

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 2221

Issued 7-1-45

Revised

Page 1 of 4

T O L E R A N C E S Copper and Copper Alloy Rods and Bars

1. PURPOSE: To publish established manufacturing tolerances.
2. APPLICATION: Tolerances shown herein apply, unless otherwise agreed between purchaser and vendor. These tolerances apply to all conditions, unless otherwise noted.
3. DIAMETER OR THICKNESS:

TABLE I
RODS

Diameter or Distance Between Parallel Surfaces Inches	Tolerance, Inch, Plus and Minus			
	Non-refractory		Refractory	
	Rounds	Hexagons Octagons	Rounds	Hexagons Octagons
To 0.150, incl.	0.0013	0.0025	0.002	
Over 0.150 to 0.500, incl.	0.0015	0.003	0.002	0.004
Over 0.500 to 1.00, incl.	0.002	0.004	0.003	0.005
Over 1.00 to 2.00, incl.	0.0025	0.005	0.004	0.006
Over 2.00	0.15%	0.30%	0.20%	0.40%

TABLE II
SQUARES, RECTANGLES - COPPER

Thickness Inches	Tolerance, Inch, Plus and Minus						
	Width Over	Width Over	Width Over	Width Over	Width Over	Width Over	Width Over
	0.090" to 0.150" incl.	0.150" to 0.500" incl.	0.500" to 1.00" incl.	1.00" to 2.00" incl.	2.00" to 4.00" incl.	4.00" to 8.00" incl.	8.00" to 12.00" incl.
Over 0.090 to 0.150, incl.	0.0015	0.002	0.0025	0.0025	0.003	0.0035	
Over 0.150 to 0.500, incl.		0.0025	0.003	0.0035	0.0035	0.004	0.005
Over 0.500 to 1.00, incl.			0.0035	0.004	0.0045	0.005	0.006
Over 1.00 to 2.00, incl.				0.0045	0.005	0.006	
Over 2.00					0.30%		

3. DIAMETER OR THICKNESS: (cont'd)

TABLE III
SQUARES, RECTANGLES - NON-REFRACTORY

Thickness Inches	Tolerance, Inch, Plus and Minus						
	Width Over	Width Over	Width Over	Width Over	Width Over	Width Over	Width Over
	0.090"	0.150"	0.500"	1.00"	2.00"	4.00"	8.00"
	to	to	to	to	to	to	to
	0.150"	0.500"	1.00"	2.00"	4.00"	8.00"	12.00"
	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Over 0.090 to 0.150, incl.	0.0025	0.0025	0.003	0.0035	0.004	0.005	
Over 0.150 to 0.500, incl.		0.003	0.0035	0.004	0.0045	0.006	0.008
Over 0.500 to 1.00, incl.			0.004	0.0045	0.005	0.007	0.009
Over 1.00 to 2.00, incl.				0.005	0.006	0.008	
Over 2.00					0.30%		

TABLE IV
SQUARES, RECTANGLES - REFRACTORY

Thickness Inches	Tolerance, Inch, Plus and Minus					
	Width Over	Width Over	Width Over	Width Over	Width Over	Width Over
	0.150"	0.500"	1.00"	2.00"	4.00"	8.00"
	to	to	to	to	to	to
	0.500"	1.00"	2.00"	4.00"	8.00"	12.00"
	incl.	incl.	incl.	incl.	incl.	incl.
Over 0.090 to 0.150, incl.	0.004	0.0045	0.006	0.006		
Over 0.150 to 0.500, incl.	0.005	0.005	0.006	0.007	0.009	0.012
Over 0.500 to 1.00, incl.		0.006	0.007	0.008	0.010	0.013
Over 1.00 to 2.00, incl.			0.007	0.009	0.011	
Over 2.00				0.50%		

TABLE V
EXTRUDED

Diameter or Distance Between Parallel Surfaces Inches	Tolerance, Inch, Plus and Minus	
	Rounds, Squares, Rectangles, Hexagons, Octagons	
	Non-refractory	Refractory
To 1.00, incl.	0.010	0.020
Over 1.00 to 2.00, incl.	0.015	0.030
Over 2.00 to 3.00, incl.	0.025	0.050
Over 3.00 to 3.50, incl.	0.035	0.070
Over 3.50 to 4.00, incl.	0.060	0.120

3. DIAMETER OR THICKNESS: (cont'd)TABLE VI
HOT ROLLED ROUNDS

Diameter Inches	Tolerance, Inch
0.250	+ 0.020
Over 0.250 to 0.375, incl.	± 0.010
Over 0.375 to 0.750, incl.	+ 0.015
Over 0.750 to 1.25, incl.	± 0.020
Over 1.25 to 1.50, incl.	+ 0.030
Over 1.50 to 3.00, incl.	+ 0.0625
Over 3.00	+ 0.125

4. WIDTH:TABLE VII
RECTANGLES (Not Including Squares)

Width Inches	Tolerance, Inch, Plus and Minus	
	Non-refractory	Refractory
To 0.500, incl.	0.0035	0.005
Over 0.500 to 1.00, incl.	0.005	0.007
Over 1.00 to 2.00, incl.	0.006	0.009
Over 2.00	0.30%	0.50%

5. LENGTH: Length shall not vary more than plus and minus 1/2 inch, unless specific lengths are ordered in which case the variation shall not exceed plus and minus 3/16 inch.
6. STRAIGHTNESS: (a) Rods (Rounds, Hexagons, Octagons).- Rods shall be of such straightness that the maximum curvature (depth of arc) shall not exceed 0.50 inch in any 10 feet of length or 0.05 inch x length in feet for other lengths.
- (b) Bars (Squares, Rectangles).- Bars shall be of such straightness that the maximum curvature (depth of arc) shall not exceed 0.50 inch in any 6 feet of length or 0.083 inch x length in feet for other lengths.
7. FLATNESS: None
8. SPECIAL TOLERANCES: (a) If tolerances specified herein are plus and minus and if all plus or all minus are desired, double the values specified.
- (b) If tolerances specified herein are all plus and if all minus are desired, use the same values specified.
- (c) If tolerances specified herein are all plus and if plus and minus are desired, halve the values specified.