Designation: D 2770 – ~~93~~01

An American National Standard

Standard Specification for Ozone-Resisting Ethylene-Propylene Rubber Integral Insulation and Jacket for Wire and Cable[1]

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1. Scope

1.1 This specification covers a weather- and ozoneresisting vulcanized rubber integral insulation and jacket compound for electrical wires and cables. The rubber polymer shall consist substantially of ethylenepropylene copolymer (EPM) or of ethylenepropylene terpolymer (EPDM).

1.2 This type insulation is considered suitable for use on wire or cable which will be used for continuous operation at conductor temperatures up to 90°C in dry locations and 75°C in wet locations, and at operating voltages not exceeding 2000 V.

1.3 The values stated in inch-pound units, except for temperature, are regarded as the standard. The values in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

[1] This specification is under the jurisdiction of ASTM Committee ~~D-9~~ 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~~s~~ Wires and Cables.

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D 470 Test Methods for Crosslinked Insulations and Jackets for Wire and Cable[2]

3. Physical Properties

3.1 The crosslinked integral covering shall conform to the requirements for physical properties specified in Table 1.

3.2 *Thickness of Insulation*—The average thickness of the insulation shall be not less than that given in Table 2. The minimum thickness shall be not less than 90 % of the specified thickness.

4. Electrical Requirements

4.1 *Order of Testing*—Perform the ac voltage withstand, insulation resistance, and dc voltage withstand tests in that order when any of these tests are required. The sequence for other testing is not specified.

4.2 *AC Voltage Withstand Test*—Each length of integrally covered conductor shall withstand for 5 min the ac voltage specified in Table 2, unless the dc test in 4.4 is performed.

4.3 *Insulation Resistance*—The integrally covered conductor shall have an insulation resistance not less than that corresponding to a constant of 10 000 at 60°F (15.6°C). Where the temperature of the water in which the insulation is tested differs from 60°F, the measured value obtained shall be multiplied by the proper correction factor for the particular compound as previously determined by the manufacturer.

4.4 *DC Voltage Withstand Test*—Upon completion of the insulation resistance test, each length of integrally covered conductor shall withstand for 5 min the ~~d-c~~ dc test voltage specified in Table 2 unless the ~~a-c~~ ac test described in 4.2 is performed.

4.5 *Accelerated Water Absorption*—The integral covering shall meet the requirements of Table 3. The Electrical Method Test shall be conducted at 60 Hz with the water temperature at 75 ± 1°C. The water temperature in the Gravimetric Method Test shall be 70 ± 1°C.

5. Ozone Resistance

5.1 The integral covering shall show no injury after exposure for 3 h to an ozone concentration of between 0.025 and 0.03 % volume.

6. Sampling

6.1 Sample the integral insulation and jacket in accordance with Test Methods D 470.

7. Test Methods

7.1 Test the integral insulation and jacket in accordance with Test Methods D 470.

8. Keywords

8.1 AC Voltage Withstand Test; DC Voltage Withstand Test; ethylene-propylene rubber; insulation resistance; ozone resisting; water absorption

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

TABLE 1 Physical Test Requirements for EPM or EPDM Integral Insulation and Jacket

Physical Requirements (original):	
Tensile stress at 100 % elongation, min, psi (MPa)	500 (3.4)
Tensile strength, min, psi (MPa)	1200 (8.3)
Elongation at rupture, min, %	150
Physical Requirements [After heat exposure (aging) in an air oven at 121 ± 1°C for 168 h]:	
Tensile strength, min, % of original	75
Elongation at rupture, min, % of original	75

TABLE 2 Conductor Sizes, Insulation Thicknesses and Test Voltages

Rated Circuit Voltage Phase to Phase, VA	Conductor Size, AWG or K kcmil (mm^2)	Insulation Thickness		Test Voltage, kV	
		mils	(mm)	AC	DC
0 to 600	14 to 9[B] (2.08 to 6.63)	45	(1.14)	4.0	12.0
0 to 600	14 to 9	45	(1.14)	4.0	12.0
	8 to 2 (8.37 to 33.6)	60	(1.52)	5.5	16.5
	1 to 4/0 (42.4 to 107)	80	(2.03)	7.0	21.0
	225 to 500 (140 to 523)	95	(2.41)	8.0	24.0
	501 to 1000 (254 to 507)	110	(2.79)	10.0	30.0
601 to 2000	14 to 9[C] (2.08 to 6.63)	60	(1.52)	5.5	16.5
601 to 2000	14 to 9	60	(1.52)	5.5	16.5
	8 to 2 (8.37 to 33.6)	70	(1.78)	7.0	21.0
	1 to 4/0 (42.4 to 107)	90	(2.29)	8.0	24.0
	225 to 500 (140 to 523)	105	(2.67)	9.5	28.5
	501 to 1000 (254 to 507)	120	(3.05)	11.5	34.5

[A] The actual operating voltage shall not exceed the rated circuit voltage by more than (*1*) 5 % during continuous operation or (*2*) 10 % during emergencies lasting not more than 15 min.

[B] In common with other electrical equipment, the use of cables is not recommended on systems where the ratio of the zero to positive reactance of the system at the point of cable application lies between −1 and −40 since excessively high voltages may be encountered in the case of ground faults.

[C] Single-conductor cables in sizes 9 AWG (6.63 mm^2) and smaller shall not be used for direct burial.

TABLE 3 Accelerated Water Absorption Test Requirements

Electrical Method:	
Permittivity after 1 day, max	6.0
Increase in capacitance, max, %:	
1 to 14 days	5.0
7 to 14 days	3.0
Stability factor after 14 days, max	1.0
Gravimetric Method:	
Water absorption, max, $mg/in.^2$ (g/m^2)	15.0 (23)