



Designation: ~~D3917-08~~ Designation: D3917 - 11

Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes¹

This standard is issued under the fixed designation D3917; 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 tighter than associated with “standard” shapes.~~

~~1.4~~

1.3 Custom shapes and products designed for special applications may carry specific tolerances that vary from the standard.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 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.~~ 1—There is no known ISO equivalent to this 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.~~ camber—the deviation of the edge or surface from a reference straight line.

~~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 or more wall thickness measurements.~~

~~2.1.6 *the average of two or more wall thickness measurements taken at multiple locations.*~~

2.1.3 *straightness*—the perpendicular deviation of the pultruded profile when resting on a flat surface.

~~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. —the upward deviation of a pultruded shape when resting on a flat surface measured in a manner that the weight of the pultruded part minimizes the deviation.

2.1.4 *unilateral tolerance*—a tolerance in which the variation is permitted in one direction (either “+” or “-”) from the specified dimension.

3. Dimensional Criteria

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

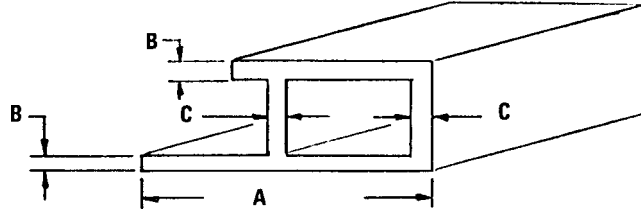
¹ This specification is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.18 on Reinforced Thermosetting Plastics.

Current edition approved March 1, 2008. Published March 2008. Originally approved in 1980. Last previous edition approved in 2002 as D3917-96(2002)^{ε1}. DOI: 10.1520/D3917-08.

Current edition approved April 1, 2011. Published April 2011. Originally approved in 1980. Last previous edition approved in 2008 as D3917-08. DOI: 10.1520/D3917-11.

*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 3/16-in. (25914-mm) Diameter

Solid Dimensions, ±in. (mm)^{A, B, C}

Specified Dimension, in. (mm)	A Parallel to the Layered Construction (Perpendicular to Faying in all Products) ^A	B Perpendicular to the Wall Thickness Layered Construction (Material Only) ^{C, D}	C Wall Thickness—Completely Enclosing Space 0.11 in. ² (0.64 cm ²) and Over shapes (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)
All	±4% (0.94 in. max)	-10% of specified dimension, but not exceeding either -0.100 (2.54) max or -0.010 (0.25) min	-20% of specified dimension 0.125 to 0.249 (3.18 to 6.32) incl	0.007 (0.18)
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.

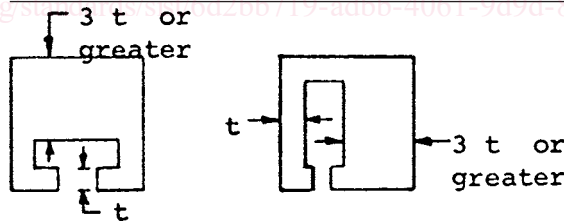
^B Allowable deviation from specified dimension where 75% or more of the dimension is composite.

^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. 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.

^E 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.

^F Tolerances in Column C take precedence over A dimension tolerances for walls which completely enclose 0.11 in.² (0.64 cm²) and over.



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

3.2 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), if required by the customer. Camber is not specified for standard shapes but will be a special customer requirement.

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.

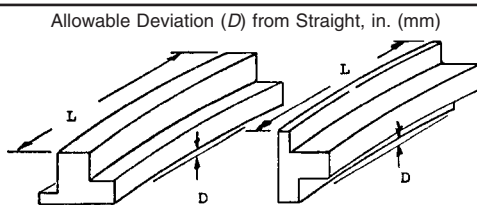
TABLE 2 Length—Standard Rods, Bars, and Shapes^A

—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 24 ft (3.65 to 9.14 m) in Length, incl	Over 24 to 50 ft (9.14 to 15.24 m) in Length, incl
in. (mm)	Up to 8 ft (3.65 m) in Length, incl	Over 8 to 24 ft (3.65 to 9.14 m) in Length, incl	Over 24 to 50 ft (9.14 to 15.24 m) in Length, incl
Up to 0.499 (12.67) incl	± 1/8 (±3.18)	± 1/4 (±6.35)	± 3 (±76.2)
0.500 to 1.249 (12.70 to 31.72) incl	± 1/8 (±3.18)	± 1/4 (±6.35)	± 3 (±76.2)
1.250 to 2.999 (31.75 to 76.17) incl	1/8 (3.18)	1/4 (±6.35)	± 3 (±76.2)
1.250 to 2.999 (31.75 to 76.17) incl	± 1/8 (3.18)	± 1/4 (±6.35)	± 3 (±76.2)
3.000 to 7.999 (76.20 to 203.17) incl	3/16 (4.76)	1/4 (±6.35)	± 3 (±76.2)
3.000 to 7.999 (76.20 to 203.17) incl	± 3/16 (4.76)	± 1/4 (±6.35)	± 3 (±76.2)

^AA unilateral tolerance is permitted if the range remains the same.

TABLE 3 Straightness—Standard Bars, Rods, and Shapes

Product	Specified Diameter (Rods) Specified Width (Bars) EnvelopeMax Diameter (Shapes)	Specified Thickness (Rectangles) Minimum Thickness (Shapes)	Allowable Deviation (D) from Straight, in. (mm)	
			In 1 ft (0.3 m) or Less of Length	In Total Length of Piece
	in. (mm)	in. (mm)		
Rods and square, hexagonal, and octagonal bars	all	...	0.0125 (0.32)	0.0125 (0.32) × length, ft (m)
Rods and square, hexagonal, and octagonal bars	all	...		0.030 (0.51) × length, ft (m)
Rectangular bars	Up to 1.499 (38.07), incl	Up to 0.094 (2.4), incl	0.050 (1.3)	0.050 (1.3) × measured length, ft (m)
Rectangular bars	Up to 1.499 (38.07), incl	Up to 0.094 (2.4), incl	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
		0.095 (2.4) and over	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
	1.500 (38.10) and over	all	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
	1.500 (38.10) and over	all	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
Shapes	Up to 1.499 (38.07), incl	Up to 0.094 (2.4), incl	0.050 (1.3)	0.050 (1.3) × measured length, ft (m)
Shapes—Open	all	all	0.040 (1.01)	0.050 (1.3) × measured length, ft (m)
		0.095 (2.4) and over	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
Shapes—Closed		all	0.040 (1.01)	0.040 (1.01) × measured length, ft (m)
	1.500 (38.10) and over	all	0.050 (1.3)	0.050 (1.3) × measured length, ft (m) ^A
	1.500 (38.10) and over	all		0.030 (1.3) × measured length, ft (m) ^A



^A Measured when weight of pultrusion minimizes the deviation by contact with flat surface.

4.2 Measure departure from straightness by placing the section on a level table so that the arc or departure from straightness is horizontal-vertical. Measure the vertical depth of the arc with a feeler gauge, a straightedge, or both.

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 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. Measure twist by placing the pultruded section on a flat surface and using an inclinometer. An inclinometer is a commercially available device used to measure the angle of inclination.

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 gauge and a straightedge. Measure angles with protractors or gauges.