Designation: D 3554 – 01

An American National Standard

Standard Specification for Track-Resistant Black Thermoplastic High-Density Polyethylene Insulation for Wire and Cable, 75°C Operation[1]

This standard is issued under the fixed designation D 3554; 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 track-resistant black thermoplastic high-density polyethylene insulation. The base polymer of this material consists substantially of polyethylene. Before application to the conductor, the insulation shall comply with the requirements of Specification D 1248, Type III, Class C, Category 5, Grade E10, J4, or J5. The requirements of Specification D 1248 shall not apply to the insulation removed from the conductor.

1.2 This type of insulation is considered suitable for use on wire or cable that will be used for continuous operation at conductor temperatures up to 75°C.

1.3 This insulation is suitable for use on wire or in cable used for power transmission in overhead spaced-line service, installed at temperatures above −25°C and exposed to sunlight and other atmospheric environments between −55 and +75°C.

1.4 In many instances, the insulation cannot be tested unless it has been formed around a conductor. Therefore, tests are done on insulated wire in this standard solely to determine the relevant property of the insulation and not to test the conductor or completed cable.

1.5 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.

2. Referenced Documents

2.1 *ASTM Standards:*

D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials[2]

D 1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics[2]

D 1711 Terminology Relating to Electrical Insulation[3]

D 1928 Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens[2]

D 2132 Test Method for Dust-and-Fog Tracking and Erosion Resistance of Electrical Insulating Materials[3]

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

3. Terminology

3.1 *Definitions:* For definitions of terms used in this specification refer to Terminology D 1711.

3.2 *Definition of Term Specific to This Standard:*

3.2.1 *aging, (act of), n*—exposure of materials to air at a temperature of 100°C for 48 h.

4. Physical Properties

4.1 When tested for physical and aging requirements, heat distortion, cold bend, U-bend discharge, and surface resistivity in accordance with Test Methods D 2633, environmental cracking in accordance with Test Method D 1693, and track resistance in accordance with Test Method D 2132, the track-resistant black thermoplastic high-density polyethylene insulation shall meet the requirements specified in Table 1.

5. Electrical Requirements

5.1 Subject cable specimens to a 5 min ac or dc voltage withstand test at voltages which are based on the nominal thickness of the insulation. Conduct tests in accordance with Test Methods D 2633 using 125 V/mil (5 kV/mm) for ac tests or 375 V/mil (15 kv/mm) for dc tests.

6. Sampling

6.1 Sample the insulation in accordance with Test Methods D 2633 and Test Method D 1693.

7. Test Methods

7.1 Test the insulation in accordance with Test Methods D 2633 and Test Method D 1693, modified as noted in Table 1, and noted as follows.

[1] This specification is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.18 on Solid Insulations, Nonmetallic Shieldings, and Coverings for Electrical and Telecommunications Wires and Cables.

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[2] *Annual Book of ASTM Standards,* Vol 08.03.

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

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

***A Summary of Changes section appears at the end of this standard.**

TABLE 1 Physical Requirements for Track-Resistant Black Thermoplastic High-Density Polyethylene Insulation

Physical requirements (unaged):	
Tensile strength, min, psi (MPa)	2500 (17.2)
Elongation at rupture, min, %	300
Physical requirements [after aging in an air oven at 100 ± 1°C for 48 h]:	
Tensile strength, min, % of unaged value	75
Elongation at rupture, min, % of unaged value	75
Heat distortion at 90± 1°C, max, % of unaged thickness:	
4/0 AWG (107 mm^2) and smaller (insulation on cable)	30
Larger than 4/0 AWG (107 mm^2) (buffed sample of insulation)	10
Cold bend, at − 25± 1°C for 1 h	no cracks
Environmental cracking, 48 h	no cracks
U-bend discharge, 125 V/mil (5 kV/mm)	no cable failures or cracks in insulation surface
Surface resistivity, min, MΩ	200 000
Track Resistance:	
Average time to failure, min, h	200

7.2 To test for environmental cracking in accordance with Test Method D 1693, test specimens shall be molded in accordance with Procedure C of Practice D 1928 and the test reagent shall be 10 % Igepal CO-630[5].

7.3 Test the track resistance in accordance with Test Method D 2132.

8. Keywords

8.1 ac test; cold bend; dc test; elongation; environmental cracking; heat distortion; high-density polyethylene; surface resistivity; tensile strength; thermoplastic; track-resistant; u-bend discharge

[5] Igepal CO-630 is available from Rhone-Poulenc Inc.

SUMMARY OF CHANGES

(1) Added new paragraphs 1.2 and 1.4.
(2) Changed title of Table 1.
(3) Minor editorial changes.