properties

(a) Types I and II (glaziers' and wood) chisels shall be hardened and tempered to 53 HRC to 62 HRC or equivalent for a distance of not less than 0.25 in. from the cutting edge.

(b) Types III and IV (ripping and flooring/electricians') chisels shall be hardened and tempered to 30 HRC to 52 HRC or equivalent for a distance of not less than 0.25 in. from the cutting edge.

(c) The hardness of the struck face of the chisel shall not exceed 44 HRC or equivalent.

6 TESTS

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

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

6.1 Hardness Determination Test

Hardness determination shall be made in accordance with ASTM E 18.

6.2 Side Force Test

This test applies only to Types I and II chisels. There shall be no evidence of breaks, cracks, or permanent deformation when a side force as indicated below is applied perpendicular and then parallel to the blade flats at 0.50 in. from the struck face, with the blade rigidly supported 1.5 in. from the cutting edge (see Fig. 6).

Cutting Edge Width, in.	Side Force, lbf
< 0.50	10
≥ 0.50 and < 1.00	20
≥ 1.00 and <1.50	30
≥ 1.50	50

6.3 Impact Test

6.3.1 Types I and II Chisels. Chisels shall be mounted vertically with the cutting edge resting on a hardwood test dowel and oriented at 90 deg to the axis of the dowel (rod). The chisel should be retained in a vertical position with a snug-fitting fixture permitting unrestricted vertical movement in response to the impact of the drop weight on the chisel struck face. The dowel shall have a diameter of 1 in. and shall be made of hardwood, such as maple, birch, or beech.

The dowel with its end grain perpendicular to the cutting edge (see Fig. 7) shall rest on a solid foundation, such as a steel block, weighing not less than 20 lb. A 10 lb cylindrical steel weight, with a striking face hardness of 45 HRC to 60 HRC, shall be dropped 20 times (through seamless tubing slightly larger than the diameter of the weight) onto the chisel struck face from the height indicated below. The test dowel shall be moved after each drop of the weight to make a new impression. The diameter of the striking face of the weight shall be less than 0.375 in. larger than the struck face of the chisel.

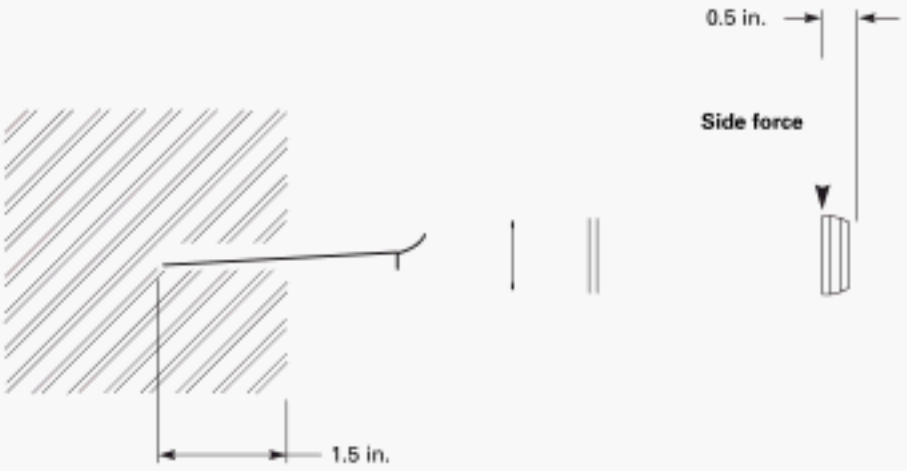
Cutting Edge Width, in.	Drop Height, in
< 0.50	6
≥ 0.50 and ≤ 1.00	12
≥ 1.00	16

There shall be no chipping, cracking, or spalling of either the cutting edge or the struck face, or cracking or bending of the chisel. There shall be no deterioration of the handle. Normal deformation[1] at either end is permitted.

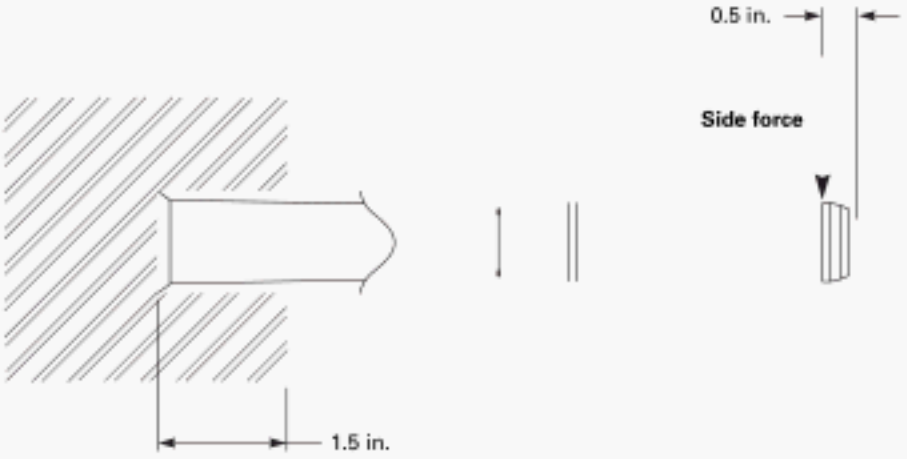
6.3.2 Types III and IV Chisels. The chisel shall be mounted vertically with the cutting edge resting on a steel bar. The chisel shall be retained in a vertical position

[1] This test is so severe that a degree of permissible deformation, such as denting of the cutting edge and the struck face, can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

Fig. 6 Side Force Test for Glaziers' and Wood Chisels



(a) Perpendicular Load



(b) Parallel Load

Fig. 7 Impact Test for Types I and II Chisels

with a snug-fitting fixture permitting unrestricted vertical movement in response to the impact of the drop weight on the chisel struck face.

The bar shall have a minimum thickness of 0.75 in., a width of at least 0.25 in. greater than the width of the chisel cutting edges. The bar shall be mild steel (UNS G10180–G10300) and have a uniform hardness of 80 HRB to 85 HRB. The bar shall rest on a solid foundation, such as a steel block, weighing 20 lb or greater.

A 5 lb cylindrical weight with a striking face hardness of 45 HRC to 60 HRC shall be dropped 20 times (through seamless tubing slightly larger than the diameter of the weight) from a height of 10 in. onto the chisel struck face. The diameter of the striking face of the weight shall not be less than 0.375 in. larger than the struck face of the chisel. The test bar shall be moved after each drop of the weight to make a new impression.

There shall be no chipping, cracking, or dulling of the cutting edge; no mushrooming or chipping of the struck face; and no bending of the chisel. Normal deformation at either end is permitted.[1]

6.4 Tensile Force Test

For chisels with separate handles, the chisel blade and handle shall not loosen when subjected to a 60 lbf tensile force applied at room temperature.

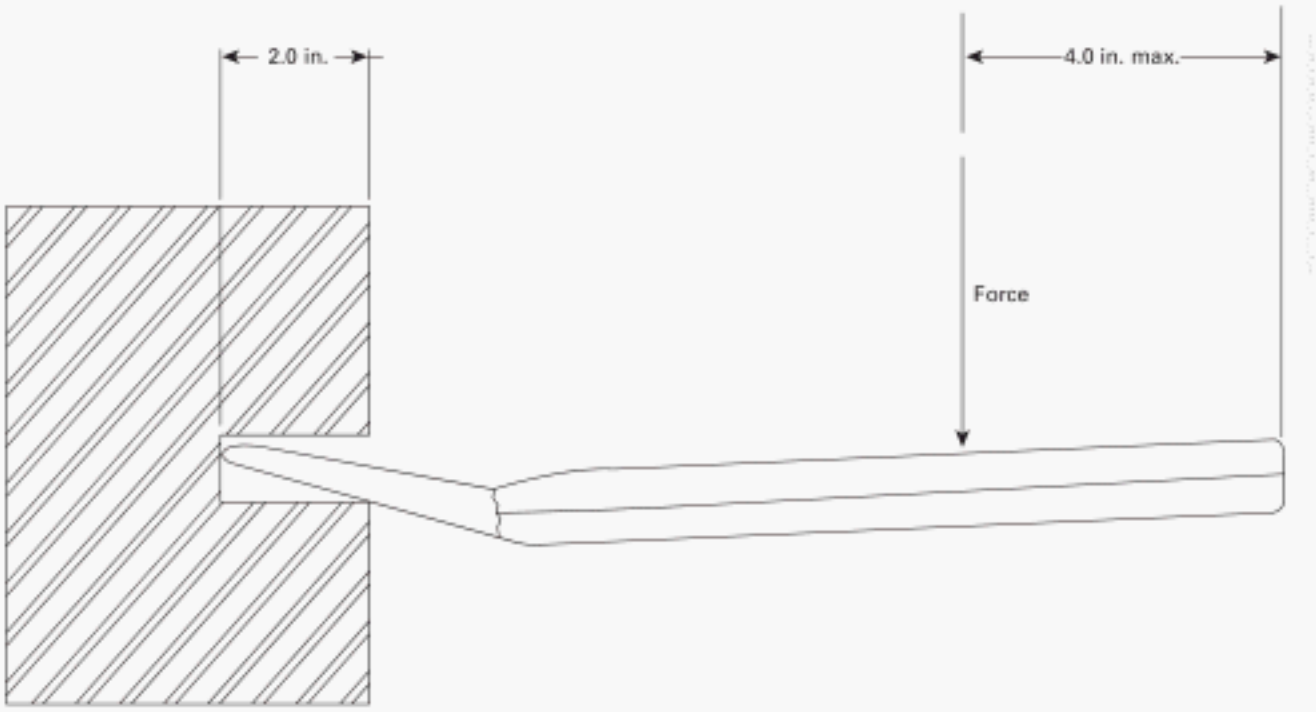
6.5 Permanent Set

6.5.1 Type III Ripping Chisels. Samples shall be supported as illustrated in Fig. 8 and a bending moment of 4,500 lbf-in. applied. After application of the bending moment, the sample shall be removed from the supporting fixture and measured for permanent set. Permanent set is determined by measuring the vertical displacement, relative to the horizontal plane through the centerline of the sample, of a fixed point on the chisel handle (preferably near the struck face end of the chisel) and dividing the displacement by the distance from the fulcrum. Samples pass this test only if all of the following conditions are met after loading the tool:

(a) The sample does not fracture.

(b) The sample does not permanently deform more than 0.1 in./in.

Fig. 8 Permanent Set Test



6.5.2 Type IV Flooring/Electricians' Chisels. Samples shall be supported as illustrated in Fig. 8 and a bending moment of 2,000 lbf-in. applied. After application of the bending moment, the sample shall be removed from the supporting fixture and measured for permanent set. Permanent set is determined by measuring the vertical displacement, relative to the horizontal plane through the centerline of the sample, of a fixed point on the chisel handle (preferably near the struck face end of the chisel) and dividing the displacement by the distance from the fulcrum. Samples pass this test only if all of the following conditions are met after loading the tool:

(a) The sample does not fracture.

(b) The sample does not permanently deform more than 0.01 in./in.

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 the safe use of these tools.

(a) Glaziers' chisels and wood chisels are special-purpose tools designed and intended only for use as listed in paras. 5.1(a) and (b).

(b) Ripping chisels and flooring/electricians' chisels are special-purpose tools designed and intended only for use as listed in paras. 5.1(c) and (d).

(c) To avoid possible eye and other bodily injury, glaziers' chisels and wood chisels shall not be used to cut metal or masonry objects.

(d) To avoid possible eye or other bodily injury, flooring/electricians' chisels shall not be used to cut metal or masonry objects.

(e) A hammer blow should always be struck squarely with the hammer face parallel with the struck face of the chisel. Glancing blows, overstrikes, and understrikes should be avoided.

(f) Glaziers' and wood chisels shall not be used for wedging, nor struck on any surface other than the struck face. The appropriate type and size of hammer shall have a striking face with a diameter not less than 0.375 in. larger than the struck face of the chisel.

(g) Flooring/electricians' chisels shall not be struck on any surface other than the struck face. The appropriate type and size of hammer shall have a striking face with a diameter not less than 0.375 in. larger than the struck face of the chisel.

(h) 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 chisel is being used to avoid possible eye injury from flying objects.

(i) Chisels shall be inspected prior to each use and their use discontinued at the first sign of bending of the chisel, or chipping or cracking of the cutting edge or struck face.

(j) Except as indicated in paras. 7(k) and 7(l), no area, section, or portion of the chisel shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(k) Dulling of the cutting edge may occur from tool usage. The cutting edge shall be resharpened or redressed to its original contour only by the use of a whetstone or hand file.[2]

(l) At the first indication of mushrooming, the chisel struck face shall be redressed to its original contour by the use of a hand file.[2]

(m) Each chisel 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 principles set forth in ANSI Z535.4 shall be used as the guide for alternative, 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.

ASME B107.46

STUD, SCREW, AND PIPE EXTRACTORS: SAFETY REQUIREMENTS

1 SCOPE

This Standard provides performance and safety requirements for handheld screw and pipe extractors that are intended specifically for removing broken screws, pipes, bolts, studs, and fittings from threaded openings.

It is intended to cover only those designs that require striking of the extractor to seat it properly in the broken pipe or fastener being removed. This Standard, therefore, does not cover designs that do not require striking, such as the ground thread extractor.

The Standard 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 for training personnel in safe practices.

This Standard may be used as a guide by state authorities or other regulatory bodies in the formulation of laws or regulations.

2 CLASSIFICATION

Various typical styles of extractors and their usages are listed here and shown in Figs. 1 through 4. The names given in this Standard are those generally recognized. The styles covered by the Standard are not limited to those listed or illustrated.

(a) *Type I:* multi-spline extractor
(b) *Type II:* spiral flute extractor
(c) *Type III:* straight flute extractor
(d) *Type IV:* tapered flute extractor

3 REFERENCES

The following documents are referenced in this Standard. At the time of publication, the editions indicated for dated references were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent edition of the documents indicated below. If a date is not specified, 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: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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

4 DEFINITIONS

body: the portion of the extractor exclusive of the taper and/or flutes.

chamfer: the angled flat surface or equivalent radius between the struck face and the body of the extractor encircling the perimeter of the struck face.

cutting edge: the edge formed by the flute.

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

flute: the straight or spiral groove that forms the cutting edge of the extractor.

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

rounded head: an equivalent design for the struck face and chamfer portion of the extractor.

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

shall: characterizes mandatory requirements of this Standard.

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

struck face: the portion of the extractor, directly opposite the fluted or tapered end.

taper: the portion of the extractor, when provided, opposite the struck face with a gradually reducing cross-sectional area.

Fig. 1 Nomenclature for Straight Flute Extractor

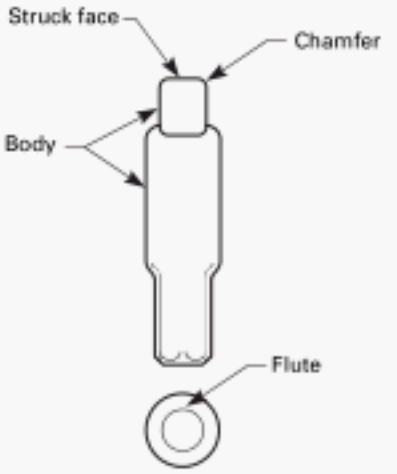


Fig. 2 Nomenclature for Multi-Spline Flute Extractor

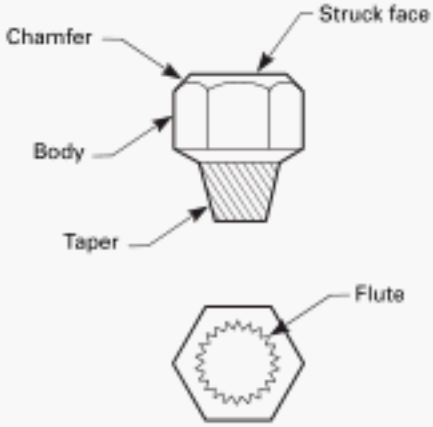


Fig. 3 Nomenclature for Spiral Flute Extractor

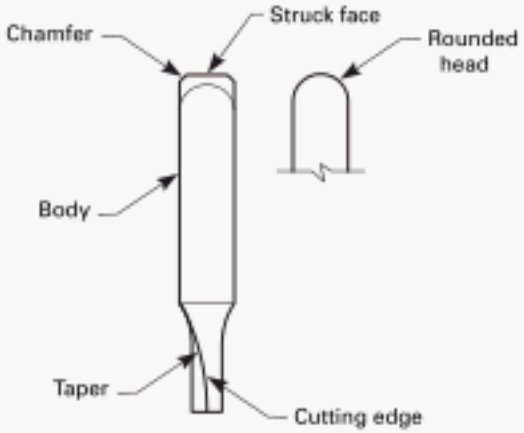
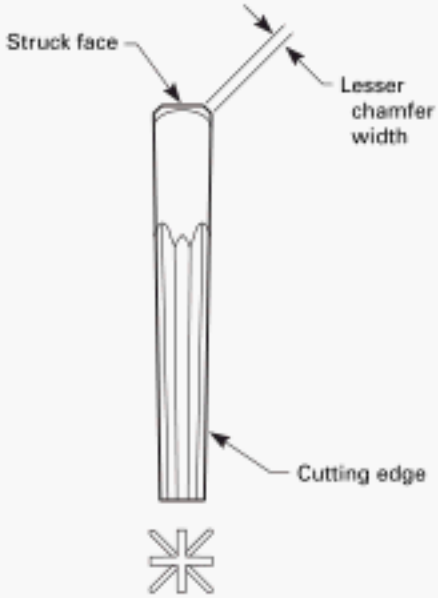


Fig. 4 Nomenclature for Tapered Flute Extractor



5 REQUIREMENTS

5.1 Design

Extractors shall have a straight or tapered fluted portion at one end for engaging and removing broken fasteners and pipes of materials that are softer than the extractor. The opposite end shall have a struck face to be struck by a hammer. Hole sizes to be used with extractors shall be supplied by the manufacturers.

(a) The struck face of extractors shall have a convex or flat surface.

(b) The struck face shall have a chamfer of approximately 45 deg or equivalent radius all around the perimeter, and the lesser width (see Fig. 4) shall be approximately one-tenth the body stock size. For example, if the body stock size equals 1 in., then the lesser chamfer width will equal approximately 0.10 in.

(c) The body portion of the extractor shall have a square, hexagonal, or other shape suitable for turning the extractor with a wrench over all or part of its length.

(d) The flutes shall be on the straight or tapered portion of the extractor and of any shape that presents sharp edges suitable for cutting into the hole in the pipe or fitting, or a hole drilled into the fastener when the extractor is struck with an appropriate hammer. Spiral flutes, when present, shall be of a left-hand thread orientation (for right-hand fastener threads), so that when the extractor is engaged with the pipe, fitting, or fastener and turned counterclockwise with a wrench, the extractor tends to further engage while the part to be extracted is removed.

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

Extractors shall be free of manufacturing defects such as seams, laps, pipes, and cold shuts that would jeopardize sound construction, and shall withstand the tests specified in section 6.

5.2 Materials

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

5.3 Mechanical Properties

Hardness of the cutting edges shall be 45 HRC to 60 HRC or equivalent. Hardness of the struck face of the extractor shall not exceed 43 HRC or equivalent.

6 TESTS

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

Separate (new) samples shall be used in each of these tests. Failure to pass any one of the tests indicates the extractors are not in compliance with this Standard.

6.1 Hardness Determination Test

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

6.2 Impact Test

For this test, the extractor shall be mounted vertically in a hole in a steel plate. The hole diameter shall be equal to the drill size recommended by the extractor manufacturer, and the depth shall be sufficient to prevent bottoming out. The steel plate shall be at least 1 in. thick and shall be of medium carbon alloy steel heat treated to 35 HRC to 40 HRC. A steel weight, having a striking face hardness of 45 HRC to 60 HRC and having weight as specified in Table 1, shall be dropped 20 times from the height indicated in Table 1 squarely onto the extractor struck face. The diameter of the striking face of the weight shall not be less than 0.375 in. larger than the struck face of the extractor. Typically, the weight is cylindrical and is dropped through a seamless tube slightly larger than the diameter of the weight.

The extractor shall not chip, spall, crack, or bend when subjected to this test. Normal deformation of the struck face and cutting edges is permitted.[1]

[1] This test is so severe that a degree of permissible deformation of the cutting edge and the struck face can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

Table 1 Impact Test Parameters

Extractor — Corresponding Drill Size, in. [Note (1)]	Drop Weight, lb	Drop Height of Weight, in.
1/16	1.0	1.0
3/32	1.0	2.0
1/8	1.0	5.0
5/32	1.0	10.0
3/16	2.5	10.0
7/32	2.5	20.0
1/4	2.5	30.0
5/16	5.0	25.0
3/8	5.0	35.0
7/16	10.0	22.5
1/2	10.0	27.5
5/8	20.0	19.0
3/4	20.0	24.0

NOTE:
(1) Sizes other than those listed shall be tested to the next smaller drill size.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of extractors and shall emphasize the need to wear and ensure the use of safety goggles. The publication *Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care* provides guidelines for the safe use of hand tools.

(a) Screw and pipe extractors are special purpose tools designed and intended only for removing broken screws, pipes, bolts, studs, and fittings from threaded openings. They are intended only for removing threaded metal pipes and fasteners that are of softer material than the extractor. An initial cautious blow may be used to ascertain the relative difference in hardness of the extractor and object being removed. To avoid possible eye or other bodily injury, extractors shall not be used to extract objects as hard as or harder than the extractor cutting edges.

(b) A blow from an appropriate striking tool should always be struck squarely, with the striking face parallel with the struck face of the extractor. Glancing blows, overstrikes, and understrikes should be avoided.

An *appropriate striking tool* shall mean a ball peen, hand drilling, or engineer's hammer with a striking face approximately 0.375 in. larger in diameter than the struck face of the extractor.

(c) Extractors shall always be used with hole sizes as specified in the manufacturer's instructions.

(d) Extractors shall not be used as a punch, pry bar, or wedge.

(e) When using a wrench to turn an extractor, the user should always pull on the handle and adopt a stance

that will prevent a fall in the event of a sudden tool or fastener failure.

(f) 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 extractor is being used to avoid possible eye injury from flying objects.

(g) Extractors shall be inspected prior to each use, and their use shall be discontinued at the first sign of bending of the extractor or of chipping or cracking of the cutting edges or the struck face.

(h) Except as indicated in para. 7(i), no area, section, or portion of the extractor shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.[2]

[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.

(i) At the first indication of mushrooming, the extractor struck face shall be redressed to its original contour by the use of a hand file.[2]

(j) Each extractor shall be stamped, labeled, or otherwise marked, size permitting, by the manufacturer with the following safety message or the 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 principles set forth in ANSI Z535.4 shall be used as the guide for alternate, equivalent methods of labeling.

ASME B107.48

METAL CHISELS, PUNCHES, AND DRIFT PINS

1 SCOPE

This Standard provides performance and safety requirements for handheld and handled metal chisels, punches, and drift pins. Chisels are intended specifically for use in cutting and shaping metal objects. Punches and drift pins are intended specifically for use in marking metal, driving and removing such things as pins and rivets, and aligning holes in different sections of material. Power-driven chisels, punches, and drift pins are excluded from this Standard. This Standard 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. Inclusion of dimensional data in this Standard does not mean that all products described herein are stock production sizes. Consumers should consult with manufacturers concerning lists of stock production sizes.

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 manufacture the tools covered.

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

2 CLASSIFICATIONS

(a) Type I Chisels

(1) Class 1 Cape. For cutting grooves and keyways.

(2) Class 2 Cold. For general-purpose cutting and shaping.

(3) Class 3 Concave Splitting. For splitting bushings, mufflers, and tailpipes.

(4) Class 4 Diamond Point. For cutting V-grooves, inside corners, and square holes.

(5) Class 5 Half-Round. For cutting grooves.

(6) Class 6 Blacksmith's Cold. Handle-held cold chisel for general-purpose cutting and shaping.

(b) Type II Punches

(1) Class 1 Backing-Out. Handle-held punch for backing out and driving such things as rivets and pins (a.k.a. Blacksmith's Backing-out).

(2) Class 2 Bearing Race. Punch used for removing races from bearings.

(3) Class 3 Center. Punch used for marking by indentation to start drills in metal and other materials.

(4) Class 4 Drift or Lining-Up. Punch used for aligning and sizing holes in metal and other materials.

(5) Class 5 Pin. Punch used for driving and removing such things as pins and keys after initial movement by a starting punch.

(6) Class 6 Prick. Punch used for marking by indentation, as in layout work, and piercing holes in light-gage metal and other materials.

(7) Class 7 Round. Handle-held punch for drifting holes, aligning, and drifting and driving such things as pins (a.k.a. Blacksmith's Round).

(8) Class 8 Starting. Punch used for loosening such things as frozen pins and keys.

(c) Type III Drift Pin. Pin used for aligning and sizing holes in metal and other materials.

3 REFERENCES

The following is a list of publications referenced in this Standard. Unless a specific edition is referenced, the latest available edition should 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: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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

4 DEFINITIONS

See Figs. 1 through 4 as applicable.

bevel: conical portion of the punch adjacent to the point end extending to the taper or the angular portion of the chisel adjacent to the cutting edge extending to the taper.

body: straight portion of the punch or chisel between the chamfer and taper or the tapers of the drift pin.

chamfer: angled flat surface or equivalent radius between the struck face and body of the punch or chisel encircling the perimeter of the struck face.

Fig. 1 Nomenclature for Type II Punches

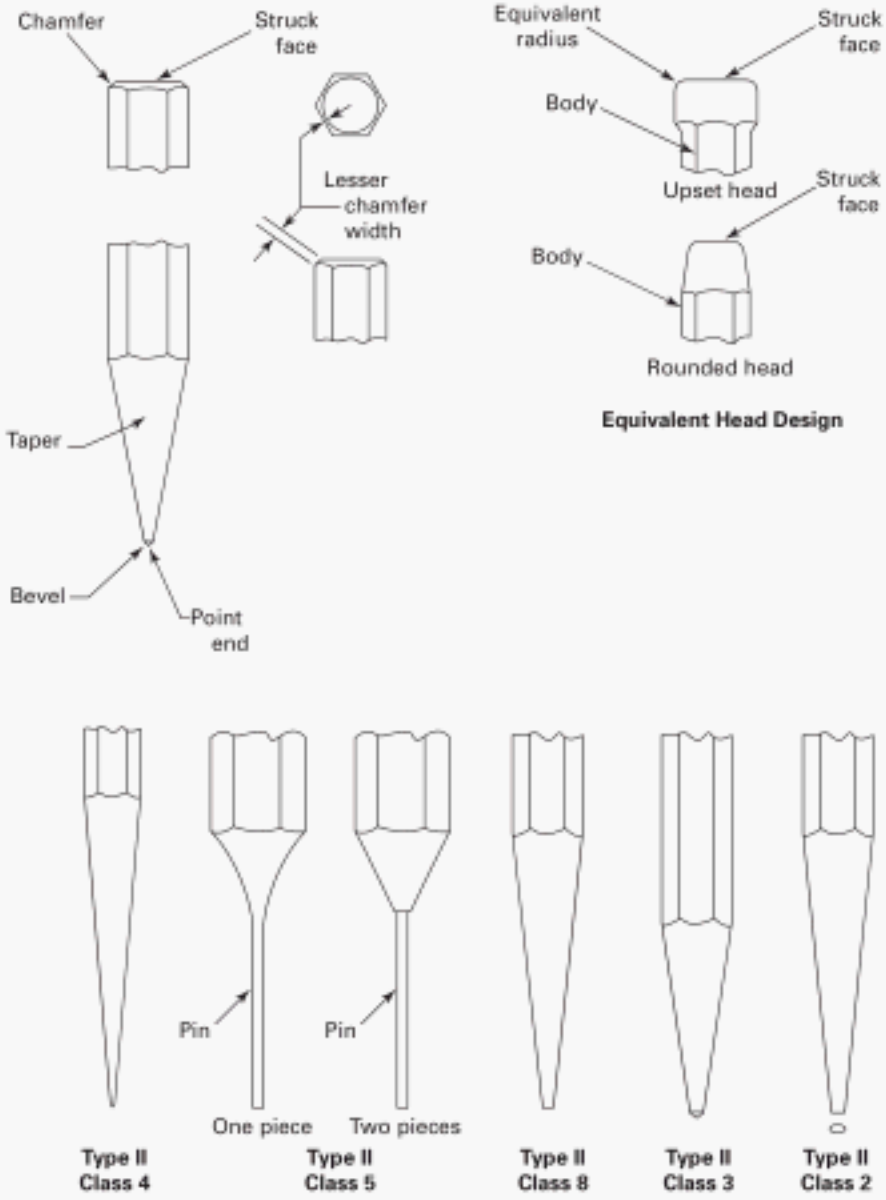


Fig. 2 Nomenclature for Type I Chisels

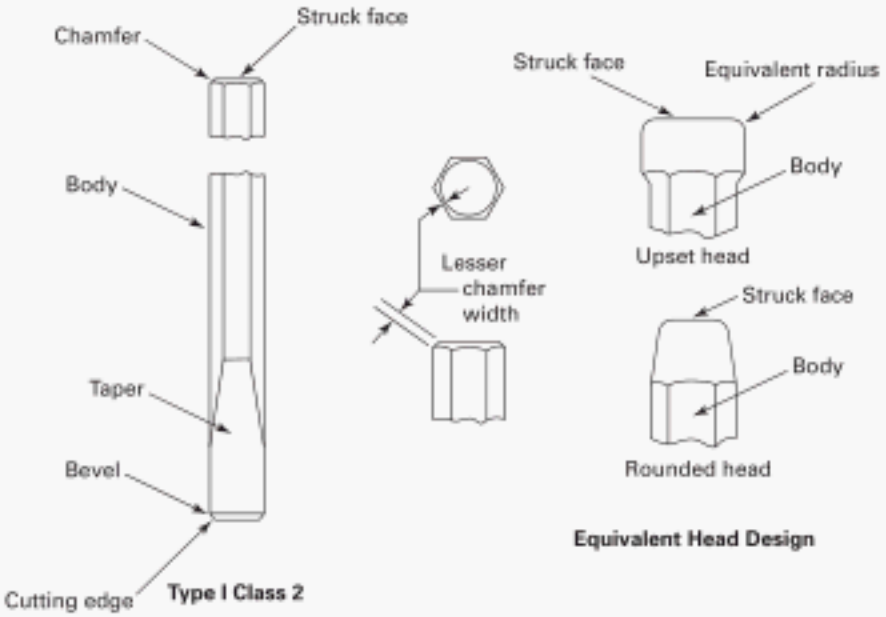
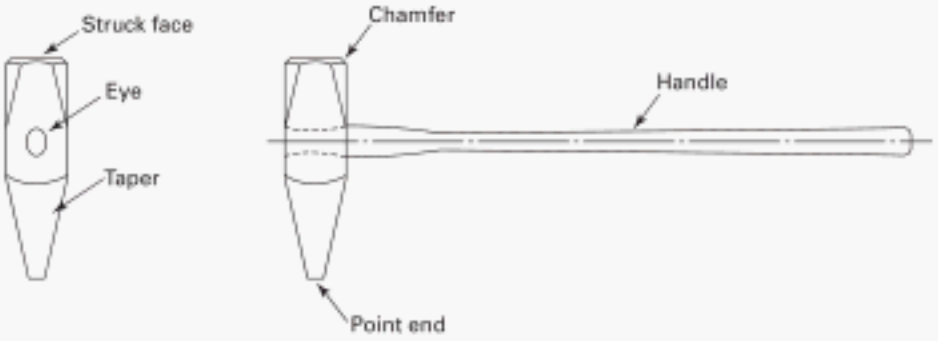
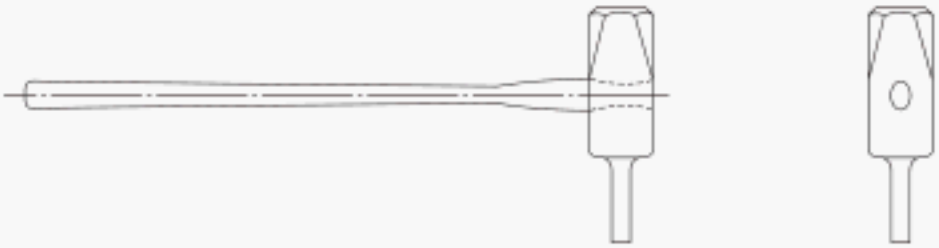


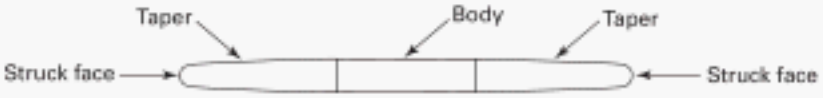
Fig. 3 Nomenclature for Type II Handle-Held Punches and Type III Drift Pins



Type II Class 7

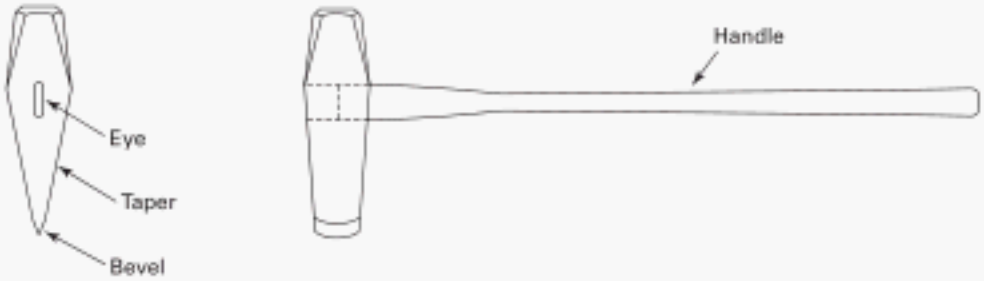


Type II Class 1



Type III

Fig. 4 Nomenclature for Type I Handle-Held Chisels



Type I Class 6

cutting edge: the edge formed by the bevel directly opposite the struck face.

equivalent: in this Standard, the word *equivalent* shall mean alternative designs or features that will provide an equal degree of safety.

eye: an opening or aperture located in the body of the punch or chisel into which a handle is inserted.

handheld chisel: a chisel designed to be held by its body.

handheld punch: a punch designed to be held by its body.

handle: portion protruding from the punch or chisel body by which the tool is held.

hardness: condition of the tool resulting from heat treatment.

pin: straight cylindrical section of the punch between the point and taper or body.

point end: formed end directly opposite the struck face of the punch.

point size: diameter of the point end or the diameter at the bevel/taper intersection.

rounded head: an equivalent design for the struck face and chamfer portion of the punch or chisel.

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

shall: characterizes mandatory requirements of this Standard.

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

struck face: portion of the punch or chisel exclusive of the chamfer and body, directly opposite the point end; the extreme end portions of the drift pin exclusive of the body and tapers.

taper: portion of the punch or chisel between the body and bevel or point end with a gradually reducing cross-sectional area; the portion of the drift pin between the body and struck face with a gradually reducing cross-sectional area.

upset head: portion of the punch or chisel body having an enlarged cross-sectional area at the struck end of the tool, including and underlying the struck face.

5 REQUIREMENTS

The illustrations shown herein are descriptive and nonrestrictive and not intended to preclude the manufacture of chisels, punches, or drift pins that otherwise comply with this Standard.

5.1 Design

Metal chisels, punches, and drift pins shall pass applicable tests in section 6. All metal chisels, punches, drift pins, and handles shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury to the user when handling the tool.

5.1.1 Type I Chisels. Chisels shall have a cutting edge at one end for cutting, shaping, and removing metal softer than the cutting edge itself, such as cast iron, wrought iron, steel, bronze, copper, and the like, and shall have a struck face on the opposite end to be struck by a hammer of the appropriate type and size. The appropriate hammer shall have a striking face approximately 0.375 in. larger in diameter than the struck face of the chisel. Various typical styles of chisels are shown in Figs. 2 and 4.

(a) The struck face of all chisels shall have a convex or flat surface.

(b) The struck face of all chisels shall have a chamfer of approximately 45 deg or equivalent radius all around the perimeter, with the lesser width (see Fig. 2) equal to approximately one-tenth the body stock size. For example, if the body stock size equals 1 in., then the lesser chamfer width will equal approximately 0.1 in.

(c) Handles may be of any design and shall be inserted securely into the chisel and permit the chisel to be held over the work. Handles shall withstand the test specified in para. 6.4.

(d) All chisels and handles shall be free of nonfunctional sharp edges, points, and surface roughness that could adversely affect performance or safety.

5.1.2 Type II Punches. Punches shall have a point end for marking metal, driving and removing such things as pins and rivets, and aligning holes in different sections of material and a struck face on the opposite end to be struck by a hammer of the appropriate type and size. The appropriate hammer shall have a striking face approximately 0.375 in. larger in diameter than the struck face of the punch. Various typical styles of punches are shown in Figs. 1 and 3.

(a) The struck face of all Type II punches shall have a convex or flat surface.

(b) The struck face of all Type II punches shall have a chamfer of approximately 45 deg or equivalent radius all around the perimeter, with the lesser width (see Fig. 1) equal to approximately one-tenth the body stock size. For example, if the body stock size equals 1 in., then the lesser chamfer width will equal approximately 0.1 in.

(c) Type II, Class 1 and Type II, Class 7 handles may be of any design and shall be inserted securely into the punch and permit the punch to be held over the work without exposing the user to personal injury. Handles shall withstand the test specified in para. 6.4.

5.1.3 Type III Drift Pins. Type III drift pins shall taper to a convex struck face at each end to be struck by a hammer of the appropriate size to align holes in metal. The appropriate hammer shall have a striking face not less than 0.375 in. larger in diameter than the struck face of the pin.

5.2 Materials

The materials used in the manufacture of punches, chisels, and drift pins shall be such as to produce tools conforming to this Standard.

5.3 Mechanical Properties

(a) All Type II punches shall have a hardness of 48 HRC to 60 HRC or equivalent for a distance of not less than 0.25 in. from the point end.

(b) Hardness of the struck face of chisels, punches, and drift pins shall not exceed 44 HRC or equivalent.

(c) Chisels shall have a hardness of 53 HRC to 60 HRC or equivalent for a distance of not less than 0.25 in. from the cutting edge.

5.4 Finish

Surfaces shall have a rust preventive treatment and be essentially free from pits, nodules, burrs, cracks, and other conditions that would adversely affect the performance or safety of the chisel, punch, or drift pin.

5.5 Marking

All chisels, punches, and drift pins shall be marked in a plain and permanent manner with the manufacturer's name or a trademark of such known character that the source of manufacture shall be readily determined. All types shall also be marked with nominal size. Marking shall be as permanent as the normal life expectancy of the tool to which it is applied (providing the marked surface has not been subjected to a fretting or abrading action) and be capable of withstanding the cleaning procedures normally experienced during its intended use.

Each punch and chisel shall be stamped, labeled, or otherwise marked, size permitting, with the safety message given below. Handled chisels and punches shall be stamped on the body, and the same safety message or equivalent shall appear on all replacement handles.

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 principles given in ANSI Z535.4 shall be used as a guide for alternative, equivalent methods of labeling.

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 these tests. Failure to meet the requirements of any one of these tests indicates that the chisels, punches, or drift pins do not comply with this Standard.

6.1 Hardness

Hardness determination shall be made in accordance with ASTM E 18.

6.2 Impact Test

Impact tests are conducted by mounting the subject tool vertically with the cutting edge, point end, or drift pin struck face resting against the test object. For chisels, the test object shall be a steel bar as specified in Table 1. For punches and drift pins, the test object shall be a steel plate of the hardness specified in Tables 2 and 3, respectively. The test object shall rest on a steel block weighing not less than 200 lb. A test weight having a diameter not less than 0.375 in. larger than the struck face of the tool being tested shall be dropped from the height and for the number of hits specified in the appropriate table (Table 1, 2, or 3) for the type of tool. The test weight shall have a striking face hardness of 45 HRC to 60 HRC or equivalent and shall be dropped squarely onto the subject tool's struck face. The test object shall be moved after each drop of the weight. There shall be no chipping or spalling of the cutting edge, point end, or struck face and no cracking of the chisel, punch, or drift pin as a result of the test. Normal deformation at either end is permitted.[1]

6.3 Bending Moment Test for Drift or Lining-Up Punches

With the punch supported not more than 0.25 in. from the point end, pivoted on a cylindrical fulcrum that is located one-third of the taper length from the point end, a bending moment is applied by a static force at the midpoint of the body with the force acting substantially at right angles to the axis of the body. The diameter of the fulcrum shall be approximately twice that of the punch cross-section at the point of contact and oriented at right angles to the axis of the punch. The punch must show at least 20 deg permanent deformation without fracture (see Fig. 5).

6.4 Handle Static Force Test

Handles of assembled chisels and punches shall not break, loosen, or otherwise fail when subjected to a force of 150 lbf while

(a) the chisel or punch body is locked securely in the test fixture with the struck face up and the handle extended in the horizontal plane

(b) the static force is applied vertically at a point on the handle measuring 10 in. from the top of the tool (see Figs. 6 and 7)

[1] The striking test is so severe that a degree of permissible deformation, such as denting of the struck face and bending of pin or taper, can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

Table 1 Impact Test Parameters — Type I Chisels

Chisel Class	Cutting Edge Width, in.	Drop Weight, lb	Drop Height of Weight, in.	Number of Hits	Test Bar	
					Shape and Material	Hardness
1, 2, and 3	< 0.375	10	6	20	0.25 in. diameter rod, AISI 01	33–35 HRC
	0.375 to < 0.56	10	20	20	0.25 in. diameter rod, AISI 01	33–35 HRC
	≥ 0.56	10	30	20	0.25 in. diameter rod, AISI 01	33–35 HRC
4 and 5	All sizes	5	10	10	Rectangular, 0.75 in. minimum thickness and at least 0.25 in. wider than chisel cutting edge, SAE-AISI 1018–1030	80–85 HRB
6	All sizes	10	40	10	Rectangular, 0.75 in. minimum thickness and at least 0.25 in. wider than chisel cutting edge, SAE-AISI 1018–1030	25–30 HRC

GENERAL NOTE: For further information about AISI designations, contact Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086.

Table 2 Impact Test Parameters — Type II Punches

Punch Class	Nominal Point Size, in. [Note (1)]	Drop Weight, lb	Drop Height of Weight, in.	Number of Hits	Test Plate Hardness, HRC
1 and 7 (Backing-out)	3/8 to <5/8	20	25	20	45–50
	≥5/8	20	30	20	45–50
2 (Bearing race)	7/16 × 15/64	20	15	20	45–50
	1/2 × 17/64	20	20	20	45–50
	9/16 × 19/64	20	25	20	45–50
	5/8 × 9/16	20	30	20	45–50
3 (Center)	<3/16	5	10	20	25–30
	≥3/16	5	15	20	25–30
4 (Drift or lining-up)	3/32	5	5	20	45–50
	1/8	5	10	20	45–50
	3/16	5	20	20	45–50
	1/4	5	20	20	45–50
	5/16	10	20	20	45–50
	3/8	10	20	20	45–50
5 (Pin)	1/16	1	5	20	45–50
	3/32	1	7	20	45–50
	1/8	2.5	10	20	45–50
	5/32	5	10	20	45–50
	3/16	5	20	20	45–50
	7/32	5	30	20	45–50
	1/4	10	25	20	45–50
	5/16	10	30	20	45–50
	3/8	10	30	20	45–50
6 (Prick)	All sizes	5	5	20	25–30
8 (Starting)	1/16	1	20	20	45–50
	3/32	2.5	10	20	45–50
	1/8	5	10	20	45–50
	3/16	10	15	20	45–50
	7/32	10	20	20	45–50
	1/4	10	35	20	45–50

NOTE:
(1) Sizes other than those listed are tested to the next smaller point size.

Table 3 Impact Test Parameters — Type III Drift Pins

Body Size, in.	Drop Weight, lb	Drop Height of Weight, in.	Number of Hits	Test Plate Hardness, HRC
9/16	5	25	20	25–30
11/16	10	20	20	25–30
13/16	10	25	20	45–50
15/16	20	25	20	45–50
1 1/16	20	30	20	45–50

Fig. 5 Bending Moment Test

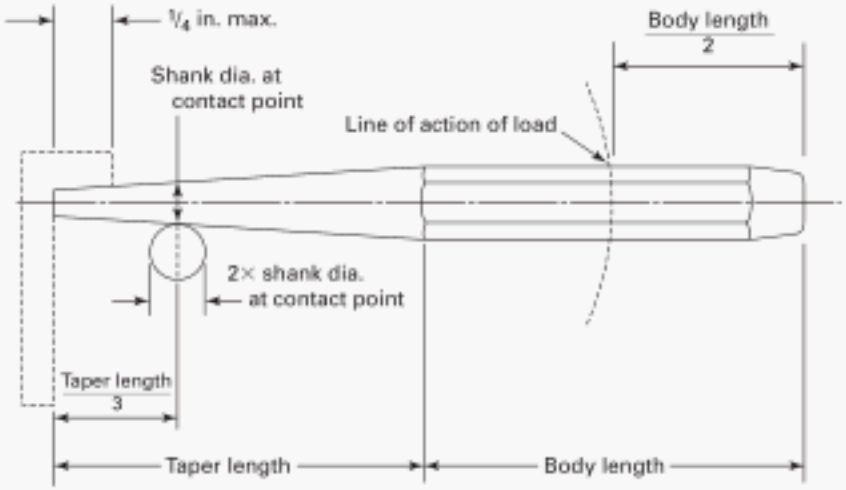


Fig. 6 Static Force Test for Handle-Held Punches

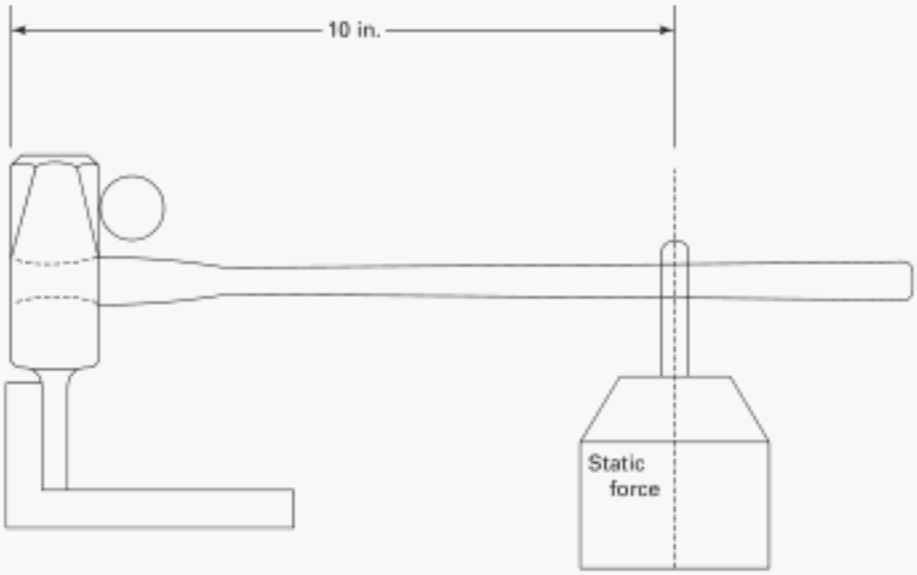
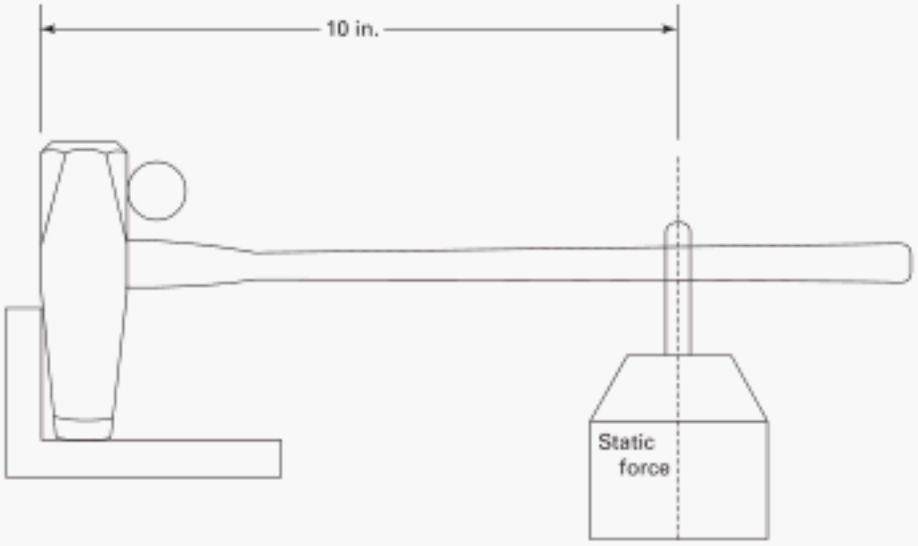


Fig. 7 Static Force Test for Handle-Held Chisels



7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

Instructors and employers shall stress proper use and safety in the use of striking tools and 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) Metal punches are special-purpose tools designed and intended only for the uses listed in para. 5.1.2. They are intended only for marking metal, driving such things as pins and rivets, or aligning holes in different sections of material.

(b) Metal drift pins are special-purpose tools designed and intended only for the uses listed in para. 5.1.3. They are intended only for aligning holes in different sections of material.

(c) When using a pin, round, starting, or backing-out punch, the point end diameter of the punch shall approximate the size of the pin or rivet being driven.

(d) Prick, center, pin, backing-out, and round punches shall not be used for prying or wedging. Pin, prick, and center punches shall not be used as starting punches. Prick and center punches shall not be used for driving pins.

(e) Metal chisels are special-purpose tools designed and intended for the cutting, shaping, and removing of metal softer than the cutting edge of the chisel itself. Such softer materials include cast iron, wrought iron, steel, bronze, copper, and the like. An initial cautious blow may be used to ascertain the relative hardness of the stuck object with subsequent examination of the cutting edge. To avoid possible eye or other bodily injury, chisels shall not be used to cut objects as hard or harder than the chisel cutting edge, such as stone or concrete.

(f) Chisels shall not be used for prying or wedging.

(g) Drift or lining-up punches and drift pins are special-purpose tools intended for aligning holes and shall not be used for driving metal or other hard objects.

(h) A hammer should always be used with the striking face parallel with the struck face of the chisel, punch, or drift pin. Glancing blows, overstrikes, and understrikes should be avoided. No surface of a chisel, punch, or drift pin shall be struck other than the struck face. The striking tool of the appropriate size shall have a diameter not less than 0.375 in. larger than the struck face of the punch or drift pin.

(i) 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 chisel, punch, or drift pin is being used to avoid possible eye injury from flying objects.

(j) Chisels, punches, and drift pins shall be inspected prior to each use and their use discontinued at the first sign of bending, chipping, or cracking of the point end or the struck face.

(k) Except as indicated in paras. 7(l) and 7(m), no area, section, or portion of a punch, chisel, or drift pin shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(l) As dulling of the cutting edge or point end occurs from tool usage, it shall be redressed to its original contour only by the use of a whetstone or hand file.[2]

[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.

(m) Any mushrooming of the tool-struck face shall be promptly redressed to the original contour by use of a whetstone or hand file.[2]

(n) Handles shall be inspected prior to each use, and those damaged shall be replaced. The handles of tools shall be free of splinters or cracks and kept tight in the tool. Replacements shall withstand the test requirements specified in para. 6.4 and be equivalent to the original handle in size and quality.

(o) Chisels and punches with handles shall not be swung against the work but rather held by the handle with the tool on the work and struck with a hammer of the appropriate size [see para. 7(h)].

ASME B107.49

NAIL SETS

1 SCOPE

This Standard provides performance and safety requirements for nail sets that are intended primarily for setting unhardened finishing nails below the surface of the material being nailed.

This Standard may be used as a guide in selecting, testing, and using the hand tools covered. It is also meant to serve as a guide in developing manuals and posters for training personnel in safe practices.

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. It is not the purpose of this Standard to specify the details of manufacturing.

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

2 CLASSIFICATION

(a) Type I: one-piece nail set (see Fig. 1)

(b) Type II: self-centering (center punch) nail set (see Fig. 2)

3 REFERENCES

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

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: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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

4 DEFINITIONS

body: the portion of the nail set between the head and taper, used for holding during nail setting operation.

chamfer: the angled flat surface, or equivalent radius, encircling the perimeter of the struck face and of the point end encircling the cup.

cup: the conical, concave relief at the center of the point end of the nail set (not normally provided on self-centering nail sets).

cup edge: the edge formed by the intersection of the cup and the chamfer surfaces (not normally provided on self-centering nail sets).

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

head: the portion of the nail set between the struck face and the body.

punch: the movable, struck member of a self-centering nail set.

safety message: the information imprinted on or affixed to the nail set 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.

struck face: the end directly opposite the point end exclusive of the chamfer.

taper: the portion of the nail set between the body and the point end chamfer and having a gradually reducing cross-sectional area.

5 REQUIREMENTS

Nail sets shall withstand the tests specified in section 6.

5.1 Design

5.1.1 Type I. Nail sets shall have a chamfer and cup surface on the point end for setting unhardened nails below the surface of the material being nailed and a struck face on the opposite end.

5.1.2 Type II. Self-centering nail sets shall have a body with an internal movable punch. A cup point may be provided on the punch point end. A return method

Fig. 1 Type I Nail Set

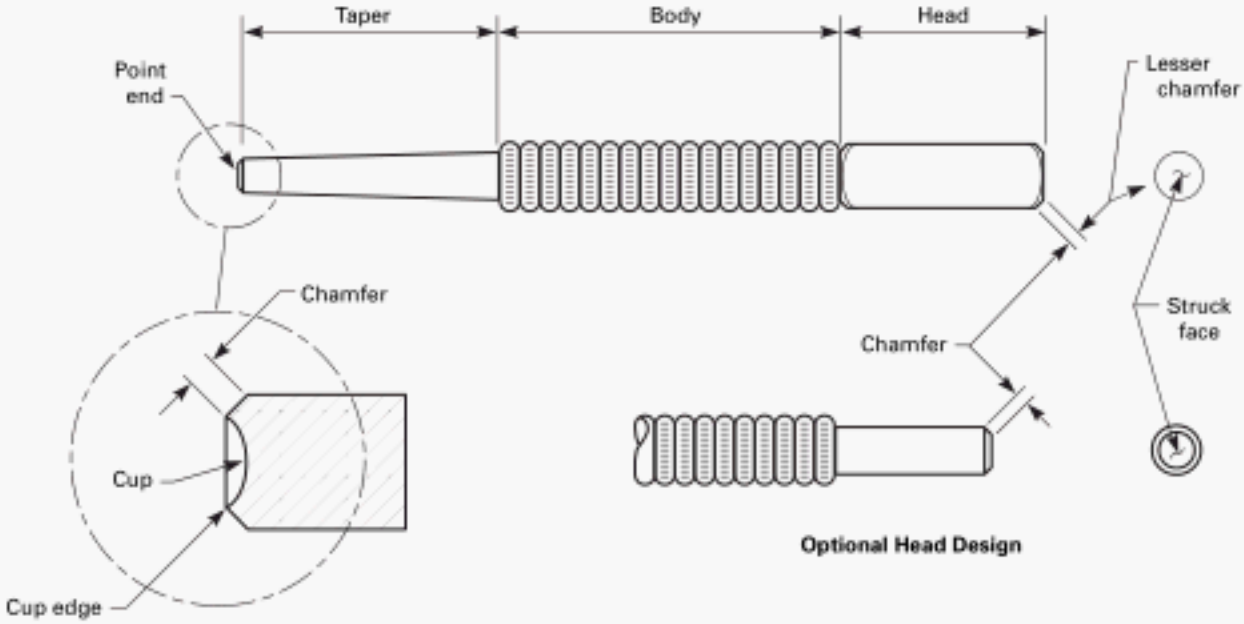
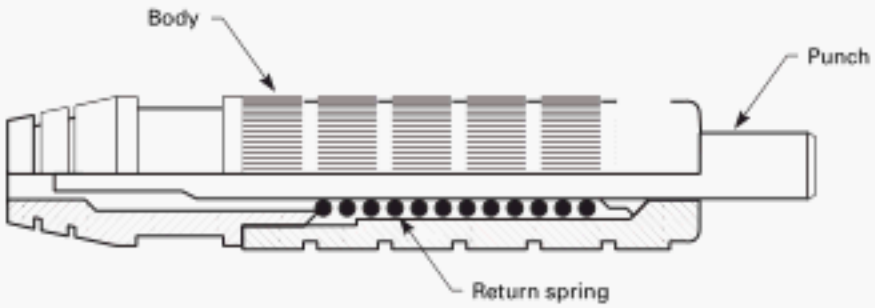


Fig. 2 Type II (Self-Centering) Nail Set



shall be provided to hold the punch in the retracted position.

5.1.3 Struck Face. The struck face shall have a flat or convex shape and a chamfer of approximately 45 deg or equivalent radius all around the perimeter. The lesser chamfer width (see Fig. 1) shall be equal to approximately one-tenth of the diameter of the struck face. For example, if the struck face diameter is 0.25 in., then the lesser chamfer width will equal approximately 0.025 in.

5.2 Materials

Materials used in the manufacture of nail sets shall be such as to produce nail sets that meet the requirements herein. Nail sets shall be free of manufacturing and material defects, such as seams that would jeopardize sound construction, and free of nonfunctional sharp edges or surface roughness that could inflict personal injury when handling the tool.

5.3 Hardness

Hardness of the point end shall be 48 HRC to 60 HRC or equivalent for at least 0.125 in. from the point end. Hardness of the struck face of the nail set shall not exceed 44 HRC or equivalent.

6 TESTS

Tests required herein are inherently hazardous; adequate safeguards for personnel and property shall be employed in conducting such tests. Separate (new) samples shall be used for each of these tests. Failure to meet the requirements of either of these tests indicates that the nail sets are not in compliance with this Standard.

6.1 Hardness Determination Test

Hardness determination shall be made per ASTM E 18.

6.2 Impact Test

The nail set shall be mounted vertically with the point end resting on a steel plate that is on a rigidly supported steel block weighing not less than 200 lb. A weight of 1.0 lb having a striking face hardness of 45 HRC to 60 HRC or equivalent shall be dropped, unrestricted 20 times in such a manner that each drop applies the full force of the weight squarely to the struck face. Typically, the weight is cylindrical and is dropped through a seamless tube or pipe slightly larger in diameter than the weight. For nail sets with a point diameter up to 0.063 in., the weight shall be dropped from a height of 10.0 in. For point diameters greater than 0.063 in., the weight shall be dropped from a height of 18.0 in. The test plate shall have a minimum thickness of 0.25 in. with a uniform hardness of 25 HRC to 30 HRC or equivalent and shall be moved after each drop of the weight to make a new impression. The point end or struck face shall neither chip nor spall, and the nail set shall neither crack nor bend as a result of the test. Normal deformation at either end is permitted.[1]

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

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

(a) Nail sets are special-purpose tools designed and intended only for the specific use of setting unhardened nails below the surface of the material being nailed.

(b) To avoid possible eye or other bodily injury, nail sets shall not be used to strike hard or hardened objects, such as rocks, bricks, concrete, masonry nails, and other hardened nails or steel tools.

(c) A striking tool always should be used with the striking face parallel to the struck face of the nail set. Glancing blows, overstrikes, and understrikes should be avoided. No surface of the nail set other than the struck face shall be struck. The striking tool of the appropriate size shall have a diameter not less than 0.375 in. larger than the struck face of the nail set.

(d) Nail sets shall not be used for prying, wedging, or aligning holes.

(e) 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 nail set is being used to avoid possible eye injury from flying objects.

(f) Nail sets shall be inspected before each use, and their use shall be discontinued at the first sign of bending of the nail set or chipping, mushrooming, or cracking of the point end or struck face.

(g) No part of the nail set shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(h) The body of a self-centering nail set is placed over the protruding unhardened nail, and the punch is struck with the appropriate hammer to set the nail below the surface of the material being nailed. The appropriate hammer shall have a striking face of approximately 0.375 in. larger in diameter than the struck face of the nail set.

(i) Each punch, size permitting, shall be stamped, labeled, or otherwise marked by the manufacturer with the following safety message or equivalent:

WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

Pictorials are an acceptable equivalent. 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.

[1] The striking test is so severe that a degree of permissible deformation, such as denting of the struck face, can be anticipated. A much less severe test would not cause this, but it would not provide the level of safety assurance desired.

ASME B107.50

BRICK CHISELS, BRICK SETS, AND STAR DRILLS

1 SCOPE

This Standard provides performance and safety requirements for brick chisels, brick sets, and handheld star drills. Brick chisels and brick sets are intended specifically for use in scoring and cutting brick and masonry block. Star drills are intended for use in drilling holes in brick, tile, concrete, or stone. Inclusion of dimensional data in this Standard does not mean that all products described herein are stock production sizes. Consumers should consult with manufacturers concerning lists of stock production sizes.

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

2 DEFINITIONS

See Figs. 1, 2, and 3.

bevel: the angular portion of the brick chisel, brick set, or star drill adjacent to the cutting edge and extending to the taper.

body: the straight portion of the chisel or set between the chamfer and the taper, or the straight portion of the star drill between the chamfer on one end and the taper, flute, and the flute side on the other end.

chamfer: the angled flat surface or equivalent radius between the struck face and the body of the brick chisel, brick set, or star drill encircling the perimeter of the struck face.

cutting edge: the edge formed by the bevel or bevels at the end opposite the struck face.

equivalent: this word is understood to mean alternative designs or features that will provide an equal degree of safety and performance.

flute: the rounded groove of the star drill between any two adjacent tapers extending to the body and bevels.

flute side: the portion of the star drill adjacent to the taper and extending from the body to the bevels.

handheld star drill: a star drill intended to be held by its body.

may: this word is understood to be permissive.

rounded head: an equivalent design for the struck face and chamfer portion of the brick chisel, brick set, or star drill.

safety message: the information imprinted on or affixed to the brick chisel, brick set, or star drill that is intended to promote safety.

shall: this word is understood to be mandatory.

should: this word is understood to be advisory.

struck face: the portion of the brick chisel, brick set, or star drill exclusive of the chamfer and body, at the end opposite the cutting edge.

taper: the portion of the brick chisel or brick set between the body and the bevel with a gradually reducing cross-sectional area, or the portion of the star drill between the flute and the flute side extending from the body to the bevels with gradually reducing cross-sectional area.

upset head: the portion of the body having an enlarged cross-sectional area at the struck end of the tool including and underlying the struck face.

3 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 A 29/A 29M, Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for

ASTM A 322, Standard Specification for Steel Bars, Alloy, Standard Grades

ASTM A 331, Standard Specification for Steel Bars, Alloy, Cold-Finished

ASTM A 576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

ASTM A 681, Standard Specification for Tool Steels Alloy

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

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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. 1 Nomenclature for Brick Chisel and Brick Set

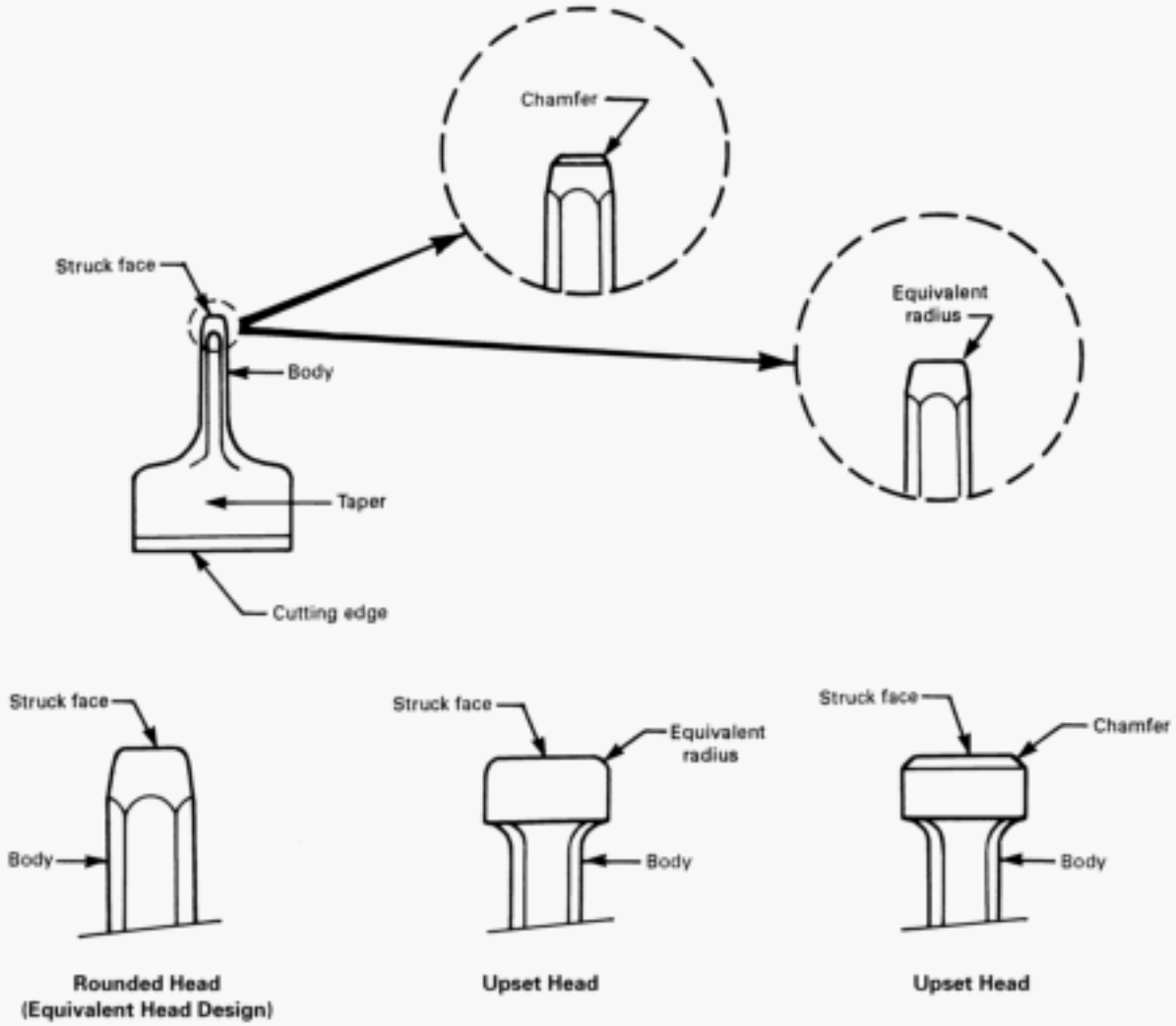


Fig. 2 Configuration of Brick Chisel and Brick Set Bevels

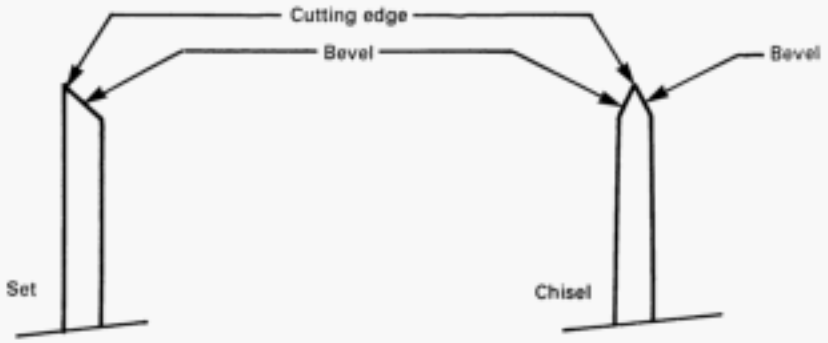
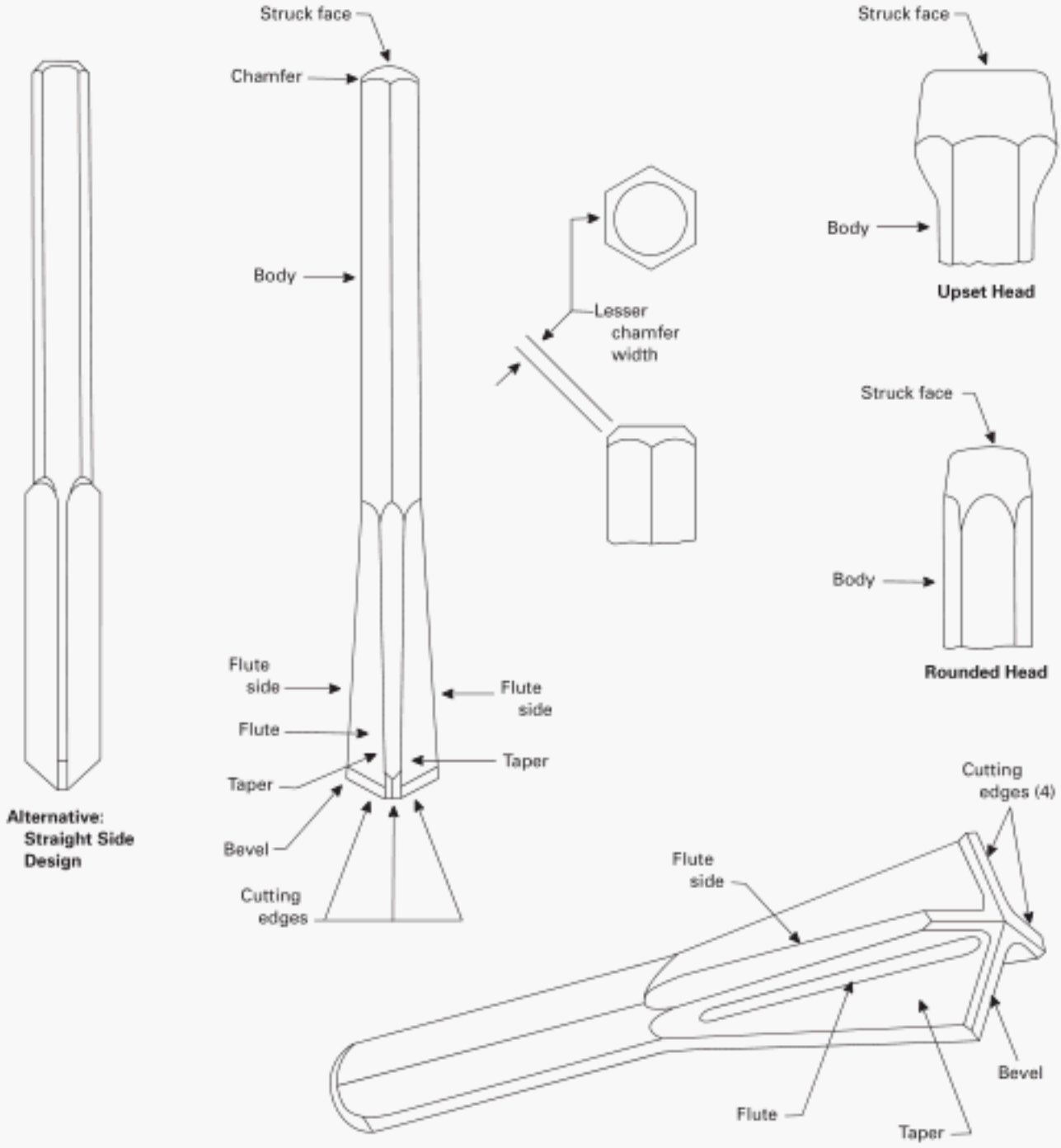


Fig. 3 Nomenclature for Star Drill



4 CLASSIFICATION

(a) Type I: brick chisel
(b) Type II: brick set
(c) Type III: star drill

5 REQUIREMENTS

The illustrations shown herein are descriptive and not restrictive, and are not intended to preclude the manufacture of brick chisels, brick sets, or star drills that are otherwise in accordance with this Standard.

5.1 Design

(a) Brick chisels and brick sets shall have a cutting edge on one end and a struck face on the opposite end to be struck by a ball peen, hand drilling, or engineer's hammer of the appropriate size. The hammer of the appropriate size shall have a striking face not less than 0.375 in. larger in diameter than the struck face of the chisel or set.

(1) Brick chisels shall be designed for cutting brick and masonry block and shall have two bevels that create the cutting edge (see Fig. 2). Brick chisels shall pass the tests in paras. 6.1 and 6.2.1.

(2) Brick sets shall be designed for scoring, adjusting, and trimming brick and masonry block, and shall have a single bevel that creates the cutting edge (see Fig. 2). Brick sets shall pass the tests in paras. 6.1 and 6.2.2.

(b) Star drills shall have four cutting edges at one end for use in drilling holes in brick, tile, concrete, and stone and a struck face on the opposite end to be struck by a ball peen, hand drilling, or engineer's hammer of the appropriate type and size. The appropriate size hammer shall have a striking face not less than 0.375 in. larger than the diameter of the struck face of the star drill. Star drills may be relieved from the cutting edges to permit ejection of dust and debris from the hole being drilled. Star drills shall pass the tests in paras. 6.1 and 6.2.3.

(c) The struck face of brick chisels, brick sets, and star drills shall have a flat or convex shape.

(d) The struck face shall have a chamfer of approximately 45 deg or equivalent radius all around the perimeter with a width equal to approximately one-tenth of the diameter of the material behind the struck face. For example, if the body stock size equals 0.50 in., then the chamfer width (see Fig. 1) will equal approximately 0.05 in.

(e) All brick chisels, brick sets, and star drills shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury to the user while handling these tools.

5.2 Materials

(a) Brick chisels, brick sets, and star drills shall be made from special-quality, fine-grain, hot-rolled or cold-finished carbon or alloy steel bars, or from an equivalent material, having good wear-resisting and shock-resisting qualities and conforming to any of the following standards: ASTM A 29/A 29M, ASTM A 322, ASTM A 331, ASTM A 576, or ASTM A 681.

(b) Brick chisels, brick sets, and star drills 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. 5.4 and shall withstand the tests described in paras. 6.1 and 6.2.1 through 6.2.3.

5.3 Finish

Surfaces shall have a rust preventive treatment and be essentially free from pits, nodules, burrs, cracks, and other conditions that would adversely affect the performance or safety of the tool. When provided, coatings shall be adherent, smooth, continuous, and free from any conditions that would interfere with their protective value, safety, and function.

5.4 Mechanical Properties

(a) Brick chisels and brick set bevels shall be hardened and tempered to a hardness of 35 HRC to 55 HRC for a distance of not less than 0.25 in. from the cutting edge.

(b) Star drill bevels and tapers shall be hardened and tempered to a hardness of 53 HRC to 60 HRC for a distance of not less than 0.62 in. from the cutting edges.

(c) The hardness of the struck face of brick chisels, brick sets, and star drills shall not exceed 45 HRC for a distance of not less than 1 in. from the struck face.

5.5 Marking

Brick chisels, brick sets, and star drills shall be marked in a plain and permanent manner with the manufacturer's name or with a trademark of such known character that the manufacturer shall be readily determined. Marking shall be as permanent as the normal life expectancy of the tool to which it is applied (providing the marked surface has not been subjected to a fretting or abrading action) and be capable of withstanding the cleaning procedures normally experienced during its intended use.

6 TESTS

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

6.1 Hardness Tests

Hardness determinations shall be made in accordance with ASTM E 18.

6.2 Impact Test

There shall be no chipping, spalling, cracking, dulling, or turning of the cutting edge; no mushrooming or chipping of the head (struck face); and no bending of the tool when tested according to the following procedure.

Normal deformation at either end of the tool is permitted.[1]

6.2.1 Brick Chisels. The brick chisel shall be mounted vertically with the cutting edge resting crosswise on the largest surface of a rectangular common brick having a minimum thickness of 2.0 in. and a width of at least 3.0 in.

The brick shall rest on a solid foundation that supports the entire brick surface, such as a block weighing not less than 10.0 lb. A steel weight of 5.0 lb and having a striking face hardness of 45 HRC to 60 HRC or equivalent shall be dropped 20 times from a height of 10.0 in. squarely onto the chisel struck face. The diameter of the striking face of the weight shall not be less than 0.375 in. larger than the struck face of the chisel. Typically the weight is cylindrical and is dropped through a seamless tube slightly larger than the diameter of the weight. The test brick shall be moved after each drop of the weight to make a new impression.

6.2.2 Brick Sets. The impact test for brick sets shall be the same as the test in para. 6.2.1, except that the weight shall be dropped 10 times.

6.2.3 Star Drills. The star drill shall be mounted vertically with the cutting edges resting on solid concrete. The struck face of the star drill shall be struck repeatedly by a hammer of the appropriate type and size [see para. 5.1(b)] until a hole of 0.5 in. ±0.1 in. in depth has been attained. The star drill should be rotated slightly after each successive hit. Three holes shall be drilled.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

(a) Brick chisels and brick sets are special-purpose tools designed, manufactured, and intended only for use in scoring and cutting brick and masonry block.

(b) Star drills are special-purpose tools designed and intended only for the drilling of holes in brick, tile, concrete, and stone.

(c) To avoid possible eye or other bodily injury, brick chisels and brick sets shall not be used to cut metal objects or concrete.

(d) A hammer blow should always be struck squarely with the hammer face parallel with the struck face of the brick chisel, brick set, or star drill. Glancing blows, overstrikes, and understrikes should be avoided.

(e) No surface of the brick chisel, brick set, or star drill other than the struck face shall be struck. The ball peen, hand drilling, or engineer's hammer of the appropriate size shall have a striking face with a diameter not less than 0.375 in. larger than the struck face of the brick chisel, brick set, or star drill.

(f) Brick chisels, brick sets, or star drills shall never be struck by a bricklayer's hammer.

(g) Brick chisels, brick sets, and star drills shall not be used for prying or wedging.

(h) Safety goggles or equivalent eye protection conforming to ANSI Z87.1 shall be worn by the user and all persons in the immediate area where any brick chisel, brick set, or star drill is being used to avoid possible eye injury from flying objects.

(i) Brick chisels, brick sets, and star drills shall be inspected prior to each use, and their use discontinued at the first sign of bending of the tool or chipping or cracking of the cutting edge or the struck face.

(j) Except as indicated in paras. 7(k) and 7(l), no area, section, or portion of the brick chisel, brick set, or star drill shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(k) As dulling of the cutting edge occurs from tool usage, the cutting edge shall be resharpened or redressed to its original contour only by the use of a whetstone or file.[2]

(l) Any mushrooming of the struck face shall be promptly redressed to its original contour by the use of a hand file.[2]

(m) Instructors or employers, or both, shall stress proper use and safety in the use of brick chisel, brick set, or star drill and shall emphasize the necessity to wear and ensure the use of safety goggles. The publication *Guide to Hand Tools — Selection, Safety Tips, Proper Use and Care* provides guidelines for the safe use of these tools.

(n) Each brick chisel, brick set, and star drill shall be stamped, labeled, or otherwise marked, size permitting, with a warning that conveys the hazard and what to do to avoid the hazard. As an example, the following safety message or equivalent may be used:

WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

At a minimum, the tool shall be marked with the phrase "Warning — Wear Safety Goggles" or the above pictogram.

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

The principles given in ANSI Z535.4 shall be used as a guide for alternate, equivalent methods of labeling.

[1] The striking test is so severe that a degree of permissible deformation, such as denting of the struck face, can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

[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 tool.

ASME B107.52

NAIL-PULLER BARS AND PRY BARS

1 SCOPE

This Standard provides performance and safety requirements for nail-puller bars intended primarily for use in extracting nails, and for pry bars that are intended for separating, prying, ripping, lifting, scraping, and aligning applications.

This Standard is intended to serve as a guide in selecting and using the hand tools covered. 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 the training of personnel in safe practices.

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

body: straight portion of the bar (excluding the handle grip when provided) used for gripping during nail-pulling or prying operations.

chisel end: portion of bar having a tapered shape gradually reducing to and including the prying edge.

claw: nail-pulling end of the bar having a tapered V-shaped opening for gripping the nail shank.

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.

grip: when provided, material securely attached to the body for holding during use.

grip area: the area of the body at the end opposite the prying end or point end that the user grips to apply force.

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

heel: portion of Type I bar intended to be struck, which is the outer surface of the curved section of the bar adjacent to the claw end.

nail-pulling slot: V-shaped slot or opening designed for pulling nails.

point end: portion of bar intended for aligning applications having a tapered round cross-sectional area.

prying edge: edge formed by the tapering of the chisel end or claw end.

prying end: portion of bar having a chisel end or a claw end.

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

shall: characterizes mandatory requirements of this Standard.

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

softwood: wood of a coniferous tree, e.g., fir, pine, or hemlock.

3 REFERENCES

The following publications 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

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

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959

SAE J1703, Motor Vehicle Brake Fluid

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

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

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

4 CLASSIFICATION

(a) Type I: struck nail-puller bar (Fig. 1)
(b) Type II: nonstruck nail-puller bar
  (1) Class 1: multipurpose (Fig. 2)
  (2) Class 2: ripping/wrecking (Fig. 3)
(c) Type III: pry bars
  (1) Class 1: close quarter (Fig. 4)
  (2) Class 2: die setter (Fig. 5)
  (3) Class 3: handled (Fig. 6)
  (4) Class 4: pinch (Fig. 7)
  (5) Class 5: rolling head (Fig. 8)

5 REQUIREMENTS

Nail-puller bars and pry bars shall pass the applicable tests in section 6.

5.1 Design

5.1.1 Nail-Puller Bars. Types I and II nail-puller bars shall be provided with a slotted claw, at one or both ends of the bar, suitable for pulling nails.

(a) Type I nail-puller bars shall be provided with one or more struck surfaces.

(b) Type II nail-puller bars shall be provided with no struck surfaces. Class 1 multipurpose bars are generally flat and thin for accessing tight spaces. Class 2 ripping/wrecking bars are heavy-duty tools with a prying end and a nail-pulling end.

5.1.2 Type III Class 1 Close Quarter. Pry bars shall have a sharply bent chisel end providing leverage in limited space applications and a point end for alignment applications.

5.1.3 Type III Class 2 Die Setter. Pry bars shall have a bent half-loop chisel end for separating or prying applications and a straight chisel end for scraping or prying.

5.1.4 Type III Class 3 Handled. Pry bars shall have a slightly bent chisel end for separating, scraping, or prying applications and a handle.

5.1.5 Type III Class 4 Pinch. Pry bars shall have a slightly bent chisel end for separating, scraping, or prying applications and a point end for alignment applications.

5.1.6 Type III Class 5 Rolling Head. Pry bars shall have a formed rounded chisel end that acts as a fulcrum to provide leverage and a point end for alignment applications.

5.2 Materials

The materials used in the manufacture of nail-puller bars and pry bars shall be such as to produce tools conforming to the requirements of this Standard.

5.3 Mechanical Properties

(a) Type I bars, excluding the heel, shall have a hardness of not more than 55 HRC or equivalent. The heel shall have a hardness of not more than 44 HRC or equivalent.

(b) Type II bars shall have a maximum hardness of 48 HRC or equivalent.

(c) Type III bars shall have a maximum hardness of 50 HRC or equivalent.

5.4 Additional Properties

Bars shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury to the user or adversely affect performance. Bars shall be free of manufacturing and material defects, such as seams, laps, pipes, or cold shuts, which would jeopardize sound construction.

6 TESTS

Many tests required herein are inherently hazardous, and adequate safeguards for personnel and property shall be employed in conducting such tests. Tests shall be conducted at a temperature between 40°F and 90°F.

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

6.1 Hardness

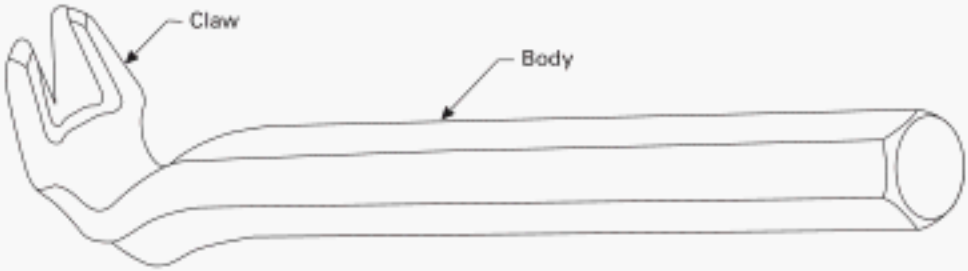
Hardness determination shall be made in accordance with ASTM E 18.

6.2 Nail-Pulling Test

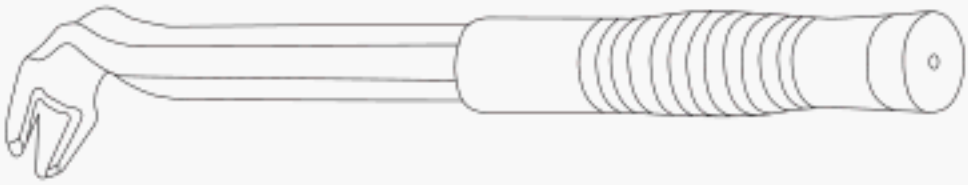
6.2.1 Type I. Six common unhardened nails (16d) corresponding to ASTM F 1667 designation F 1667 NLCMS-11B shall be driven into a softwood board with a minimum thickness of 3.5 in. so that the nail heads are flush with the board surface. Using an appropriate size ball peen, hand drilling, or engineer's hammer [see para. 7(a)], the claw end of the nail-puller bar is to be driven into the wood under the nail heads by striking the heel so that the V-shaped opening grips the nail shanks. Each nail is to be completely removed from the wood by successively engaging the nail shank with the V-shaped opening of the claw. There shall be no cracks or bending of the claw or tips and no cracking or chipping of the V-shaped opening.

6.2.2 Type II Class 1 Multipurpose. Each nail-pulling slot or opening shall completely remove six twopenny common nails driven into softwood board with a minimum thickness of 0.63 in. so that the nailheads are within 0.13 in. of the board surface. Successive prying using shims may be required. The test shall be repeated for every V-shaped opening or slot that is designed to pull nails. The pry bar shall not permanently deform or break.

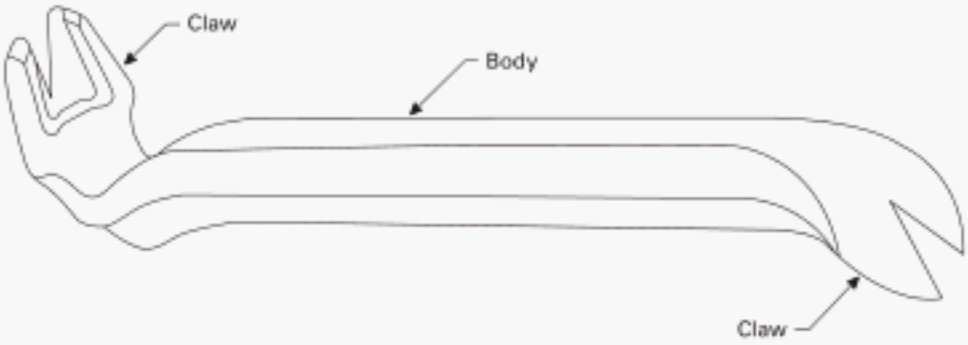
Fig. 1 Type I Struck Nail-Puller Bars



(a) Single Claw Without Grip



(b) Single Claw With Grip



(c) Double Claw

Fig. 2 Type II Class 1 Nonstruck Multipurpose Bar

Fig. 3 Type II Class 2 Nonstruck Ripping/Wrecking Bar

Fig. 4 Type III Class 1 Close Quarter Pry Bar

Fig. 5 Type III Class 2 Die Setter Pry Bar

Fig. 6 Type III Class 3 Handled Pry Bar

Fig. 7 Type III Class 4 Pinch Bar

Fig. 8 Type III Class 5 Rolling Head Pry Bar

6.2.3 Type II Class 2 Wrecking/Ripping. Six common unhardened nails (16d) corresponding to ASTM F 1667 designation F 1667 NLCMS-11B shall be driven into a softwood board with a minimum thickness of 3.5 in. so that the nailheads are within 0.25 in. of the board surface. The pry bar shall be positioned so that the V-shaped opening engages the nail shank immediately beneath the nailhead. Each nail shall be completely removed from the wood by applying force to the pry bar. Successive prying using shims may be required. The test shall be repeated for every V-shaped opening or slot that is designed to pull nails. The pry bar shall not permanently deform or break.

6.3 Type II Prying Test

Each end of the nail-puller bar shall be tested with the load applied as close to the opposite end as practical, as illustrated in Fig. 9, illustrations (a) and (b). Apply a slow steady load to the nail-puller bar to meet the torque specified in Table 1. If the blade or tip fails or takes a permanent set, the nail-puller bar has failed this test.

6.4 Type III Prying Tests

6.4.1 Prying End Test. The load shall be applied near the middle of the handle or grip area of the pry bar [see Fig. 9, illustration (c)]. Apply a slow steady load to the pry bar to the torque specified in Table 2. If the blade or tip fails, takes a permanent set, or if the handle loosens from the pry bar, the pry bar has failed this test.

6.4.2 Point End Test. The load shall be applied near the middle of the grip area of the pry bar (see Fig. 10). Apply a slow steady load to the pry bar to the minimum bend angle specified in Table 3. The pry bar shall not fracture before the minimum bend angle is achieved.

6.5 Handle Solvent Resistance Test

Assembled pry bar handles shall be fully immersed in the test fluids specified (new samples shall be used for each test fluid) for 15 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.

6.6 Handle Tensile Force (Pull Apart) Test

Assembled pry bar handles shall not break, loosen, or separate from the pry bar when subjected to the force specified in Table 4.

6.7 Handle Impact Test (See Table 5 and Fig. 11)

(a) The test plate shall have a hardness of 45 HRC to 50 HRC.

(b) The test plate shall rest on a solid foundation.

Fig. 9 Prying Test

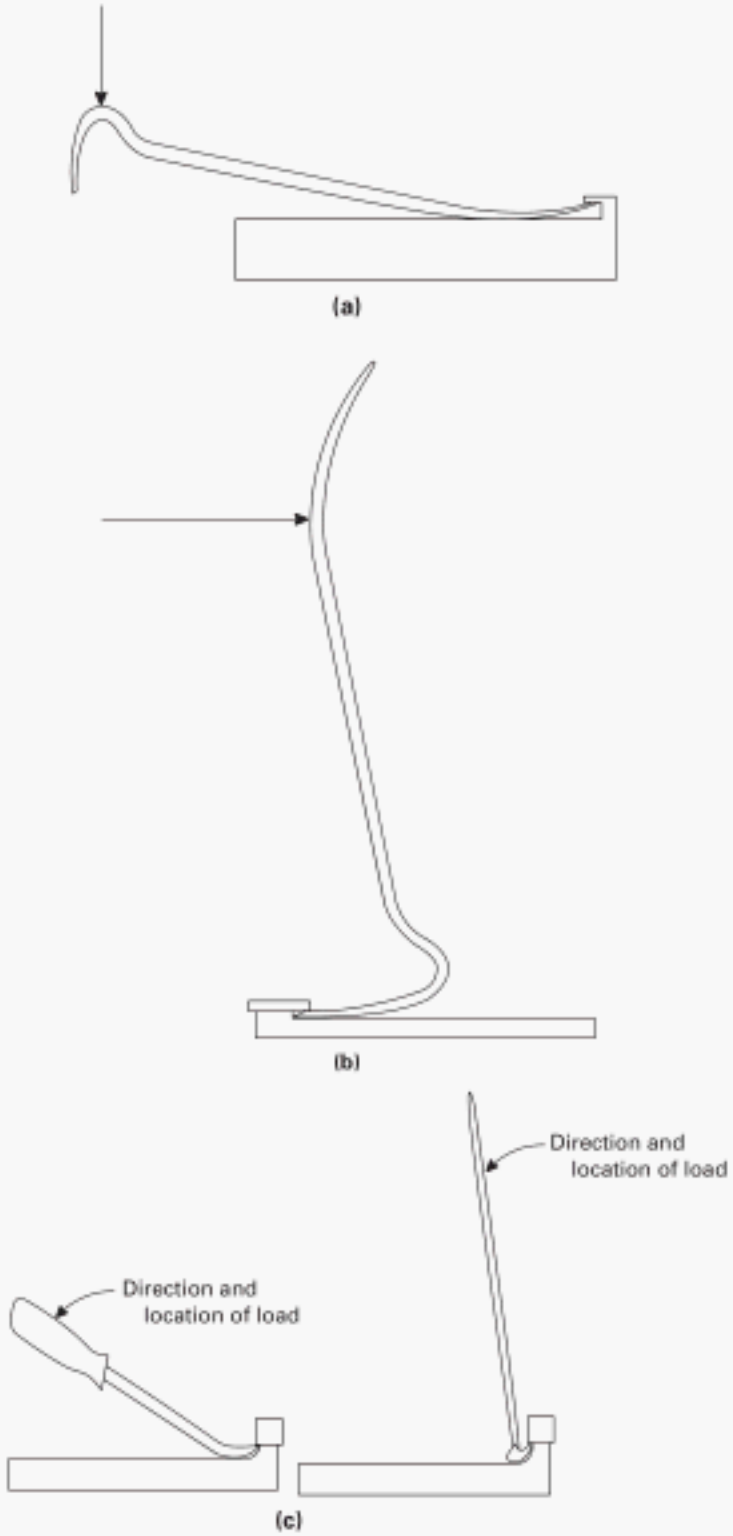


Table 1 Type II Prying End Test Specifications

Nail-Puller Bar Type II	Nominal Overall Length, in.	Torque, lbf-in., min.
Class 1 Multipurpose	Less than 8	...
	8 and above	2,000
Class 2 Ripping/Wrecking	Up to 15	1,200
	Over 15 to 21	2,100
	Over 21	2,600

Table 2 Type III Prying End Test Specifications

Type III Pry Bar Class	Nominal Overall Length, in.	Torque, lbf-in., min.
Class 1 Close Quarter	Up to 12	280
	Over 12 up to 17	700
	Over 17 up to 20	800
	Over 20	1,500
Class 2 Die Setter	...	2,600
Class 3 Pry Bar With Handle	Up to 10	500
	Over 10 up to 15	1,200
	Over 15 up to 21	1,400
	Over 21 up to 28	1,600
	Over 28	2,900
Class 4 Pinch	Up to 14	460
	Over 14 up to 15.5	650
	Over 15.5 up to 24	1,800
	Over 24 up to 33	2,800
	Over 33	5,100
Class 5 Rolling Head (rolling head end)	Up to 9	500
	Over 9 up to 14	1,200
	Over 14 up to 18	1,400
	Over 18	1,600

Table 3 Point End Test Specifications

Type III Pry Bar Class	Nominal Length, in.	Minimum Bend Angle, deg
Class 1 Close Quarter	All	30
Class 4 Pinch	All	30
Class 5 Rolling Head	Less than or equal to 6	20
	All others	30

GENERAL NOTE: Insertion to midpoint of taper ±0.13.

Fig. 10 Point End Test

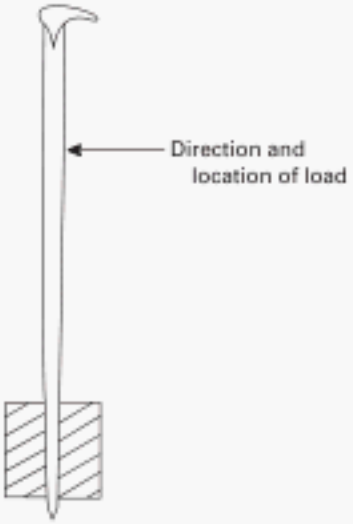


Fig. 11 Handle Impact Test

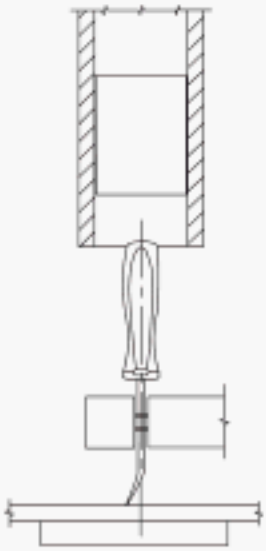


Table 4 Handle Tensile Force Test Loads

Nominal Across Flats of Shank, in.	Minimum Load, lb
Up to 1/4	150
Above 1/4 up to 3/8	210
Above 3/8 up to 7/16	275
Above 7/16	475

Table 5 Handle Impact Test Specifications

Nominal Blade Width, in.	Drop Weight, lb ±2 oz	Drop Height, in. ±0.5	Maximum Blade Penetration Into Handle, in.
Up to 1/4	15	10.0	0.7
Above 1/4 up to 3/8	15	20.0	0.7
Above 3/8 up to 7/16	15	25.0	0.7
Above 7/16	15	35.0	0.7

(c) The striking weight shall fall freely through a seamless tube having an inner dimension slightly larger than the weight.

(d) The striking face of the weight shall have a minimum hardness of 54 HRC.

(e) Impact each sample 20 times.

(f) Assembled pry bar handles shall not break, crack, nor significantly distort. "Significantly distort" (for the purpose of this test) means an increase of at least 5% in the handle diameter, either as a uniform or irregular bulge.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

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

(a) The Type 1 nail-puller bar is a special-purpose tool designed and intended only for the specific use

of extracting embedded nails from wood. The claw is intended to be driven into the wood under a nail head by striking the heel with an appropriate hammer such as a ball peen, hand drilling hammer, or engineer's hammer with a striking face diameter at least 0.375 in. larger than the heel of the nail-puller bar. A nail hammer shall not be used to strike a nail-puller bar. (The striking face is too small and may chip.) A pipe extension or other form of "cheater" to increase the leverage of any nail-puller bar shall never be used.

(b) Type II nail-puller bars are not intended to be struck.

(c) Type III pry bars are special-purpose tools designed and intended only for the specific use of separating, prying, ripping, lifting, scraping, and aligning applications. A pry bar is not intended to be struck.

(d) A hammer blow should always be struck squarely with the hammer face parallel to the heel. Glancing blows and overstrikes and understrikes should be avoided. No other part of the nail-puller bar should be struck.

(e) 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 nail-puller bar or pry bar is being used to avoid possible injury from flying objects.

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

(g) Handle grips that have loosened shall be repaired or replaced.

(h) No part of the bar shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(i) A pipe extension or other form of "cheater" to increase the leverage of any bar shall never be used.

(j) Each bar 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

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.

ASME B107.59

SLUGGING AND STRIKING WRENCHES

1 SCOPE

This Standard provides performance and safety requirements for slugging and striking wrenches that are intended for torquing of fasteners.

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 for the development of manuals and posters and for training personnel to work safely.

2 DEFINITIONS

See Figs. 1 and 2.

box end: portion of wrench that engages axially with the hex head of a threaded fastener.

chamfer: angled surface or equivalent radius encircling the perimeter of and breaking the sharp corners of the struck face.

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

may: the word *may* in this Standard shall be interpreted to indicate a foreseeable or allowable nonmandatory condition.

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

shall: refers to a mandatory requirement.

shank: portion of wrench between the box end and struck block.

should: characterizes a provision to be a recommendation.

struck block: portion of wrench opposite the box end having a square or rectangular cross section that includes the struck faces.

struck face: surface of struck block exclusive of the chamfer that is intended to be struck with a striking tool while torquing fasteners.

struck face crown: convex shape or radius of the struck face (if provided).

Fig. 1 Nomenclature for Striking Wrenches

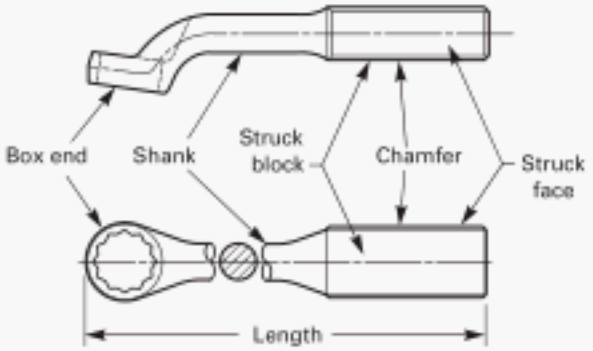
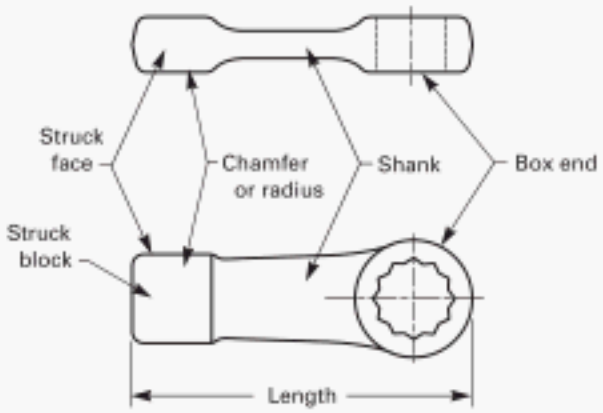


Fig. 2 Nomenclature for Slugging Wrenches



3 REFERENCES

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

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

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

ASME B107.100, Wrenches

ASME B107.17M, Gages, Wrench Openings, Reference

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

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

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, 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

4 CLASSIFICATION

See Table 1.

(a) Type I: slugging wrench (straight shank)

(b) Type II: slugging wrench (offset shank)

(c) Type III: striking wrench (slightly angled shank and large offset)

5 REQUIREMENTS

5.1 Design

Slugging and striking wrenches shall have a box end for turning fasteners, a shank, and a block at the opposite end to be struck by a striking tool of the appropriate type and size. The appropriate striking tool, such as a ball peen hammer, blacksmith's hammer, maul, or sledge shall have a striking face diameter not less than 0.375 in. larger than the struck face width of the wrench (see Fig. 3).

Typical styles of slugging and striking wrenches are shown in Figs. 1 and 2. Slugging wrenches generally have thicker cross-sections than striking wrenches and are intended for withstanding heavier blows. The styles covered by this Standard are not limited to those named or illustrated.

The struck faces of slugging and striking wrenches shall have a crowned or a flat surface. The struck faces of slugging and striking wrenches shall have a chamfer of approximately 45 deg or equivalent radius around the perimeter having a width equal to approximately one-tenth the struck face width (see Fig. 3). For example, if the struck face width is 1.00 in., then the chamfer width would be approximately 0.10 in.

All slugging and striking wrenches shall be free of nonfunctional sharp edges, points, and surface roughness that could inflict personal injury when handling the tool. They shall conform to the requirements for mechanical properties specified in para. 5.3 and shall withstand the impact test specified in para. 6.2.

5.2 Materials

The materials used in the manufacture of slugging and striking wrenches shall be such as to produce slugging and striking wrenches conforming to the requirements specified herein.

5.3 Mechanical Properties

Slugging and striking wrenches shall be through hardened and tempered to a maximum hardness of 44 HRC or equivalent.

5.4 Markings

Each wrench shall be marked in a plain and permanent manner with the nominal wrench opening and safety message. See para. 7(l).

5.5 Wrench Openings

Wrench openings shall be such as to ensure acceptance when gaged with gages conforming to ASME B107.17M.

6 TESTS

SAFETY WARNING: 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 manner inconsistent with safe use of the tools.

Slugging and striking wrenches shall be capable of meeting the tests specified in paras. 6.1 and 6.2. Separate (new) wrenches shall be used for each test. Failure to meet the requirements of the applicable tests indicates that the wrenches do not comply with this Standard.

6.1 Hardness Determination Test

Hardness determination shall be made in accordance with ASTM E 18.

6.2 Impact Test

Sample wrenches shall be subjected to the impact test in para. 6.2.1 or 6.2.2, depending on the style of wrench. All three wrenches shall be evaluated at the conclusion of the test. The struck block of the wrenches shall not crack or chip. There shall be no visible bending of the shank or twisting of the box ends in excess of 5 deg. There shall be no cracks evident on any portion of the wrenches. The wrench openings shall not slip on the mandrel. Normal deformation of the struck face and the box end of the wrenches is permitted.[1]

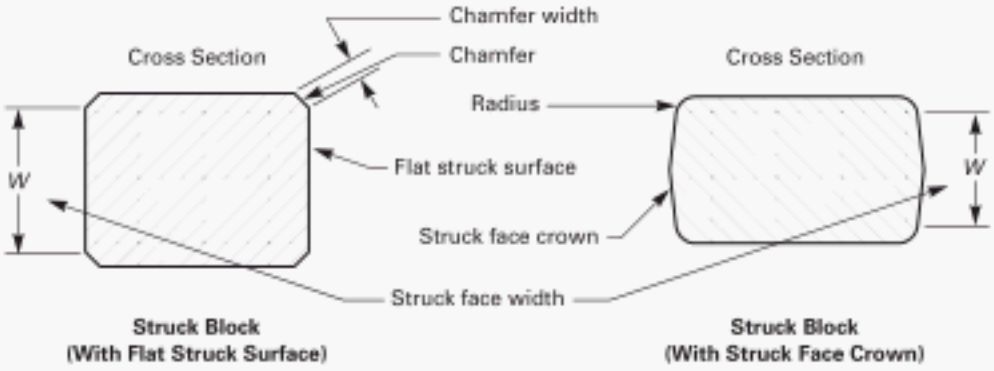
6.2.1 Slugging Wrench. Three samples of the same style and size slugging wrench shall be mounted on a hexagonal mandrel with the middle wrench offset 30 deg with respect to the other wrenches. The hexagonal mandrel shall meet the requirements of ASME B107.100 as applicable. Steel shims 0.25 in. thick shall be placed under the heads of the two wrenches on the ends of the mandrel, and the assembly clamped at each of these heads to a rigidly supported steel block weighing not

[1] The test is so severe that a degree of permissible deformation such as the denting of the box end wrenching surfaces and the struck face can be anticipated. A much less severe test would avoid this, but it would not provide the level of safety assurance desired.

Table 1 Wrench Applications

Style	Type	Application
Slugging wrench (straight shank)	I	Designed for use in applications where heavy shock or impact from a hammer or sledge is required to loosen or set large nuts or fasteners. Should be used when the torquing force can be applied directly in the plane of the fastener.
Slugging wrench (offset shank)	II	Designed for use in applications where heavy shock or impact from a hammer or sledge is required to loosen or set large nuts or fasteners. Should be used when fastener clearance is restricted and the torquing force cannot be applied directly in the plane of the fastener.
Striking wrench (slightly angled shank and large offset)	III	Designed for use in applications where shock or impact from a hammer or sledge is needed to tighten or loosen nuts or fasteners. Offset allows use where fastener clearance is restricted. Should be used when the torquing force cannot be applied directly in the plane of the fastener.

Fig. 3 Struck Block Cross-Section



less than 400 lb. The drop weight shall have a striking face hardness of not less than 45 HRC or equivalent nor more than 60 HRC or equivalent and shall be dropped squarely onto the struck face of the middle wrench. The striking face diameter of the drop weight shall not be less than 0.375 in. larger than the struck face width of the wrench being struck (see Fig. 3).

Typically, the drop weight is cylindrical and is dropped through a seamless tube slightly larger in diameter. Drop weights and drop heights are listed in Table 2. The drop weight shall be dropped 100 times onto the struck face of the middle wrench (see Fig. 4 for illustration of impact test setup). Alternate methods of striking the wrench may be used if the required impact energy in Table 2 is satisfied.

6.2.2 Striking Wrench. Three samples of the same style and size wrench shall be mounted and tested using the same apparatus and method used in para. 6.2.1, except the drop weight shall be dropped 20 times onto the struck face of the middle wrench. Drop weights and drop heights are listed in Table 2. Alternate methods of striking the wrench may be used if the required impact energy in Table 2 is satisfied.

7 SAFETY REQUIREMENTS AND LIMITATIONS OF USE

(a) Instructors and employers shall stress proper use and safety in the use of slugging and striking wrenches 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 hand tools.

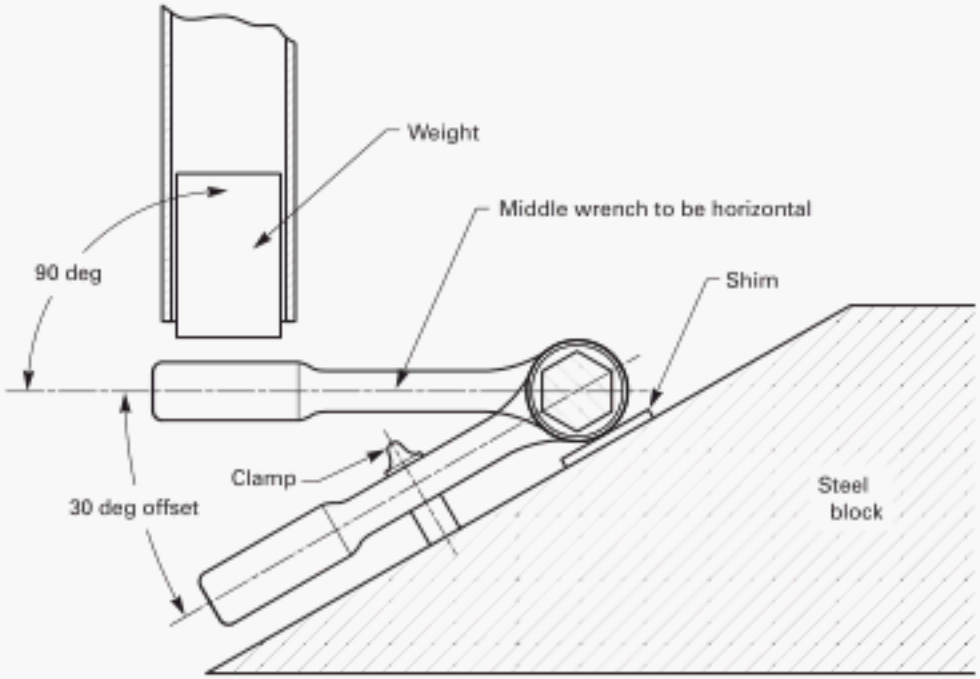
(b) Slugging and striking wrenches are special-purpose tools designed and intended only for use with heavy-duty fasteners where shock or impact is needed to fully tighten or loosen (see Table 1).

(c) To avoid possible eye or other bodily injury, slugging and striking wrenches shall be used only for the purpose specified in para. 7(b).

Table 2 Impact Test Specifications

Wrench Style	Nominal Wrench Opening, in.	Drop Weight, lb	Drop Height, ft	Impact Energy, lbf-f
Slugging (offset and straight shank), Types I and II	Less than 2	10	10	100
	At least 2, but less than $2\frac{3}{4}$	15	10	150
	$2\frac{3}{4}$ or greater	24	15	360
Striking Type III	Less than $1\frac{5}{8}$	5	5	25
	At least $1\frac{5}{8}$, but less than $2\frac{3}{8}$	10	5	50
	$2\frac{3}{8}$ or greater	10	10	100

Fig. 4 Impact Test Setup



(d) A striking tool should always be used with the striking face parallel to the struck face of the wrench. Glancing blows, overstrikes, and understrikes should be avoided. No surface of the wrench other than the struck face shall be struck. The striking tool of the appropriate size shall have a striking face diameter not less than 0.375 in. larger than the struck face of the wrench.

(e) To avoid possible eye 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 where any slugging and striking wrench is being used.

(f) Slugging and striking wrenches shall not be used with "cheater" pipes or other means to extend the length of the tool.

(g) Slugging and striking wrenches shall be inspected prior to each use and their use discontinued at the first sign of bending the shank or chipping or cracking of the box end or struck block.

(h) Deformation of the wrenching configuration may occur from tool usage. Wrenches shall be inspected prior to each use and their use discontinued at the first sign of significant wrenching surface deterioration.

(i) Except as indicated in para. 7(j), no area, section, or portion of the wrench shall be ground, welded, treated by reheating, or otherwise altered from the original condition as furnished by the manufacturer.

(j) At the first indication of mushrooming, the struck face and struck face chamfer of the wrench shall be

redressed to its original contour by the use of a hand file or whetstone.[2]

(k) Care shall be exercised to prevent the wrench from dislodging from the fastener or nut while being impacted.

(l) Each wrench shall be permanently marked by the manufacturer with the following message or equivalent:

WARNING
WEAR SAFETY GOGGLES
USER AND BYSTANDER

Pictorials are an acceptable equivalent. This safety message shall be located in a position that will not interfere with the quality or performance of the tool.

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

B107 AMERICAN NATIONAL STANDARDS FOR HAND TOOLS

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ASME B107.410-2008

ISBN-13: 978-0-7918-3115-1
ISBN-10: 0-7918-3115-9

N16508