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AMERICAN NATIONAL STANDARD

Solid Steel Rectangular Metal Cutting Squaring Shear Knives Dimensional Tolerances

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SECRETARIAT

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

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FOREWORD

The Metal Cutting Knife Association appointed the "Standards Committee" of the Association to review the possibility of standardizing "Squaring Shear Knives."

After reviewing this program the committee notified the members of Technical Committee #17 about this proposed standard and meetings were held on October 8, 1974, April 8, 1975, October 7, 1975, March 9, 1976, September 21, 1976, December 7, 1976 and March 22, 1977.

On May 6, 1977 this Standardization Program was forwarded to the Chairman of the B94 Standards Committee, Technical Committee 17 for review and with anticipation of having it adopted as an American National Standard. This Standard was approved as an American National Standard on April 5, 1978.

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AMERICAN NATIONAL STANDARD

SOLID STEEL RECTANGULAR METAL CUTTING SQUARING SHEAR KNIVES DIMENSIONAL TOLERANCES

1. SCOPE

This document specifies dimensions and tolerances in inches and millimeters for solid steel metal cutting squaring shear knives used for shearing ferrous and non-ferrous metals. The dimensions and tolerances together with the terminology represent within the industry practice for the manufacture, assembly and use of shear knives covered in this standard. This document contains two separate series of shear knives, a customary unit series and a metric series. The metric series are hard converted and not interchangeable with the customary product.

2. TERMINOLOGY

2.1 Gap Shear. A sheet or plate shear whose side housings have a throat or gap allowing the handling of material of a greater width than the width of the machine.

2.2. Plate Shear. A shear to cut flat rolled material ¼" (6 mm) and thicker.

2.3 Sheet Shear. A shear to cut flat rolled material less than ¼" (6 mm) thick.

2.4 Squaring Shear. Shear used to square plates and sheets.

2.5 Shear Capacity. Capacity of the shear expressed in maximum thickness and length of cut in mild steel. (55,000 PSI Tensile) (380 MPa).

2.6 Solid Steel Shear Knife. Knife composed of one homogeneous grade of tool steel.

2.7 Four Edge Shear Knife. Straight rectangular in section, having all four corners (edges) available for cutting.

2.8 Length. The straight line dimension from one end of the cutting edge to the other, and the greatest dimension.

2.9 Width. The second largest external dimension on a shear knife.

2.10 Thickness. The least of the three dimensions used to identify the size of a shear knife.

2.11 Parallelism. Two surfaces following the same plane at an equal distance. The tolerances on parallelism indicate the degree of variation acceptable from the true parallel surfaces.

2.12 Squareness. Two adjacent surfaces being 90° to each other.

2.13 Tolerances. Allowable deviation from nominal dimensions.

2.14 Bow. Variation from straight plane edgewise or flatwise over full length of knife. (See Table 1.)

2.15 Flatness. Having an even surface witthout depressions or elevations when gauged along the same plane. Tolerance on flatness is the degree of variation acceptable from the true flat surface. (See Table 1.)

BOLT HOLES

2.16 Angle of Countersink. The included angle formed by the two opposite sides of the countersink. (Measured in degrees.)

2.17 Countersink. Enlarged conical part of a hole to allow for the head of a fastener.

2.18 Keyslot. Slot in or through hole and countersink to accommodate lug on plow bolt to prevent bolt from turning in knife.

2.19 Tapped Hole. A through-hole with internal threads to accept a thread fastener.

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Cross Section Recommendations

Width (in Inches)	Thickness
2	1/2
3	3/4
3	1
4	1
5	1-1/8
5-1/2	1-1/2
6-1/2	1-3/4

Lengths

Recommended knife length should be the shearing length capacity of the shear plus the width of the knife:

Example:

4" x 1" cross section on a 10 ft. shear would be 120" plus 4" or 124" for knife length. Similarly, a 5-1/2" x 1-1/2" cross section for 10 ft. shear would be 120" plus 5-1/2" or 125-1/2" for knife length. Recommended maximum length or one piece knives should be nominal 168". Longer knives should be sectional.

Holes

The following table shows knife thickness, bolt diameter, and diameter of the bolt hole:

Knife Thickness (in inches)	Bolt Diameter (in inches)	Hole Diameter (in inches)
1/2	3/8	7/16
3/4	1/2	9/16
1	3/4	13/16
1-1/8	3/4	13/16
1-1/2	1	1-1/16
1-3/4	1	1-1/16

Hole Spacing

It is recommended that end holes should be no closer to end of knife than 1/2 the width of the knife.

Example:

4" wide knife, end holes to be 2" from end of knife minimum. Where feasible, holes to be on 8" centers.

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SQUARING SHEAR KNIVES

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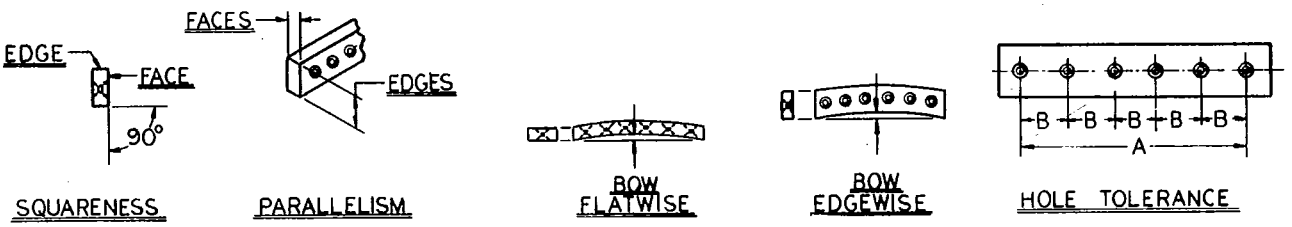

Table 1 Dimensional Tolerances in Inches of Solid Steel Rectangular Metal Cutting Squaring Shear Knives
(Dimensions in Inches)

Knife Lengths	Length	Width	Thickness	Permissible Bow Flatwise	Permissible Bow Edgewise	A Tolerance Between End Holes	B Tolerance Between Holes
12" & Shorter	± 0.031	+ 0.000 - 0.031	+ 0.000 - 0.015	0.031	0.015	± 0.031	± 0.031
Over 12" to 36"	± 0.062	+ 0.000 - 0.031	+ 0.000 - 0.015	0.062	0.015	± 0.062	± 0.062
Over 36" to 96"	± 0.125	+ 0.000 - 0.031	+ 0.000 - 0.015	0.093	0.031	± 0.125	± 0.062
Over 96" to 126"	+ 0.125 - 0.187	+ 0.000 - 0.031	+ 0.000 - 0.015	0.125	0.062	± 0.187	± 0.062
Over 126"	+ 0.125 - 0.250	+ 0.000 - 0.031	+ 0.000 - 0.015	0.250	0.062	± 0.250	± 0.062

Squareness of edge to face of knife within 0.005".
Parallelism of Knife Faces: Within 0.003" with no variation greater than 0.001" within any 12" length throughout entire length.
Parallelism of Knife Edges: Within 0.005" with no variation greater than 0.001" within any 12" length throughout entire length.

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Cross Section Recommendations

Width (in Millimeters)	Thickness (in Millimeters)
50	12
75	20
75	25
100	25
125	30
140	40
165	45

Lengths

Recommended knife length should be the shearing length capacity of the shear plus the width of the knife:

Example:

100 mm x 25 mm cross section on a 3048 mm shear would be 3048 mm plus 100 mm or 3150 mm for knife length. Similarly, a 140 mm x 40 mm cross section for 3048 mm shear would be 3048 mm plus 140 mm or 3190 mm for knife length. Recommended maximum length or one piece knives should be nominal 4250 mm. Longer knives should be sectional.

Holes

The following table shows knife thickness, bolt diameter, and diameter of the bolt hole:

Knife Thickness (in mm)	Bolt Diameter (in mm)	Hole Diameter (in mm)
12	10	12
20	12	14
25	20	22
30	20	22
40	25	27
45	25	27

Hole Spacing

It is recommended that end holes should be no closer to end of knife than 1/2 the width of the knife.

Example:

100 mm wide knife, end holes to be 50 mm from end of knife maximum. Where feasible, holes to be on 200 mm centers.

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SQUARING SHEAR KNIVES

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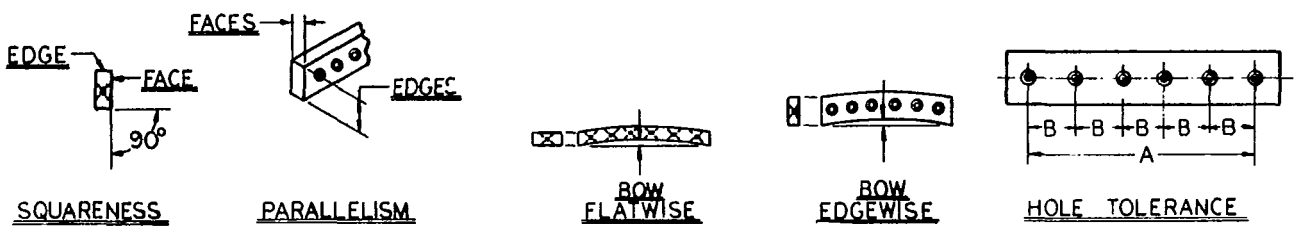

Table 2 Dimensional Tolerances in Millimeters of Solid Steel Rectangular Metal Cutting Squaring Shear Knives
(Dimensions in Millimeters)

Knife Lengths	Length	Width	Thickness	*Permissible* Bow Flatwise	*Permissible* Bow Edgewise	A *Tolerance* Between End Holes	B *Tolerance* Between Holes
300 mm & Shorter	± 1.0	+ 0 - 1.0	+ 0 - 0.5	1.0	0.5	± 1.0	± 1.0
Over 300 mm to 1000 mm	± 2.0	+ 0 - 1.0	+ 0 - 0.5	1.5	0.5	± 1.5	± 1.5
Over 1000 mm to 2500 mm	± 3.0	+ 0 - 1.0	+ 0 - 0.5	2.5	1.0	± 3.0	± 1.5
Over 2500 mm to 3200 mm	+ 3.0 - 5.0	+ 0 - 1.0	+ 0 - 0.5	3.0	1.5	± 5.0	± 1.5
Over 3200 mm	+ 3.0 - 6.0	+ 0 - 1.0	+ 0 - 0.5	6.0	1.5	± 6.0	± 1.5

Squareness of edge to face of knife within 0.1 mm.
Parallelism of Knife Faces: Within 0.07 mm with no variation greater than 0.02 mm within any 300 mm length throughout entire length.
Parallelism of Knife Edges: Within 0.1 mm with no variation greater than 0.02 mm within any 300 mm length throughout entire length.

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