



Designation: ~~D3555–07 (Reapproved 2018)~~ D3555 – 20

Standard Specification for Track-Resistant ~~Black~~ Crosslinked Polyethylene Insulation for Wire and Cable, 90 °C Operation¹

This standard is issued under the fixed designation D3555; 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~~ Scope*

1.1 This specification covers a track-resistant ~~black~~ crosslinked polyethylene insulation, the base polymer which consists substantially of polyethylene or its copolymers. This insulation shall be carbon black ~~pigmented~~, pigmented, or colored and suitably protected to enable UV stability.

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 90 °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° and exposed to sunlight and other atmospheric environments between -55 and $+90$ °C.

1.4 In many instances, the insulation cannot be tested unless it has been formed around a conductor. Therefore, tests done on insulated wire in this standard are 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 first set are to be regarded as standard.~~ The values given in parentheses are for information only—mathematical conversions that are provided for information only and are not considered standard.

1.6 *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

[D470 Test Methods for Crosslinked Insulations and Jackets for Wire and Cable](#)

[D1711 Terminology Relating to Electrical Insulation](#)

[D2132 Test Method for Dust-and-Fog Tracking and Erosion Resistance of Electrical Insulating Materials](#)

[D2765 Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics](#)

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.

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

2.2 ICEA Standard:

ICEA T-28-562 Test Method for Measurement of Hot Creep of Polymeric Insulations³

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this specification, refer to Terminology **D1711**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *aging, (act of), n*—exposure of materials to air at a temperature of 121 °C for 168 h.

4. Physical Properties

4.1 When tested for physical and aging requirements, heat distortion, cold bend, U-bend discharge, surface resistivity, and track resistance in accordance with Test Methods **D470**, the track-resistant black crosslinked polyethylene insulation shall meet the requirements specified in **Table 1**. The insulation is to meet the requirements for percent hot creep and hot set specified in **Table 1**. The test is to be performed in accordance with ICEA T-28-562. Only in case of dispute, the solvent extraction (gel content and swell ratio) test in Test Methods **D2765** is to be the referee method. The extractables, after a drying time of 20 h, shall be no more than 30 %.

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 **D470** using ~~125 V/mil (5 kV/mm)~~ 5000 V/mil (125 V/mil) for ac tests or ~~375 V/mil (15 kv/mm)~~ 15 000 V/mm (375 V/mil) for dc tests.

6. Sampling

6.1 Sample the insulation in accordance with Test Methods **D470**, **D2765**, and ICEA T-28-562.

7. Test Methods

7.1 Test the insulation in accordance with Test Methods **D470**, **D2132**, and **D2765**, modified as noted in **Table 1**; and ICEA T-28-562.

8. Keywords

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

³ Available from The Insulated Cable Engineers Association, Inc. (ICEA), P.O. Box 1568, Carrollton, GA 30112, <http://www.icea.net>.

TABLE 1 Physical Requirements for Track-Resistant Black Crosslinked Polyethylene Insulation

Physical requirements (unaged):	
— Tensile strength, min, psi (MPa)	1800 (12.4)
— Tensile strength, min, psi (MPa)	1800 (12.4)
— Elongation at rupture, min, %	250
— Elongation at rupture, min, %	250
Physical requirements (after aging in an air oven at 121 ± 1 °C for 168 h):	
Physical requirements (after aging in an air oven at 121 ± 1 °C for 168 h):	
— Tensile strength, min, % of unaged value	75
— Tensile strength, min, % of unaged value	75
— Elongation at rupture, min, % of unaged value	75
— Elongation at rupture, min, % of unaged value	75
Heat distortion at 121 ± 1 °C, max, % of unaged thickness:	
— 4/0 AWG (107 mm ²) and smaller (insulation on cable)	30
— 4/0 AWG (107 mm ²) and smaller (insulation on cable)	30
— Larger than 4/0 AWG (107 mm ²) (buffed sample of insulation)	15
— Larger than 4/0 AWG (107 mm ²) (buffed sample of insulation)	15
Percent Hot Creep	
Percent hot creep	
— Filled	100
— Filled	100
— Unfilled	175
— Unfilled	175
Percent Hot Set	
Percent hot set	
— Filled	5
— Filled	5
— Unfilled	10
— Unfilled	10
Cold bend, -25 ± 1 °C for 1 h	no cracks
U-bend discharge, 125 V/mil (5 kV/mm)	no cable failures or cracks in insulation surface
U-bend discharge, 125 V/mil (5000 V/mm)	no cable failures or cracks in insulation surface
Surface resistivity, min, MΩ	200 000
Track resistance:	
— Average time to failure, min (h)	200 (3.33)
— Average time to failure, min (h)	200 (3.33)