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Standard Specification for Cool-Application Filling Compounds for Telecommunications Wire and Cable[1]

This standard is issued under the fixed designation D4732; 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 covers a variety of compounds used for filling the air spaces in telecommunications wires and cables (both electrical and fiber optic) for the purpose of preventing water and other undesirable fluids from entering or migrating through the cable structure. (For related standards see Specifications D4730 and D4731.)

1.2 A cool-application compound is a material that has sufficiently low viscosity that it does not require heating.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D6 Test Method for Loss on Heating of Oil and Asphaltic Compounds
D88 Test Method for Saybolt Viscosity
D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester
D97 Test Method for Pour Point of Petroleum Products
D127 Test Method for Drop Melting Point of Petroleum Wax, Including Petrolatum
D150 Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation
D217 Test Methods for Cone Penetration of Lubricating Grease
D257 Test Methods for DC Resistance or Conductance of Insulating Materials
D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
D566 Test Method for Dropping Point of Lubricating Grease
D938 Test Method for Congealing Point of Petroleum Waxes, Including Petrolatum
D942 Test Method for Oxidation Stability of Lubricating Greases by the Oxygen Pressure Vessel Method
D972 Test Method for Evaporation Loss of Lubricating Greases and Oils
D1264 Test Method for Determining the Water Washout Characteristics of Lubricating Greases
D1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
D1742 Test Method for Oil Separation from Lubricating Grease During Storage
D1743 Test Method for Determining Corrosion Preventive Properties of Lubricating Greases
D2161 Practice for Conversion of Kinematic Viscosity to Saybolt Universal Viscosity or to Saybolt Furol Viscosity
D3895 Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
D3954 Test Method for Dropping Point of Waxes
D4565 Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable
D4568 Test Methods for Evaluating Compatibility Between Cable Filling and Flooding Compounds and Polyolefin Wire and Cable Materials
D4730 Specification for Flooding Compounds for Telecommunications Wire and Cable
D4731 Specification for Hot-Application Filling Compounds for Telecommunications Wire and Cable
D4872 Test Method for Dielectric Testing of Wire and Cable Filling Compounds

[1] This specification is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.07 on Electrical Insulating 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* volume information, refer to the standard's Document Summary page on the ASTM website.

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3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *filling material, n*—any of several materials used to fill the air spaces in the cores of multi-conductor insulated wires and cables, or between buffer tubes covering optical fibers, or within such buffer tubes, or any combination of these configurations and any other cable components, for the purpose of excluding water and other undesirable fluids; especially with regard to telecommunications wire and cable, including optical cable, intended for outside aerial, buried, or underground installations.

3.1.2 *producer, n*—the primary manufacturer of the material.

3.1.3 *suppliers, n*—jobbers and distributors as distinct from producers.

4. Classification

4.1 Two basic types of filling compounds are covered, as follows:

4.1.1 *Type I*—General-purpose filling compounds include all materials to be used for filling cables that are not required to function under electrical stress (for example, all-dielectric fiber-optic cable), including filling compounds for fiber-optic loose buffer tubes.

4.1.2 *Type II*—Electrical-type filling compounds include materials having prescribed electrical properties and used for filling wires and cables that are required to function fully or partially under electrical stress (including hybrid fiber-optic cable).

5. Ordering Information

5.1 Orders for material under this specification shall include the following information:

5.1.1 Quantity (mass or volume) for each item,

5.1.2 Generic name of the material, such as cool-application cable filling material,

5.1.3 Type of Material: Type I, General Purpose, or Type II, Electrical,

5.1.4 How Furnished: Drums or Barrels, tank cars or tank trucks, and the like,

5.1.5 Certification, if required (Section 14),

5.1.6 This specification designation, and

5.1.7 Any special requirements, as listed in 7.2, 9.2, 10.2, and Sections 11 and 12, that apply.

6. Materials and Manufacture

6.1 The material and the manufacturing methods used shall be such that the resulting products will conform to the properties and characteristics prescribed in this specification.

7. Chemical Composition

7.1 The chemical composition of these materials is not specified. The material is of a chemical composition suitable for the intended purpose and that meets the requirements of this specification as hereinafter stated.

7.2 When agreed upon between the producer and the purchaser, antioxidant stabilizing additives shall be included in the compound formulation to assure specified results in thermal oxidative stability testing.

7.3 Once established, the producer shall not change the composition of the compound in successive lots of material without prior approval of the purchaser.

8. Electrical Properties

8.1 When a Type II (electrical) filling compound is specified, the compound shall exhibit the electrical properties in 8.1.1 and 8.1.2. The electrodes used shall be parallel plates of solid or foil metal of a size and shape appropriate for the specimen holder. Other electrodes are used as agreed upon between the producer and the purchaser. The voltage applied and the time of the electrification shall be appropriate for the instrumentation used and as agreed upon between producer and purchaser.

8.1.1 When tested, in accordance with Test Method D150 or D4872, at a temperature of 23 ± 3 °C, the dissipation factor shall not exceed 0.0010 at a frequency of 1 MHz and the permittivity shall not exceed 2.30.

8.1.2 When tested, in accordance with Test Method D257, at a temperature of 23 ± 3 °C, the volume resistivity shall be not less than 10^{13} Ω·cm.

9. Physical Properties

9.1 Filling compound furnished under this specification shall inhibit the corrosion of any metallic wire and cable elements with which it comes in contact, while serving as a radial and longitudinal barrier to moisture transmission. Contact of the filling compound with any cable component shall not cause degradation of performance of the cable component. The filling compound shall display adhesive properties to provide adhesion between metallic sheath elements and the outer jacket materials of wire and cable.

9.2 *Other Physical Properties:*

9.2.1 Other physical properties requirements such as Flash Point (for example, Test Method D92), high-temperature drip/oil separation (syneresis) in the raw material state (for example, Test Method D1742), evaporation loss (for example, Test Method D972), and water resistance (for example, Test Method D1264), and the like, shall be as agreed upon between the producer and the purchaser.

9.2.2 The purchaser (individual cable manufacturer or other) shall specify any other expected requirements needed to ensure compliance with such end-product requirements as cold-bend, low-temperature flexibility, and the like.

10. General Requirements

10.1 All filling compounds manufactured in accordance with this specification shall meet the following requirements:

10.1.1 *Homogeneity*—The compound shall be homogeneous and free of agglomerates.

10.1.2 *Color and Opacity*—The compound shall be as nearly colorless as is commercially feasible, consistent with the requirements of the end products for which the filling compound is intended. In general, identification of cable members coated with filling compound shall not be significantly inhibited because of filling compound color or opacity.

10.1.3 *Color Stability*—After aging a specimen of filling compound in a suitable container for a period of 120 ± 1 h (5 days) at a temperature of 130 °C (266 °F) in a static air oven, measure the compound color in accordance with Test Method D1500. Unless otherwise specified, the color of the aged compound shall not exceed 2.5.

10.1.4 *Foreign Material*—The compounds shall be free of dirt, metallic particles, and other foreign matter.

10.2 *Other Properties*—Other property requirements such as Volatility (for example, Test Method D6),Thermal Oxidative Stability (for example, testing similar to Test Methods D942 or D3895), Cone Penetration (for example, Test Methods D217), Corrosion Prevention (for example, Test Method D1743), and the like, shall be as agreed upon between the producer and the purchaser.

NOTE 1—If Test Method D6 is referenced, a test cycle of 22 h at 107 °C (225 °F) is recommended in lieu of the 163 °C (325 °F) temperature required by Test Method D6.

11. Temperature Characteristics

11.1 Raw material temperature characteristics, such as Pour Point (for example, Test Method D97), Drop-melting Point (for example, Test Methods D127 and D566), Viscosity (for example, Test Methods D88, D445, and Practice D2161), Congealing Point (for example, Test Method D938), and Drop Point (for example, Test Methods D566 and D3954), if needed shall be as agreed upon between the producer and the purchaser.

NOTE 2—Although cited in 11.1, Test Method D127 is "not" a preferred method for determining the melting point of wire and cable filling compounds since results tend to be too high to be useful in predicting material behavior in the cable filling process. However, this may be a good test for quality control purposes.

11.2 The purchaser (individual cable manufacture or other) shall specify any other expected temperature conformance requirements (high and low) needed to assure compliance with such end-product requirements as cable drip-out temperature, cold-bend low-temperature flexibility, and the like (for example, Test Methods D4565).

12. Compatibility With Other Materials

12.1 It is the responsibility of the purchaser to ensure that the filling compound ordered is suitable for the intended application and is compatible with any other components that it may come into contact with.

12.2 The purchaser shall specify the materials that the compound must be compatible with when tested in accordance with Test Method D4568.

13. Quality Assurance

13.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer shall use his own or any other suitable facilities for the performance of these inspection and test requirements unless otherwise stated by the purchaser in the order or at the time of contract signing. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that the material conforms to the prescribed requirements.

13.2 Each producer shall establish written nominal values and tolerances for the material properties routinely checked. For properties not routinely checked, typical values shall be specified. Once these values have been accepted by the purchaser, the producer shall not ship material that deviates from these limits without prior notification to and approval of the purchaser.

13.3 An inspection lot shall consist of an identifiable quantity of the same material subjected to inspection at one time.

14. Certification

14.1 The producer or supplier shall, on request, furnish to the purchaser a certificate stating that each lot has been sampled, tested, and inspected in accordance with this specification, and meets the requirements.

15. Packaging and Package Marking

15.1 *Packaging*—Quantities of the filling compound may be packaged in standard 55 gal (210 L) drums or in tank cars capable of protecting the material from contamination during shipment. Smaller containers are also used as agreed upon between the producer and the purchaser.

15.2 *Package Marking*—Shipping containers shall be marked with the name of the manufacturer, trade name, type of material, lot number, mass or volume, and date of manufacture.

16. Keywords

16.1 compatibility; cool application; filling compounds; telecommunications wire and cable

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