AE O PACE
ATERIAL SPECIFICATIONS
SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 2251D

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TOLERANCES
Alloy Steel Bars

1. PURPOSE: To publish established manufacturing tolerances.

2. APPLICATION: Tolerances shown herein apply, unless otherwise agreed upon by purchaser and vendor. These tolerances apply to all conditions, unless otherwise noted. The term "excl" is used to apply only to the higher figure of the specified range.

3. DIAMETER OR THICKNESS:

3.1 Cold Finished:

TABLE I

Nominal Diameter of Rounds, Thickness of Hexagons and Squares, or Width of Flats Inches	Tolerances, Inch, Minus Only, Maximum of Carbon Range, %		
	Up to 0.28, incl	Over 0.28 to 0.55, incl	Over 0.55 and all carbons Heat Treated or Stress Relieved
ROUNDS			
Up to 1.000, incl	0.003	0.005	0.007
Over 1.000 to 2.000, incl	0.004	0.006	0.009
Over 2.000 to 4.000, incl	0.005	0.007	0.011
Over 4.000 to 6.000, incl	0.006	0.008	0.013
Over 6.000 to 7.750, incl	0.007	0.010	0.017
Over 7.750 to 9.000, incl	0.008	0.011	0.019
HEXAGONS			
Up to 0.3125, incl	0.003	0.005	0.007
Over 0.3125 to 1.000, incl	0.004	0.006	0.009
Over 1.000 to 2.500, incl	0.005	0.007	0.011
Over 2.500 to 3.125, incl	0.006	0.008	0.013
SQUARES			
Up to 0.3125, incl	0.004	0.006	0.009
Over 0.3125 to 1.000, incl	0.005	0.007	0.011
Over 1.000 to 2.500, incl	0.006	0.008	0.013
Over 2.500 to 4.000, incl	0.007	0.010	0.017
FLATS			
Up to 0.750, incl	0.004	0.006	0.009
Over 0.750 to 1.500, incl	0.005	0.007	0.011
Over 1.500 to 3.000, incl	0.006	0.008	0.013
Over 3.000 to 4.000, incl	0.007	0.010	0.017
Over 4.000 to 6.000, incl	0.009	0.012	0.021
Over 6.000	0.014	--	--

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3.1.1 When rough turned round bars are permitted, the above tolerances shall be doubled.

3.1.2 The tolerance for flats applies to both width and thickness.

3.1.3 Tolerances in the column headed "Over 0.28 to 0.55, **incl" also** apply to all carbons up to 0.55 max, annealed or normalized before cold finishing.

3.2 Ground and Polished Rounds:

Nominal Diameter Inches	Tolerance, Inch, Minus Only
Up to 2.5, excl	0.002
2.5 to 4.0, incl	0.003

3.3 Hot Finished:

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TABLE II

ROUNDS AND SQUARES

Nominal Diameter or Thickness Inches	Tolerance, Inch Plus	Tolerance, Inch Minus	Out-of-Round or Out-of-Square Inch (See Note 1)
Up to 0.3125, incl	0.005	0.005	0.008
Over 0.3125 to 0.4375, incl	0.006	0.006	0.009
Over 0.4375 to 0.625, incl	0.007	0.007	0.010
Over 0.625 to 0.875, incl	0.008	0.008	0.012
Over 0.875 to 1.000, incl	0.009	0.009	0.013
Over 1.000 to 1.125, incl	0.010	0.010	0.015
Over 1.125 to 1.250, incl	0.011	0.011	0.016
Over 1.250 to 1.375, incl	0.012	0.012	0.018
Over 1.375 to 1.500, incl	0.014	0.014	0.021
Over 1.500 to 2.000, incl	0.016	0.016	0.023
Over 2.000 to 2.500, incl	0.031	0	0.023
Over 2.500 to 3.500, incl	0.047	0	0.035
Over 3.500 to 4.500, incl	0.063	0	0.046
Over 4.500 to 5.500, incl	0.078	0	0.058
Over 5.500 to 6.500, incl	0.125	0	0.070
Over 6.500 to 8.250, incl	0.156	0	0.085
Over 8.250 to 9.500, incl	0.188	0	0.100

Note 1. Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross section. Out-of-square section is the difference in the two dimensions at the same cross section of a square bar, each dimension being the distance between opposite faces.

FLATS

Nominal Width Inches	Thickness and Width Tolerance, Inch Thickness, Plus and Minus Thickness Range, Inches Up to 0.25, excl	0.25 to 0.50, incl	Over 0.50 to 1.0, incl	Over 1.0 to 2.0, incl	Over 2.0 to 4.0, incl	Width Plus	Width Minus
Up to 1.0, incl	0.007	0.008	0.010	--	--	1/64	1/64
Over 1.0 to 2.0, incl	0.007	0.012	0.015	1/32	--	1/32	1/32
Over 2.0 to 4.0, incl	0.008	0.015	0.020	1/32	3/64	1/16	1/32
Over 4.0 to 6.0, incl	0.009	0.015	0.020	1/32	1/16	3/32	1/16

4. WIDTH: Included under Section 3.

5. LENGTH:

ø5.1 Cold Finished: No requirements for AMS.

ø5.2 Hot Finished:

5.2.1 Hot Sheared:

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TABLE V

ROUNDS, SQUARES, HEXAGONS, OCTAGONS

Nominal Diameter or Distance Between Parallel Sides Inches	Tolerance, Inch, Plus Only Length Ranges, Feet 5 to 10, excl	10 to 20, excl	20 to 30, excl	30 to 40, excl	40 to 60, incl
Up to 1.000, incl	1	1-1/4	1-3/8	2	2-3/4
Over 1.000 to 2.000, incl	1-1/4	1-1/2	1-3/4	2-1/4	3
Over 2.000	2	2-1/2	2-3/4	3	3-1/4

FLATS

Nominal Dimensions Inches Width	Thickness	Tolerance, Inch, Plus Only Length Ranges, Feet 5 to 10, excl	10 to 20, excl	20 to 30, excl	30 to 40, excl	40 to 60, incl
Up to 3.000, incl	Up to 1.000, incl	1	1-1/4	1-3/8	2	2-3/4
	Over 1.000	1-1/4	1-1/2	1-3/4	2-1/4	3
Over 3.000 to 6.000, incl	Up to 1.000, incl	1-1/4	1-1/2	1-3/4	2-1/4	3
	Over 1.000	2	2-1/2	2-3/4	3	3-1/4

5.2.2 Hot Sawn:

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TABLE VI

ROUNDS, SQUARES, HEXAGONS, OCTAGONS

Nominal Diameter or Distance Between Parallel Sides Inches	Tolerance, Inch, Plus Only, Length Ranges, Feet: 10 to 20, excl	20 to 30, excl	30 to 40, excl	40 to 60, incl
Up to 2.000, incl	1-3/4	2	2-1/4	2-3/4

FLATS

Nominal Dimensions Inches: Width	Thickness	Tolerance, Inch, Plus Only, Length Ranges, Feet: 10 to 20, excl	20 to 30, excl	30 to 40, excl	40 to 60, incl
Up to 3.000, incl	Up to 1.000, incl	1-3/4	2	2-1/4	2-3/4

5.2.3 Special Straightened and Machine Cut:

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TABLE VII

Nominal Diameter of Rounds Thickness of Hexagons and Squares, Width of Flats Inches	Tolerance, Inch, Length Ranges, Feet: Up to 12, incl, Plus	Minus	Over 12 to 25, incl, Plus	Minus
Up to 3.000, incl	3/16	1/16	1/4	1/16
Over 3.000 to 6.000, incl	1/4	1/16	3/8	1/16
Over 6.000	3/8	1/16	1/2	1/16

5.2.3.1 If bars are ordered with tolerances all plus or all minus, the unilateral tolerance shall be the arithmetic sum of the plus and minus tolerances of Table VII above.

6. STRAIGHTNESS:

Ø6.1 Cold Finished: No requirements for AMS.

6.2 Hot Finished: Shall be of such straightness that the maximum edgewise curvature (depth of arc) shall be not greater than 0.250 in. in any 5 ft of length or 0.050 in. x length in feet for shorter lengths.
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6.2.1 When so ordered, bars shall be of such straightness that the maximum edgewise curvature (depth of arc) shall be not greater than 0.125 in. in any 5 ft of length or 0.025 in. x length in feet for shorter lengths.
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