Designation: D 4568 – 99

An American National Standard

Standard Test Methods for Evaluating Compatibility Between Cable Filling and Flooding Compounds And Polyolefin Wire and Cable Materials[1]

This standard is issued under the fixed designation D 4568; 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 These test methods evaluate the compatibility between cable filling or cable flooding compounds, or both, and polyolefin materials used in the manufacture of wire and cable that are usually in intimate contact with the filler or floodant, or both.

1.2 These test methods are useful to ensure compatibility and to verify that new formulations of filling or flooding compounds will have no deleterious effect upon the other polyolefin materials being used or, conversely, use these methods to ensure that other polyolefin wire and cable materials are evaluated for possible use not degraded by contact with fillers or floodants already in use.

1.3 Whenever two sets of values are presented, in different units, the values in the first set are the standard, while those in parentheses are for information only.

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:*

D 1711 Terminology Relating to Electrical Insulation[2]

D 1928 Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens[3]

D 2633 Test Methods for Thermoplastic Insulations and Jackets for Wire and Cable[4]

D 4730 Specification for Flooding Compounds for Telecommunications Wire and Cable[4]

D 4731 Specification for Hot-Application Filling Compounds for Telecommunications Wire and Cable[4]

D 4732 Specification for Cool-Application Filling Compounds for Telecommunications Wire and Cable[4]

D 5423 Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation[4]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in these test methods, refer to Terminology D 1711

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aging (act of), n*—exposure of materials to filling or flooding compound at a specified temperature for a specified time.

3.2.2 *filling compound*—any of several materials (see Specifications D 4731 and D 4732) used to fill the air spaces in the cores of multi-conductor insulated wires and cables for the purpose of excluding air or moisture or both; especially with regard to telecommunications wire and cable intended for direct burial.

3.2.3 *flooding compound*—any of several materials (see Specification D 4730) used to flood wire or cable sheath interfaces (for example, the region between core wrap and a shield, between a shield and a jacket, etc.) to eliminate or to minimize normal voids or air spaces in these areas; especially with regard to telecommunications wire and cable intended for direct burial.

4. Significance and Use

4.1 Cable filling and flooding compounds are normally semi-solid at room temperature and fluid in varying degrees at elevated temperatures. They are normally applied in a liquid state and at an elevated temperature during wire and cable manufacturing. The completed finished wire or cable is exposed to various ambient conditions during its useful life. If not carefully selected, components of filling or flooding compounds may act to degrade the materials they contact, short term or long term. The following methods are intended to minimize the chances of such problems occurring.

[1] These test methods are under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and are the direct responsibility of Subcommittee D09.18 on Solid Insulations, Nonmettalic Shieldings, and Coverings for Electrical Wires and Cables. Members of ASTM Committee D-2 on Petroleum Products and Lubricants, and ASTM Committee B-7 on Light Metals and Alloys, have contributed to these test methods.

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[2] *Annual Book of ASTM Standards,* Vol 10.01.

[3] *Annual Book of ASTM Standards,* Vol 08.01.

[4] *Annual Book of ASTM Standards,* Vol 10.02.

4.2 Some of the effects that might occur include, but are not limited to:

4.2.1 Delamination of coated metal shields or screens in completed wire and cable. Delamination is primarily a function of the test temperature and the type of laminant used, so test results are unlikely to vary significantly between filling or flooding compounds of a common family (for example, petroleum based filling or flooding compounds).

4.2.2 Degradation of physical properties of insulation, jackets, core coverings, etc. Likely manifestations of degradation of plastic material include embrittlement of some materials and excessive softening of other materials.

4.3 Since the magnitude of any given effect will vary, some test procedures will be more critical than others. It is not, therefore, intended that every listed procedure be performed with every compatibility study. Perform procedures to the extent required by product specifications or as agreed upon between the producer and the purchaser.

5. Apparatus

5.1 *Oven*—Forced-convection oven, conforming to Specification D 5423, Type II.

5.2 *Containers*—Glass or other containers of suitable size, shape, and make-up as required to hold the designated specimens.

5.3 *Clamps*, or other devices as suitable for holding specimens in the oven.

5.4 *Tensile Strength Testing Apparatus*, as specified by the test requirement.

5.5 *Mill, Press, and Molding Equipment*, as needed for preparation of compression molded specimens as required.

5.6 *Miscellaneous Lab Equipment*—Towels, knives, etc. as required for cleaning and cutting specimens.

6. Sampling

6.1 Ensure that samples of filling and flooding compounds and the other affected wire and cable materials to be evaluated are representative of the materials to be used or to be found in the finished products.

COMPATIBILITY EVALUATION BETWEEN COATED METALS AND FILLING OR FLOODING COMPOUNDS

7. Scope

7.1 This test method is specifically for polyolefin coatings on aluminum and steel shielding and armoring material used in telecommunications wire and cables.

8. Specimen Preparation

8.1 Cut a specimen of coated metal tape (shielding tape, armor tape, screen tape) 6 in. (150 mm) long for evaluation. If a choice of tape widths is possible, select a width narrow enough to fit easily into a container (beaker, graduated cylinder, etc.)

8.2 Heat a quantity of the filling or flooding compound to a temperature such that all components of the compound are in solution and the compound is a homogenous pourable liquid (98°C minimum). Maintain at a temperature higher than 102°C only if necessary for pouring. A standardized pouring temperature of 100 ± 2°C is preferred in order to produce uniform testing. Record melting and pouring temperatures used, together with other relevant laboratory data.

8.3 Pour the melted compound into the container holding the coated metal tape. Pour sufficient material to ensure that the tape is completely covered.

9. Specimen Aging

9.1 Place the immersed metal tape into an oven preheated to the temperature mutually agreed upon between the wire and cable manufacturer and the purchaser. Unless otherwise specified, maintain this temperature for a period of 168 h (7 days) minimum. See Note 1.

NOTE 1—It may be desirable to age specimens at more than one temperature (60 ± 1°C and 80 ± 1°C are commonly used) or to age all specimens to a failure time, or both. If specimens are being aged to failure, it is suggested that sets of specimens be removed from the oven at the end of interim periods (that is, after 7 days, after 14 days, etc).

10. Specimen Examination

10.1 After the aging period is concluded and before cooling, extract the metal tape from the container of filling or flooding material. Allow as much as possible of the compound to drain from the specimen. Avoid wiping the specimen and do not expose it to solvents to remove the filling or flooding material. (See Note 2.)

NOTE 2—High melt-temperature filling and flooding materials may have to be removed from the tape by mechanical or other means. If no other choice is possible, it may be necessary to reheat the container of immersed tape to permit extracting it, but recognize that such reheating may adversely bias test results by causing the coated metal(s) to behave in a manner not encountered during a normal cable life. Recorded laboratory data should include descriptions of any special techniques used to extract tape specimens.

10.2 Allow the specimen to cool to room ambient conditions.

10.3 Visually examine (normal vision or corrected-tonormal vision, without magnification) the specimen of coated metal tape for evidence of delamination.

11. Interpretation of Results

11.1 Unless otherwise specified, consider any visual evidence of delamination of coated metal to be a failure.

11.2 *Report*—The report shall be in accordance with Section 23.

COMPATIBILITY EVALUATIONS FOR POLYOLEFIN INSULATIONS AND FILLING OR FLOODING COMPOUNDS

12. Scope

12.1 This test method is specifically for polyolefin insulating materials used in telecommunications wires and cables.

13. Specimen Preparation and Initial Testing

13.1 Obtain samples of typical insulated conductors for evaluation.