

TABLE 12.10 Squareness of Cut Ends—Extruded Tube

Allowable deviation from square: 1 degree.
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TABLE 12.11 Corner and Fillet Radii—Extruded Tube

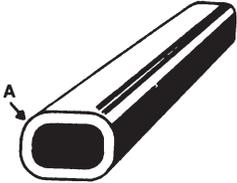
SPECIFIED RADIUS ¹⁸ in.	TOLERANCE—in.
	ALLOWABLE DEVIATION FROM SPECIFIED RADIUS
	
Sharp corners	+1/64
0.016–0.187	±1/64
0.188 and over	±10%

TABLE 12.12 Angularity—Extruded Tube

Allowable deviation from square: ±2 degrees.
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TABLE 12.13 Surface Roughness ¹⁴ ¹⁷—Extruded Tube

Specified Outside Diameter in.	Specified Wall Thickness in.	Allowable Depth of Conditions ¹³ in., max.
Up thru 12.750	Up thru 0.063	0.0025
	0.064–0.125	0.003
	0.126–0.188	0.0035
	0.189–0.250	0.004
	0.251–0.500	0.005
12.751–15.000	Up thru 0.500	0.010
	0.501 and over	0.012
15.001–20.000	Up thru 0.500	0.012
	0.501 and over	0.015
20.001 and over	Up thru 0.500	0.015
	0.501 and over	0.020

TABLE 12.14 Dents ¹⁵—Extruded Tube

Depth of dents shall not exceed twice the tolerances specified in Table 12.2 for diameter at any point from specified diameter, except for tube having a wall thickness less than 2.5 percent of the outside diameter, in which case the following multipliers apply:

- 2% to 2½% exclusive—2.5 · tolerance (max.)
- 1½% to 2% exclusive—3.0 · tolerance (max.)
- 1% to 1½% exclusive—4.0 · tolerance (max.)

Footnotes for Tables 12.2 through 12.14

- ① When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other than round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three. When both outside and inside diameters or inside diameter and wall thickness are specified, the tolerance applicable to the specified or calculated O.D. dimension shall also apply to the I.D. dimension.
- ② When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applied to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.
- ③ Mean diameter is the average of two diameter measurements taken at right angles to each other at any point along the length.
- ④ Not applicable in the annealed (O) temper if wall thickness is less than 2½ percent of outside diameter of a circle having a circumference equal to the perimeter of the tube.
- ⑤ The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-than-round tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.
- ⑥ When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) applies to mean wall thickness.
- ⑦ Tolerances for O, T3510, T4510, T6510, T73510, T76510 and T8510 tempers shall be as agreed upon between purchaser and vendor at the time the contract or order is entered.
- ⑧ TX510 and TX511 are general designations for the following stress-relieved tempers: T3510, T4510, T6510, T8510, T73510, T76510; and T3511, T4511, T6511, T8511, T73511, T76511, respectively.
- ⑨ When weight of piece on flat surface minimizes deviation.
- ⑩ The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.
- ⑪ Twist is normally measured by placing the extruded tube on a flat surface

and at any point along its length measuring the maximum distance between the bottom surface of the extruded tube and the flat surface. From this measurement, the actual deviation from straightness of the extruded tube at that point is subtracted. The remainder is the twist. To convert the standard twist tolerance (degrees) to an equivalent linear value, the sine of the standard tolerance is multiplied by the width of the surface of the section that is on the flat surface. The following values are used to convert angular tolerances to linear deviation:

Tolerance, degrees	Maximum allowable linear deviation inch per inch of width
¼	0.004
½	0.009
1	0.017
1½	0.026
3	0.052
5	0.087
7	0.122
9	0.156
15	0.259
21	0.358

- ⑫ Tolerances not applicable to TX510, or TX511 temper tube having a wall thickness less than 0.095 in.
- ⑬ Conditions include die lines, mandrel lines and handling marks.
- ⑭ For tube over 12.750 in. O.D. the 2000 and 7000 series alloys and 5000 series alloys with nominal magnesium content of 3 percent or more are excluded.
- ⑮ Not applicable to O temper tube.
- ⑯ Tolerances apply to 5xxx alloys with 4.0% Mg.
- ⑰ Not applicable to 2219 alloy tube. Most tubes in 2219 alloy will have die lines about twice the depth shown in the table; however, for each tube size the supplier should be contacted for the roughness value to apply.
- ⑱ If unspecified, the radius shall be ½ in. maximum including tolerances.