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Standard Practice for Testing Pultruded Composites[1]

This standard is issued under the fixed designation D7745; 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 protocol summarizes the applicable ASTM and other standard test methods commonly used for pultruded composites. The individual performance requirements to these test methods are defined by specific customer specifications.

1.2 This protocol also defines appropriate specimen locations for sampling from the pultruded composites.

1.3 This protocol does not discuss all possible standard test methods that may be utilized for pultruded composites.

1.4 *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 known ISO equivalent to this guide.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

D495 Test Method for High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation (Withdrawn 2013)[3]

D570 Test Method for Water Absorption of Plastics

D635 Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

D638 Test Method for Tensile Properties of Plastics

D695 Test Method for Compressive Properties of Rigid Plastics

D696 Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatometer

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D953 Test Method for Bearing Strength of Plastics

D2344/D2344M Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates

D2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

D2584 Test Method for Ignition Loss of Cured Reinforced Resins

D3039/D3039M Test Method for Tensile Properties of Polymer Matrix Composite Materials

D3916 Test Method for Tensile Properties of Pultruded Glass-Fiber-Reinforced Plastic Rod

D3918 Terminology Relating to Reinforced Plastic Pultruded Products

D4065 Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures

D5379/D5379M Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method

D5420 Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

D6641/D6641M Test Method for Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture

D7136/D7136M Test Method for Measuring the Damage Resistance of a Fiber-Reinforced Polymer Matrix Composite to a Drop-Weight Impact Event

D7332/D7332M Test Method for Measuring the Fastener Pull-Through Resistance of a Fiber-Reinforced Polymer Matrix Composite

E84 Test Method for Surface Burning Characteristics of Building Materials

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

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

G154 Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

2.2 *UL Standards:*

UL94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances[4]

3. Terminology

3.1 Terminology relating to pultruded composites is found in Terminology D3918.

4. Significance and Use

4.1 This practice is intended to aid in the selection of test protocols for reinforced pultruded composites.

4.2 This practice is intended to define the locations from which test specimens shall be taken from the reinforced pultruded composite.

5. General Requirements

5.1 All test specimens shall conform to the geometry and specimen quantity specified by the test methods of Section 2.

5.1.1 See Section 6.

5.2 All test specimens shall have a constant cross-section prior to machining the specimens.

5.3 The test specimens shall be machined from a flat constant thickness wall. The edges of the gage area of the test specimen shall be no closer than 3.18 mm (⅛ in.) from any deviation of the flat surface.

5.3.1 At least one specimen shall be taken from each side or flange of the pultruded shape.

5.4 Multiple sets of test specimens are required when:

5.4.1 The pultruded composite has two or more different thicknesses. A different set of specimens is required for each thickness of the pultruded shape.

5.4.2 The pultruded composite inherently has different reinforcement arrangements in different areas of the part such as the flange and web of W/I-Beams.

5.4.3 There are material overlaps required within the laminate for the pultruded composites such as tubes. The overlap area reinforcement is different from the remainder of the part.

5.4.4 Different reinforcement types or ratios are used for different sizes within the same general part geometry (for example, large and small tubes).

5.5 The flammability shall be tested on the thinnest wall of the thinnest pultruded composite of the same material configuration.

6. Simulated Plate Test

6.1 A simulated flat test plate shall be used when the required specimen geometry cannot be acquired from the pultruded composite. Round tubes are an example.

6.2 The simulated test plate shall be used for all variations as identified in 5.4.

6.3 The simulated flat test plate shall have the same thickness and composite as the original pultruded shape.

7. Data Reporting

7.1 The data shall be reported as required by the specific test methods.

7.2 The report shall include the source of the specimens (for example, an actual pultruded composite or a flat plate simulation).

7.2.1 The report shall state if the off-axis reinforcement overlap has been considered if a flat plate simulation has been used.

[4] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.