Designation: D 3917 – 96

An American National Standard

Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes[1]

This standard is issued under the fixed designation D 3917; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope *

1.1 This specification defines tolerances applicable to standard rods, bars, and shapes pultruded from thermosetting glass-reinforced plastics.

1.2 These dimensional tolerances apply to all shapes specified as "standard" by the pultrusion industry.

1.3 Custom shapes and products designed for special applications shall carry specific tolerances that may vary from the standard because a change in type or amount of reinforcement used in a composite directly affects dimensions. The tolerances may be wider or closer than associated with "standard" shapes.

1.4 The following safety hazards caveat pertains only to the test methods portion, Section 4, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no similar or equivalent ISO standard.

2. Terminology

2.1 *Definitions:*

2.1.1 *Class 1 hollow shape*—one whose void is round and 1 in. (25 mm) or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.

2.1.2 *envelope diameter*—the diameter of the smallest circle that will completely enclose the cross section of the pultruded product.

2.1.3 *flange bow*—the deviation where the flange of the section contacts the horizontal plane.

2.1.4 *flange camber*—the deviation from the flange surface to the reference straight line.

2.1.5 *mean wall thickness*—the average of two wall thickness measurements taken at opposite sides of the void.

2.1.6 *straightness*—the perpendicular deviation of the surface contacting a horizontal plane.

2.1.7 *web bow*—the deviation where the web of the section contacts the horizontal plane.

2.1.8 *web camber*—the deviation from the web surface to the reference straight line.

2.1.9 *web-flange camber*—the deviation from the free edge of the flange to the reference straight line.

3. Dimensional Criteria

3.1 Dimensional tolerances for cross sections shall be prescribed in Table 1.

3.2 Width/diameter for solid rods and bars and length tolerances for standard rods, bars, and shapes shall be as prescribed in Table 2.

3.3 Straightness tolerances shall be as prescribed in Table 3 (also see 4.2).

3.4 Twist tolerances for bars and shapes shall be as prescribed in Table 4 (also see 4.3).

3.5 Flatness (flat surface) tolerances for bars, solid shapes, and semihollow shapes shall be as prescribed in Table 5.

3.6 Flatness (flat surface) tolerances of hollow shapes shall be as prescribed in Table 6.

3.7 Angularity tolerances for bars and shapes shall be as prescribed in Table 7 (also see 4.4).

3.8 Camber tolerances for shapes shall be as prescribed in Table 8 (also see 4.5).

3.9 The selection, type, and amount of reinforcements, as well as resin system used, directly affect dimensions. Tolerances shall be agreed upon between the supplier and the user.

4. Test Methods

4.1 Obtain the specified tolerances with conventional measuring equipment. Measuring procedures, gages, and fixtures shall be agreed upon between the supplier and the user.

4.2 Measure departure from straightness by placing the section on a level table so that the arc or departure from straightness is horizontal. Measure the depth of the arc with a feeler gage and a straightedge.

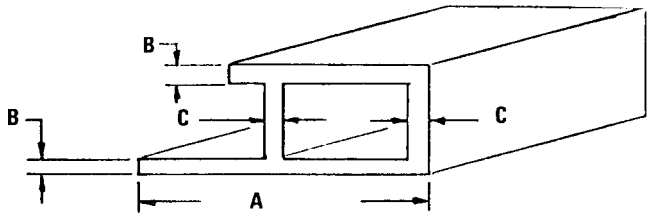
4.3 Measure twist by placing the pultruded section on a flat surface and measuring the maximum distance at any point along its length between the bottom surface of the section and the flat surface. From this measurement, subtract the deviation from true straightness of the section. The remainder is the twist. To convert the standard twist tolerance (degrees) to an

[1] This specification is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.18 on Reinforced Thermosetting Plastics.

Current edition approved Nov. 10, 1996. Published May 1997. Originally published as D 3917 – 80. Last previous edition D 3917 – 94.

*A Summary of Changes section appears at the end of this standard.

TABLE 1 Cross-Sectional Dimensions—Standard Rods, Bars, and Shapes



Standard Pultruded Section with Envelope Dimension up to 10-in. (254-mm) Diameter			
Specified Dimension, in. (mm)	Solid Dimensions, ±in. (mm)[A,B]		
	A Parallel to the Layered Construction (Perpendicular to Roving in all Products)	**B** Perpendicular to the Layered Construction (Mat and Mat-roving Products Only)[C,D]	**C** Wall Thickness Completely Enclosing Space 0.11 in.^{2} (0.64 cm^2) and Over (Eccentricity)[E,F,G]
Up to 0.124 (3.15) incl	0.006 (0.15)	0.013 (0.33)	±20 % of specified dimension
0.125 to 0.249 (3.18 to 6.32) incl	0.007 (0.18)	0.018 (0.46)	but not exceeding either
0.250 to 0.499 (6.35 to 12.67) incl	0.008 (0.20)	0.027 (0.69)	±0.100 (2.54) max or
0.500 to 0.749 (12.70 to 19.02) incl	0.009 (0.23)	0.038 (0.97)	±0.010 (0.25) min
0.750 to 0.999 (19.05 to 25.37) incl	0.010 (0.25)	0.034 (0.86)	
1.000 to 1.499 (25.40 to 38.07) incl	0.012 (0.30)	...	±20 % of specified dimension
1.500 to 1.999 (38.10 to 50.77) incl	0.014 (0.36)	...	but not exceeding either
2.000 to 3.999 (50.80 to 101.57) incl	0.024 (0.61)	...	±0.100 (2.54) max or
4.000 to 5.999 (101.60 to 152.37) incl	0.034 (0.86)	...	±0.010 (0.25) min

[A] The tolerances applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all of the component dimensions are indicated.

[B] Allowable deviation from specified dimension where 75 % or more of the dimension is composite.

[C] At points less than 0.250 in. (6.35 mm) from base of leg, the tolerances of Dimension A are applicable.

[D] When more than 25 % of the specified dimension is space, the tolerances shall be agreed upon between the purchaser and the supplier at the time the contract or order is entered.

[E] For hollow or semihollow shapes, when the nominal thickness of one wall is three times or greater than that of the opposite wall, the wall thickness tolerance shall be agreed upon between the purchaser and the supplier at the time the contract or order is entered.

[F] Where dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation (eccentricity) given in Column C applies to mean wall thickness.

[G] Tolerances in Column C take precedence over A dimension tolerances for walls which completely enclose 0.11 in.^{2} (0.64 cm^2) and over.

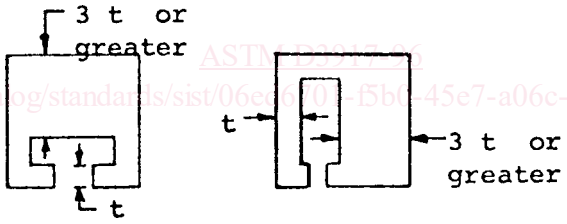


TABLE 2 Length—Standard Rods, Bars, and Shapes

Specified Diameter (Rods) Specified Width (Bars) Envelope Diameter (Shapes)	Allowable Deviation from Specified Length, +in. (+mm), except as noted		
in. (mm)	Up to 12 ft (3.65 m) in Length, incl	Over 12 to 30 ft (3.65 to 9.14 m) in Length, incl	Over 30 to 50 ft (9.14 to 15.24 m) in Length, incl
Up to 0.499 (12.67) incl	±⅛ (±3.18)	±¼ (±6.35)	±⅜ (±9.52)
0.500 to 1.249 (12.70 to 31.72) incl	±⅛ (±3.18)	±¼ (±6.35)	±⅜ (±9.52)
1.250 to 2.999 (31.75 to 76.17) incl	⅛ (3.18)	¼ (6.35)	⅜ (9.52)
3.000 to 7.999 (76.20 to 203.17) incl	3⁄16 (4.76)	5⁄16 (7.94)	7⁄16 (11.11)

equivalent linear value, multiply the tangent of the standard tolerance by the width of the surface of the section that is on the flat surface.

4.4 Measure angles with protractors or gages. A four-point contact system is illustrated in Fig. 1, two contact points being as close to the angle vertex as practical and the others near the ends of the respective surfaces forming the angle. Surface flatness is the controlling tolerance between these points of measurement.

4.5 Measure longitudinal curvature by placing the section on a level table so that the arc or curvature is vertical. Measure the depth of the arc with a feeler gage and a straightedge.