STD.ASME B94.52M-ENGL 1999 0759670 0615580 7T2

ASME B94.52M-1999
(Revision of ASME B94.52M-1994)

SPECIFICATIONS FOR HACKSAW BLADES

AN AMERICAN NATIONAL STANDARD



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Date of Issuance: January 28, 2000

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FOREWORD

The first Simplified Practice Recommendation to cover hacksaws was issued by the Department of Commerce in 1928, in cooperation with the hacksaw industry. The changing requirements of the marketplace were met by six subsequent revisions, the last revision being in 1962.

In 1962, recognizing the interest of European industry in promoting an international standard, the United States hacksaw industry began to work toward the approval of its standard under the Institute's existing standards method of procedure. The existing standard, ANSI B121.1-1970, was the result of this work.

As a result of work in the 1970s in the area of international standards, the Hack and Band Saw Manufacturers Association of America, which is a member of the committee for the promulgation of the standard (ISO TC29 WG), felt that additional information should be available to manufacturers, distributors, and users that would enable them to produce, sell, and utilize better hacksaw blades.

Added sections included:

(a) suggested composition guidelines for standard, composite, alloy, and high-speed steel hacksaws;

(b) hardness limits;

(c) tooth form suggestions;

(d) tooth form set tolerances;

(e) flatness tolerances.

The present standard is a result of submittals by the hacksaw industry to the ASME Standards Committee B94. This Committee achieves consensus of the standards by means of a Subcommittee which develops standards under procedures accepted by the American National Standards Institute.

The American Society of Mechanical Engineers is the sponsor for B94 and supervises the promulgation of the standard with the expertise furnished by individual members. This Standard was designated B94.52M and was approved as an American National Standard on April 14, 1999.

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Cutting Tools, Holders, Drivers, and Bushings

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

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SPECIFICATIONS FOR HACKSAW BLADES

1 SCOPE

This Standard provides a useful criterion of practice in production, distribution, and use of hacksaw products. It was developed to provide blades that will meet all normal requirements of consumers. Section 3, Definitions, indicates the specific types in common usage and also defines the various elements.

This Standard covers tooth shape, sizes, and tolerances for hand and power hacksaw blades in all types of materials; and it also sets out the determination of:

(a) hacksaw blade dimensions in all types of steel;

(b) tooth form and set;

(c) blade straightness and minimum hardness characteristics.

2 FIELD OF APPLICATION

This Standard applies to high-speed steel, composite, and standard steel hand hacksaw blades, and high-speed steel and composite steel power hacksaw blades.

3 DEFINITIONS

For the purpose of this Standard, the following definitions are set forth.

composite blade: consists of a high-speed steel cutting edge welded to an alloy steel back. The cutting edge after heat treatment shall not be less that 62 Rockwell C, and the body shall not be harder than 52 Rockwell C.

hacksaw blade: a steel saw blade 250 mm (10 in.) or more in length having a pinhole or pinholes near each end, the cutting edge or edges of which consists of teeth which are set, and which is hardened or hardened and tempered by any process at the cutting edge or edges, or throughout the entire blade.

hardness: hardness testing of a hacksaw is a specialized art and can be accomplished by the following methods: Superficial Rockwell 15N, Vickers, or micro hardness. Any of the readings taken from the above methods can then be converted to Rockwell C equivalents by using an approximate conversion table.

NOTE: See conversion table in Appendix I or ASTM E 140-72.

high-speed steel: the requirements for high-speed steels shown below shall apply to this Standard:

chemistry

(a) minimum alloy contents by major elements (percent by weight)

C	0.65%
Cr	3.50%
W + 1.8Mo	11.75%
V	0.80%

(b) minimum total alloy content based on tungsten equivalents: $\frac{1}{3}$ Cr + 6.2V + W + 1.8Mo

(1) for grades containing less than 5% cobalt, 22.50;

(2) for grades containing 5% cobalt or more, 21.00.

hardening response: ability to be austenitized and then tempered at a temperature not less than 510°C (950°F), to yield a fine grain structure (Snyder-Graff grain size 8 minimum) and a minimum hardness of 62 RC.

NOTE: Requirements are from ASTM A 600-79.

overall set: the total width of the extreme distance of the opposite teeth, taking into account the set on either side of the blade which determines the overall width of cut (see Fig. 1).

pitch: the distance between the apices of adjacent teeth.

Teeth per unit length is the number of complete teeth per 25 mm (1 in.) length.

NOTE: Pitch and teeth per inch are reciprocals of each other.

standard steel: a steel with carbon content in the range 0.7% to 1.3% and with other alloying elements not to exceed a maximum of 2.5%. The hardness at the tip of the tooth shall be at least 62 Rockwell C.

tooth set: the projection of the teeth from the side of the blade to provide cutting clearance (see Fig. 1).

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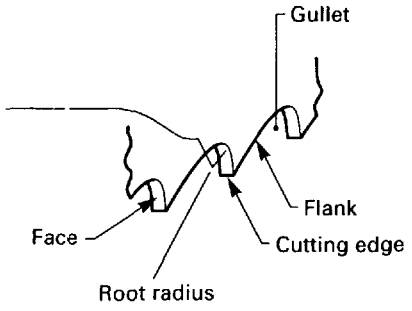

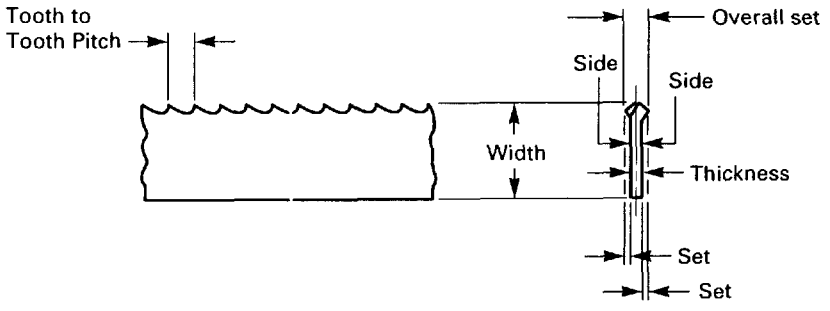

FIG. 1 TOOTH FEATURES



FIG. 2 REGULAR OR STANDARD TOOTH FORM

3.1 Tooth Nomenclature

cutting edge: the transverse edge formed by the intersection of the flank and the face (see Fig. 1).

face: that surface of the tooth adjacent to the cutting edge on which the chip impinges as it is severed from the work (see Fig. 1).

flank: that surface behind the cutting edge which extends to the root radius (see Fig. 1).

gullet: the space bounded by the face, root radius, and flank of a tooth which permits the removal of the severed chip (see Fig. 1).

rake angle: the incline of the face of the nonset tooth from the perpendicular.

side: the flat surface between the toothed edge and the back edge (see Fig. 1).

4 TOOTH FORM AND SET

4.1 Tooth Form

Tooth form may be varied to suit the individual manufacturer, the user, and the material to be cut.

Regular or standard tooth form has a zero degree rake angle and full round gullets and is the most widely used design (see Fig. 2).

4.2 Tooth Set

The basic types of tooth set are listed below:

(a) Alternate. This is a transverse setting of individual teeth, alternately to the right and the left (see Fig. 3).

(b) Raker. This is a transverse setting of individual teeth, one to the right, one to the left, and one unset, continuing the same sequence of settings (see Fig. 4).

(c) Wavy. This is a transverse setting of groups of teeth to the left and right (see Fig. 5).

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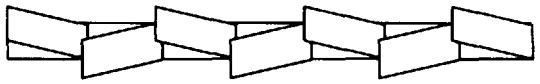

FIG. 3 ALTERNATE TOOTH SET

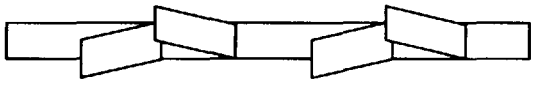

FIG. 4 RAKER TOOTH SET

(d) Modified Raker. This is a transverse setting of individual teeth, one to the right, one to the left, one unset; in the subsequent series, the setting is reversed (see Fig. 6).

(e) Variable Raker. Variable Raker set is a special set used on variable pitch teeth. Teeth are alternately set to the right and to the left with one unset tooth in each variable pitch sequence. The number of set teeth between unset teeth varies with tooth specifications (see Fig. 8).

4.3 Application

Wavy set is used generally on 24 and 32 teeth/25 mm hand hacksaw blades. Other tooth sizes generally use raker, modified raker, or alternate set.

5 DIMENSIONS AND TOLERANCES

Tables 1 through 5 provide the dimensions and tolerances allowed by this Standard.



FIG. 5 WAVY TOOTH SET

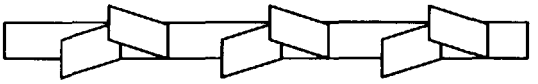

FIG. 6 MODIFIED RAKER TOOTH SET

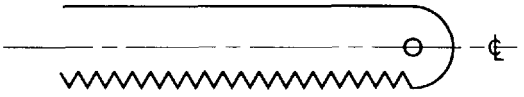

FIG. 7 PINHOLE LOCATIONS

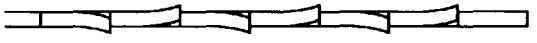

FIG. 8 VARIABLE RAKER TOOTH SET

6 PINHOLE LOCATIONS

Pinholes on hacksaws may be located on or below center of the blade at manufacturer's option (see Fig. 7).

7 APPLICATION CONSIDERATIONS

For power hacksaw blades, machine maker recommendations should be followed scrupulously. Machines should be properly maintained.

TABLE 1
HAND HACKSAW BLADES

Nominal Length		No. of Teeth per 25 mm (1 in.)	Width		Thickness		Overall Length		Center-to-Center Pinholes		Pinhole Diameter	
mm	in.		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
250	10	18, 24, 32	13.0	1/2	0.60	0.025	264	10 3/8	251	9 7/8	4	0.156
300	12	14, 18, 24, 32	13.0	1/2	0.60	0.025	314	12 3/8	302	11 7/8	4	0.156

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TABLE 2
DIMENSIONAL TOLERANCES FOR HAND HACKSAW BLADES

Blade Dimension	Tolerance	
	mm	in.
Width	+0, −0.5	+0, −0.020
Thickness, high-speed steel	±0.08	±0.003
Thickness, standard steel	±0.03, −0.08	+0.001, −0.003
Overall length	+0, −4.8	+0, −3/16
Pinholes, center-to-center	+0.4, −3.9	+1/64, −5/32
Pinholes diameter	+0.3, −0	+0.010, −0

TABLE 3
SOLID HIGH-SPEED POWER SAW BLADES

Nominal Length		No. of Teeth per 25 mm	Width		Thickness		Overall Length		Center-to-Center Pinholes		Pinhole Diameter	
mm	in.	(1 in.)	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
300	12	14, 18	16	5/8	0.80	0.032	318	12 1/2	302	11 7/8	4.78	0.188
300	12	10, 14	25	1	1.27	0.050	324(1)	12 3/4	302	11 7/8	7.14	0.281
350	14	10, 14	25	1	1.27	0.050	365(1)	14 3/8	343	13 1/2	7.14	0.281
350	14	6, 10	32	1 1/4	1.58	0.062	368	14 1/2	343	13 1/2	7.14	0.281
350	14	6	38	1 1/2	1.91	0.075	368	14 1/2	343	13 1/2	7.14	0.281
425	17	14	25	1	1.27	0.050	441(1)	17 3/8	419	16 1/2	7.14	0.281
425	17	10	32	1 1/4	1.58	0.062	445	17 1/2	419	16 1/2	7.14	0.281
450	18	6, 10	32	1 1/4	1.58	0.062	470	18 1/2	445	17 1/2	7.14	0.281
450	18	4, 6	38	1 1/2	1.91	0.075	470	18 1/2	445	17 1/2	7.14	0.281
450	18	4, 6	44	1 3/4	2.24	0.088	476	18 3/4	445	17 1/2	7.14	0.281
525	21	4, 6	44	1 3/4	2.24	0.088	565	22 1/4	533	21	7.14	0.281

NOTE:
(1) For these sizes, alternate overall lengths of 327 mm (12 7/8 in.), 368 mm (14 1/2 in.), and 445 mm (17 1/2 in.) respectively, are acceptable.

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TABLE 4
COMPOSITE POWER SAW BLADES

Nominal Length		No. of Teeth per 25 mm (1 in.)	Width [Note (1)]		Thickness		Overall Length		Center-to-Center Pinholes		Pinhole Diameter	
mm	in.		mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
300	12	14, 18	19	3/4	0.80	0.032	318	12 1/2	302	11 7/8	4.78	0.188
300	12	10, 14	29	1 1/8	1.27	0.050	324(2)	12 3/4	302	11 7/8	7.14	0.281
350	14	10, 14	29	1 1/8	1.27	0.050	365(2)	14 3/8	343	13 1/2	7.14	0.281
350	14	6, 10	35	1 3/8	1.58	0.062	368	14 1/2	343	13 1/2	7.14	0.281
350	14	6	41	1 5/8	1.91	0.075	368	14 1/2	343	13 1/2	7.14	0.281
425	17	10	35	1 3/8	1.58	0.062	445	17 1/2	419	16 1/2	7.14	0.281
450	18	6, 10	35	1 3/8	1.58	0.062	470	18 1/2	445	17 1/2	7.14	0.281
450	18	4, 6	41	1 5/8	1.91	0.075	470	18 1/2	445	17 1/2	7.14	0.281
450	18	4, 6	48	1 7/8	2.24	0.088	476	18 3/4	445	17 1/2	7.14	0.281
525	21	4, 6	48	1 7/8	2.24	0.088	565	22 1/4	533	21	7.14	0.281

NOTE:
(1) Actual size width is shown; however, manufacturer's catalogs relate these size widths the same as solid high-speed power saw blades.
(2) For these sizes, alternate overall lengths of 327 mm (12 7/8 in.), 368 mm (14 1/2 in.), and 445 mm (17 1/2 in.), respectively, are acceptable.

TABLE 5
DIMENSIONAL TOLERANCES FOR POWER HACKSAW BLADES

Blade Dimensions	Tolerance	
	mm	in.
Thickness	±0.08	±0.003
Overall length	±1.6	±1/16
Pinholes, center-to-center	±0.8	±1/32
Pinholes diameter	+0.25, −0	+0.010, −0
Width	±0.8	+1/32
	−0.8	−1/32

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MANDATORY APPENDIX I
HARDNESS CONVERSION TABLE

Hardness Conversion Table

RC Scale	R15N Scale	Vickers 10KG
25	72.2	266
37	78.8	363
38	79.4	372
62	91.1	746

GENERAL NOTE: Source: Machinery's Handbook, 22nd Edition.

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Specifications for Hacksaw Blades B94.52M-1999
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