



Designation: D 353 - 89

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St., Philadelphia, Pa. 19103

Reprinted from the Annual Book of ASTM Standards, Copyright ASTM
If not listed in the current combined index, will appear in the next edition.

Standard Specification for Natural Rubber Insulation for Wire and Cable, 60°C Operation¹

This standard is issued under the fixed designation D 353; 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 crosslinked rubber insulating compound for electrical wires and cables. The rubber polymer is primarily composed of natural rubber.

1.2 This type of insulation is considered suitable for continuous operation at conductor temperatures up to 60°C and operating voltages not exceeding 2000 V. This insulation has low-temperature limitations. Consult the manufacturer for specific recommendations for installation.

1.3 The values stated in parentheses are for informational purposes only.

2. Referenced Document

2.1 ASTM Standard:

D 470 Methods of Testing Crosslinked Insulations and Jackets for Wire and Cable²

3. Unaged and Aged Physical Properties

3.1 The crosslinked insulation shall conform to the unaged and aged physical properties specified in Table 1.

3.2 *Thickness of Insulation*—The average thickness of insulation shall be at least that given in Table 1A of Methods D 470. The minimum thickness shall be at least 90 % that given in Table 1A of Methods D 470.

4. Electrical Requirements

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

4.2 *A-C Voltage Test*—Each insulated conductor shall withstand for 5 min the a-c test voltage given for other than ozone-resisting insulations in Table 1A of Methods D 470. Unless otherwise specified, omit this test if the d-c voltage test described in 4.4 is to be performed.

4.3 *Insulation Resistance*—The insulated conductor shall have an insulation resistance value equal to or greater than that corresponding to a constant of 10 560 at 60°F (15.6°C). When the temperature of the water in which the insulation is tested differs from 60°F, apply a correction factor. Table 2 of

TABLE 1 Unaged and Aged Physical Properties for Performance-Grade Natural Rubber Insulation, 60°C Operation^{A,B}

	A	B
Unaged Requirements:		
Tensile strength, min, psi (MPa)	1200 (8.3)	900 (6.2)
Tensile stress at 200 % elongation, min, psi (MPa)	300 (2.1)	...
Elongation at rupture, min, %	400	300
Set in 2-in. (50-mm) gage length, max; %	20	20
Aged Requirements:		
After Air Oven Test at 70 ±1°C for 96 h:		
Tensile strength and elongation, min, percentage of unaged value	85	75
After Oxygen Pressure Test at 70 ±1°C for 96 h:		
Tensile strength and elongation, min, percentage of unaged value	75	65

^A When test specimens are taken from finished cables having rubber or other crosslinked sheaths, the values for original and aged physical properties shall be as specified in Column B.

^B The values are applicable only to insulation having a nominal wall thickness of 0.030 in. (0.76 mm) or greater.

Methods D 470 contains the correction factors. Each insulation manufacturer can furnish the 1°F coefficient for the insulation material by using the procedure given in Methods D 470. Multiply the measured value by the correction factor to obtain the insulation-resistance value corrected to 60°F.

4.3.1 Where a nonconducting separator is applied between the conductor and insulation, or where an insulated conductor is covered with a nonmetallic jacket so that the insulation resistance can be measured only on the completed assembly, the required insulation resistance shall be at least 60 % of that required for the primary insulation based on the thickness of that insulation.

4.4 *D-C Voltage Test*—Upon completion of the insulation resistance test, each insulated conductor shall withstand for 5 min the d-c test voltage given for other than ozone-resisting insulations in Table 1B of Methods D 470. Unless otherwise specified, omit this test if the a-c voltage test described in 4.2 has been performed.

5. Water Absorption

5.1 When requested by the purchaser, perform the Water Absorption Test described in Methods D 470. The insulation shall meet the requirements specified in Table 2.

TABLE 2 Water Absorption Requirements^A

Permittivity after 24 h, max	6.0
Increase in capacitance, max, %:	
1 to 14 days	20.0
7 to 14 days	5.0

^A 60 Hz Test at room temperature, but not less than 70°F (21°C)

¹ This specification is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.18 on Solid Insulations, Non-metallic Shieldings, and Coverings for Electrical and Telecommunications Wires and Cables.

Current edition approved Aug. 25, 1989. Published October 1989. Originally published as D 353 - 32 T. Last previous edition D 353 - 83.

² Annual Book of ASTM Standards, Vol 10.02.