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Standard Guide for Testing Materials for Aerospace Plastic Transparent Enclosures[1]

This standard is issued under the fixed designation F 790; 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 guide is intended to summarize the standard test methods available on individual and composite materials utilized in fabrication of aerospace plastic transparent enclosures. As such, it is intended to specifically include transparent thermoplastics, transparent elastomers, and reinforced plastics, whether thermoplastic or thermosetting.

1.2 This guide is intended as an aid in the search for test methods pertinent to Aerospace Plastic Transparent Enclosures. It should be understood that all methods listed may not apply to all enclosures.

1.3 The standards included refer to the properties or aspects listed in Table 1. The properties or aspects are listed in alphabetical order and the descriptions used are intended to facilitate the search.

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.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 117 Test Method for Materials Finer ~~Than 75-μm~~than 75-m (No. 200) Sieve in Mineral Aggregates by Washing
D 149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
D 150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
D 256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
D 257 Test Methods for DC Resistance or Conductance of Insulating Materials
D 412~~Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoelastic Elastometers Tension~~ Test Methods for Vulcanized Rubber and Thermoplastic ElastomersTension
D 542 Test ~~Methods~~Method for Index of Refraction of Transparent Organic Plastics
D 543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D 570 Test Method for Water Absorption of Plastics
D 624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
D 638 Test Method for Tensile Properties of Plastics
D 695 Test Method for Compressive Properties of Rigid Plastics
D 696 Test Method for Coefficient of Linear Thermal Expansion of Plastics ~~Between–30°~~ Between 30C and ~~30°C With~~30C with a Vitreous Silica Dilatometer
D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
D 785 Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D 792 Test Methods for Density and Specific Gravity (Relative Density) ~~and Density~~ of Plastics by Displacement
D 953 Test Method for Bearing Strength of Plastics
D 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics
D 1004 Test Method for ~~Initial~~ Tear Resistance (Graves Tear) of Plastic Film and Sheeting
D 1044 Test Method for Resistance of Transparent Plastics to Surface Abrasion

[1] This guide is under the jurisdiction of ASTM Committee F07 on Aerospace and Aircraft and is the direct responsibility of F07.08 on Transparent Enclosures and Materials.

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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* ~~, Vol 04.02.~~volume information, refer to the standard's Document Summary page on the ASTM website.

TABLE 1 Property or Aspects of Aerospace Plastic Transparent Enclosures

Property or Aspect	Test Method
Abrasion Resistance	D 1044
Abrasion Resistance—Oscillating Sand	F 735
Abrasion Testing—Sizing Sand for	C 117
Bearing Strength	D 953
Bird Impact Resistance	F 330
Bond Integrity	F 521
Brittleness Temperature—By Impact	D 746
Chemical Resistance	D 543
Coefficient of Linear Thermal Expansion	D 696
Compressive Properties	D 695
Electrical Insulating Material—DC Resistance or Conductance	D 257
Electrical Insulating Material—Dielectric Breakdown Voltage	D 149
Electrical Insulating Material—Dielectric Constant	D 150
~~Electrical Insulating Material—Flexural Properties~~	~~D 790~~
Electrical Insulating Material—Flexural Properties	D 790
Electrical Insulating Material—Impact Resistance	D 256
Electrical Insulating Material—Rockwell Hardness	D 785
Environmental Resistance	F 520
Exposure Apparatus Operation—Carbon ARC Type	D 1499
Exposure Apparatus Operation—Fluorescent UV Type	G 154
Exposure Apparatus Operation—Xenon ARC Type	D 2565
Flow Rate	D 1238
Glass Transition Temperature	E 1640
Hail Impact Resistance	F 320
Hardness—Barcol	D 2583
Hardness—Durometer	D 2240
Heating Elements—Detection of Flaws	F 319
Ignition Loss	D 2584
Impact Resistance—Falling Weight	D 5420
Impact Resistance—Falling Weight (Polycarbonate)	F 736
Index of Refraction	D 542
Interlayer Material Selection	F 942
Light Transmissivity	F 1316
Luminous Transmittance and Haze	D 1003
Optical Angular Deviation	F 801
Optical Angular Displacement—Multiple Images	F 1165
Optical Binocular Disparity	F 1181
Optical Distortion and Deviation—Double Exposure	F 733
Optical Reflectivity	F 1252
Peel Resistance—Floating Roller	D 3167
Rubber Properties in Tension	D 412
Scratches—Intensity of	F 548
Shear Strength—Fusion Bonded Polycarbonate	F 734
Shear Strength and Modulus—Interlayer Materials	F 1362
Softening Temperature	D 1525
Specific Gravity and Density	D 792
Specific Heat	D 2766
Stress Crazing	F 791
Stress Crazing	F 484
Tear Resistance	D 624
Tear Resistance—Initial	D 1004
Tensile Properties	D 638
Water Absorption	D 570

D 1238 Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
D 1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics
D 1525 Test Method for Vicat Softening Temperature of Plastics
D 2240 Test Method for Rubber Property—Durometer Hardness
D 2565 Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor ~~Operations~~ Applications
D 2583 Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
D 2584 Test Method for Ignition Loss of Cured Reinforced Resins
D 2766 Test Method for Specific Heat of Liquids and Solids
D 3167 Test Method for Floating Roller Peel Resistance of Adhesives
D 5420 Test Method for Impact Resistance of Flat, Rigid Plastic ~~Specimens~~Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)
E 1640 Test Method for Assignment of the Glass Transition Temperature ~~by~~By Dynamic Mechanical Analysis
F 319 Practice for Polarized Light Detection of Flaws in Aerospace Transparency Heating Elements
F 320 Test Method for Hail Impact Resistance of Aerospace Transparent Enclosures