

AEROSPACE MATERIAL SPECIFICATIONS

AMS 2203E

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

Issued 7-1-45
Revised 1-31-64

TOLERANCES Aluminum Alloy Drawn Tubing

1. **PURPOSE:** To publish established manufacturing tolerances.
2. **APPLICATION:** Tolerances shown herein shall apply, unless otherwise agreed upon by purchaser and vendor. The term "excl" is used to apply only to the higher figure of the specified range.
3. **TABLE NUMBERS:** Table numbers in this issue of AMS 2203 are not completely the same as in previous issues and may not be those referenced in AMS published earlier. The following cross-reference list is provided to assist in finding tables in this issue which are referenced in other AMS to their former numbers.

Ø	Former Table Number	AMS 2203E Table Number
	I	I
	I CONT.	II, III
	II	IV
	III	V
	III CONT.	VI
	IV	VII
	V	VIII
	VI	IX
	VII	X

4. **DIAMETER, WIDTH, OR DEPTH:**

4.1 **Round:**

TABLE I

Nominal OD or ID Inches (See Note 1)		Tolerance, Inch, Plus and Minus (See Note 12)	
		Diameter at Any Point (Ovality) (See Note 4)	
		Non-Heat Treated Alloys (See Note 5)	Heat Treated Alloys (See Note 5)
Up to	0.500, incl	0.003	0.006
Over	0.500 to 1.000, incl	0.004	0.008
Over	1.000 to 2.000, incl	0.005	0.010
Over	2.000 to 3.000, incl	0.006	0.012
Over	3.000 to 5.000, incl	0.008	0.016
Over	5.000 to 6.000, incl	0.010	0.020
Over	6.000 to 8.000, incl	0.015	0.030
Over	8.000 to 10.000, incl	0.020	0.040
Over	10.000 to 12.000, incl	0.025	0.050

Section 8.3 of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and adopting technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

4.2 Square, Rectangular, Hexagonal, and Octagonal:

TABLE II

Nominal Width or Depth Inches (See Note 1)	Tolerance, Inch, Plus and Minus (See Note 12)		
	At Corners	Not at Corners (See Note 4)	
	Square and Rectangular	Square, Hexagonal, and Octagonal	Rectangular
Up to 0.500, incl	0.003	0.006	The tolerance for the width is the value in the preceding column for a dimension equal to the depth, and conversely, but in no case less than that for its own dimension at the corners (See Note 6)
Over 0.500 to 1.000, incl	0.004	0.008	
Over 1.000 to 2.000, incl	0.005	0.010	
Over 2.000 to 3.000, incl	0.006	0.012	
Over 3.000 to 5.000, incl	0.008	0.016	
Over 5.000 to 6.000, incl	0.010	0.020	
Over 6.000 to 8.000, incl	0.015	0.030	
Over 8.000 to 10.000, incl	0.020	0.040	
Over 10.000 to 12.000, incl	0.025	0.050	

4.3 Streamline, Oval, and Elliptical:

TABLE III

Nominal Equivalent Round Diameter Inches (See Notes 1 and 7)	Tolerance, Inch (See Note 12)			
	Major Axis		Minor Axis	
	Plus	Minus	Plus	Minus
Up to 2.500, incl	0.040	0.025	0.025	0.015
Over 2.500 to 4.250, incl	0.050	0.035	0.035	0.025
Over 4.250 to 6.000, incl	0.070	0.050	0.055	0.040
Over 6.000 to 8.000, incl	0.100	0.085	0.080	0.060
Over 8.000 to 10.000, incl	0.160	0.140	0.115	0.085

5. WALL THICKNESS:

TABLE IV

Nominal Wall Thickness Inch (See Notes 1 and 2)	Tolerance, Inch, Plus and Minus (See Note 12)		
	Wall Thickness at any Point From Nominal		
	Mean Wall Thickness (See Note 8)	Round, Non-Heat Treatable (See Note 13)	Round, Heat Treatable; All Tubing Other than Round; and All Coiled Tubing
0.010 to 0.035, incl	0.002	0.002	10% of nominal wall thickness; 0.003 in., min
Over 0.035 to 0.049, incl	0.003	0.003	
Over 0.049 to 0.083, incl	0.004	0.004	
Over 0.083 to 0.120, incl	0.005	0.006	
Over 0.120 to 0.203, incl	0.006	0.008	
Over 0.203 to 0.300, incl	0.008	0.012	
Over 0.300 to 0.375, incl	0.015	0.020	
Over 0.375 to 0.500, incl	0.020	0.030	

6. LENGTH:

6.1 Straight Tubing:

TABLE V

Nominal OD, Width, Major Axis or Depth (Whichever is Greater) Inches	Tolerance, Inch, Plus Only Length Ranges, Feet			
	12 and under	Over 12 to 30, incl	Over 30 to 50, incl	Over 50
Up to 0.250, excl	1/4	3/8	1/2	-
0.250 to 3.000, excl	1/8	1/4	3/8	1
3.000 to 8.000, excl	3/16	5/16	7/16	1
8.000 and over	1/4	3/8	1/2	1

6.2 Coiled Tubing:

TABLE VI

Nominal OD, Width or Depth (Whichever is Greater) Inches	Tolerance, %, Plus and Minus Except as Indicated Length Ranges, Feet			
	Up to 100 incl	Over 100 to 250, excl	250 to 500, excl	500 and over
Up to 1.250, excl	+5, -0	10	15	20

7. STRAIGHTNESS:

7.1 Straight Tubing:

TABLE VII

ø Nominal OD, Width or Depth (Whichever is Greater) Inches	Tolerance, Inches (See Notes 9 and 10)	
	In Any Foot or Less of Length	In Total Length (L) of Piece
Up to 0.375, excl.	0.500	0.500L (See Note 11)
0.375 to 6.000, excl	0.010	0.010L
6.000 and over	0.020	0.020L

8. FLATNESS:8.1 Square, Rectangular, Hexagonal, and Octagonal:TABLE VIII

Nominal Width, Depth, or Distance Between Parallel Sides Inches	Tolerance, Inch (See Note 4)
Up to 0.500, incl	0.003
Over 0.500 to 1.000, incl	0.004
Over 1.000 to 2.000, incl	0.005
Over 2.000 to 3.000, incl	0.006
Over 3.000 to 5.000, incl	0.008
Over 5.000 to 6.000, incl	0.010
Over 6.000 to 8.000, incl	0.015
Over 8.000 to 10.000, incl	0.020
Over 10.000 to 12.000, incl	0.025

9. TWIST:9.1 Square, Rectangular, Hexagonal, and Octagonal:TABLE IX

Ø Nominal Width or Depth (Whichever is Greater) Inches	Tolerance, Degrees (See Note 9)	
	In Any Foot or Less of Length	In Total Length (L) of Piece
Up to 1.500, excl	1	L ; 7 max
1.500 to 3.000, excl	1/2	L/2; 5 max
3.000 and over	1/4	L/4; 3 max

10. CORNER RADII:10.1 Square, Rectangular, Hexagonal, and Octagonal:TABLE X

Nominal Radius, Inches	Tolerance (See Note 12)
Sharp Corners	+ 1/64 in.
Up to 0.188, excl	± 1/64 in.
0.188 and over	± 10%

11. ANGULARITY:

11.1 Tubing Other Than Round: The allowable deviation from nominal angle is ± 2 degrees.

12. SQUARENESS OF CUT ENDS: Ends shall not deviate from square by more than 1 degree.