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Standard Guide to Properties and Tests of Mastics and Coating Finishes for Thermal Insulation[1]

This standard is issued under the fixed designation C647; 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 identifies properties of mastics and coating finishes characterizing their performance as finishes for thermal insulation.

1.2 These properties relate to application and service. Each property is defined, and its significance and suggested test methods are described.

1.3 The properties appear in the following order in this guide.

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 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

[1] This guide is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.33 on Insulation Finishes and Moisture.

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2. Referenced Documents

2.1 *ASTM Standards:*[2]

C168 Terminology Relating to Thermal Insulation
C419 Practice for Making and Curing Test Specimens of Mastic Thermal Insulation Coatings
C461 Test Methods for Mastics and Coatings Used With Thermal Insulation
C488 Test Method for Conducting Exterior Exposure Tests of Finishes for Thermal Insulation
~~C639 Test Method for Rheological (Flow) Properties of Elastomeric Sealants~~
C681 Test Method for Volatility of Oil- and Resin-Based, Knife-Grade, Channel Glazing Compounds
~~C733 Test Method for Volume Shrinkage of Latex Sealants (Withdrawn 2000)[3]~~
C755 Practice for Selection of Water Vapor Retarders for Thermal Insulation
C792 Test Method for Effects of Heat Aging on Weight Loss, Cracking, and Chalking of Elastomeric Sealants
D36/D36M Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)
D56 Test Method for Flash Point by Tag Closed Cup Tester
D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester
D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
~~D529 Practice for Enclosed Carbon-Arc Exposures of Bituminous Materials (Withdrawn 2013)[3]~~
D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer
D638 Test Method for Tensile Properties of Plastics
~~D658 Test Method for Abrasion Resistance of Organic Coatings by Air Blast Abrasive (Withdrawn 1996)[3]~~
D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam (Withdrawn 2019)[3]
D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D822/D822M Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D903 Test Method for Peel or Stripping Strength of Adhesive Bonds
D968 Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
D1310 Test Method for Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D1640 Test Methods for Drying, Curing, or Film Formation of Organic Coatings
D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
~~D1823 Test Method for Apparent Viscosity of Plastisols and Organosols at High Shear Rates by Extrusion Viscometer~~
~~D1824 Test Method for Apparent Viscosity of Plastisols and Organosols at Low Shear Rates~~
D1849 Test Method for Package Stability of Paint
D2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer
D2243 Test Method for Freeze-Thaw Resistance of Water-Borne Coatings
D2354 Test Method for Minimum Film Formation Temperature (MFFT) of Emulsion Vehicles
D2444 Practice for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
D2453 Test Method for Shrinkage and Tenacity of Oil- and Resin-Base Caulking Compounds
D2485 Test Methods for Evaluating Coatings For High Temperature Service
D2507 Terminology of Rheological Properties of Gelled Rocket Propellants (Withdrawn 2003)[3]
~~D2939 Test Methods for Emulsified Bitumens Used as Protective Coatings (Withdrawn 2012)[3]~~
D3134 Practice for Establishing Color and Gloss Tolerances
D3274 Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
D3361/D3361M Practice for Unfiltered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester
D4339 Test Method for Determination of the Odor of Adhesives
D5590 Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
E84 Test Method for Surface Burning Characteristics of Building Materials
E96/E96M Test Methods for Water Vapor Transmission of Materials
E162 Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
E659 Test Method for Autoignition Temperature of Chemicals
F1249 Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

[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.

G21 Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000)[3]

3. Terminology

3.1 Terminology C168 shall be considered as applying to the terms used in this specification.

3.2 *General Definitions:*

3.2.1 *application properties*—properties that influence or affect the effective installation of finishes.

3.2.2 *coating*—a liquid or semiliquid protective finish capable of application to thermal insulation or other surfaces, usually by brush or spray, in moderate thickness, 30 mils (0.76 mm).

3.2.3 *mastic*—a protective finish of relatively thick consistency capable of application to thermal insulation or other surfaces usually by spray or trowel, in thick coats greater than 30 mils (0.03 in.) (0.76 mm).

3.2.4 *service properties*—properties that govern performance of finishes after installation.

3.3 *Specific Definitions*—Terms specific to Sections 6 and 7 are defined as appropriate.

4. Significance and Use

4.1 Each of the properties listed should be considered in selecting materials for specific projects. A list of the selected properties with limiting values assigned will form a part of the product specification.

4.2 All of the properties ~~may not be pertinent in any specific situation,~~ are not required, and all of the tests outlined ~~may~~are not ~~be~~ required. A condition to any specification must be an evaluation of the proposed use to determine which properties ~~may~~shall be required.

4.3 Membrane reinforcements are frequently specified and used with mastics and coatings. Service properties of such systems of finishes ~~may be~~are often different from the unreinforced finishes; therefore, it is essential to test specimens of the reinforced system.

5. Classification of Mastics and Coatings

5.1 *Vapor-Retarder Type*—A finish intended for service on insulated units that are operated below ambient temperature at least part of the time.

NOTE 1—Practice C755 ~~may provide~~ provides additional guidance.

5.1.1 Outdoor service.

5.1.2 Indoor service.

5.2 *Vapor-Permeable Type*—A finish intended for service on insulated units that are operated above ambient temperature. (See 7.6.2. Sometimes referred to as a "breather" finish.)

5.2.1 Outdoor service.

5.2.2 Indoor service.

6. Application Properties

6.1 *Consistency:*

6.1.1 *Definition*—the resistance of a non-Newtonian material to deformation or flow.

NOTE 2—Consistency is not a fundamental property but is made up of viscosity, plasticity, and other rheological phenomena (see Terminology D2507). In non-Newtonian behavior, usual for mastics and coatings for thermal insulation, the ratio of shearing stress to the rate of shearing strain varies with the shearing stress.

6.1.2 *Significance and Use*—Consistency determines whether a mastic or coating can be troweled, applied by gloved hand, brushed, or sprayed. It has a direct effect on application costs.

6.1.3 *Technical Evaluation*—Test Methods C461, ~~C639,~~ D562, ~~D1823, D1824,~~ and D2196.

6.2 *Coverage:*

6.2.1 *Definition*—the measure of surface area in ft^2/gal (m^2/litre) (coatings) or gallons per 100 ft^2 (mastics) at which finish must be applied to obtain specified dry thickness and desired performance.

6.2.2 *Significance and Use*—The performance of finishes is related directly to the optimum dry thickness. Therefore, performance properties must be defined in terms of optimum dry thickness, and this value must be established for application purposes in terms of coverage. Coverage data are essential for estimating material quantities and costs.

6.2.3 *Technical Evaluation*—Test Methods C461.

6.3 *Build:*

6.3.1 *Definition*—the thickness to which a coating or mastic finish can be applied without sagging, running, sliding, or dripping.