UL 1655

Underwriters Laboratories Inc.

Standard for Safety

Community-Antenna Television Cables

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UL Standard for Safety for Community-Antenna Television Cables, UL 1655

Second Edition, Dated April 21, 2009

Summary of Topics

Revision pages have been issued for the Standard for Community-Antenna Television Cables, UL 1655, to reflect the latest ANSI approval date and to incorporate the proposal dated September 4, 2009. This proposal includes the following:

- ***Revision to requirements for metallic messengers.***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated September 4, 2009.

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Future Effective Date	References
April 1, 2010	6.3, 15.3.1, Section 18

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Standard for Community-Antenna Television Cables

First Edition – November, 1997

Second Edition

April 21, 2009

This ANSI/UL Standard for Safety consists of the Second Edition including revisions through November 10, 2009.

The most recent designation of ANSI/UL 1655 as an American National Standard (ANSI) occurred on November 10, 2009. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

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CONTENTS

INTRODUCTION

1 Scope 5
2 Units of Measurement 7
3 References 7

CONSTRUCTION

4 Materials 7
5 Center Conductor of Coaxial Members 7
6 Metal Coating of Center Conductor 11
7 Insulation 11
7.1 Material and application 11
7.2 Thicknesses 12
8 Coaxial Members 14
9 Electromagnetic Shields 14
10 Optical-Fiber Members 15
11 Binders 16
12 Communications Conductor 16
13 Core Wrap 16
14 Assembly of a Multiple-Member Cable 16
15 Overall Cable Jacket 17
15.1 General 17
15.2 Flexibility test 17
15.3 Physical properties test 18
15.4 Jacket 18
16 Metal Covering (Armor) 20
16.1 General 20
16.2 Smooth metal sheath 21
16.3 Welded and corrugated metal sheath 22
16.4 Extruded and corrugated metal sheath 22
16.5 Interlocked armor 23
17 Jacket over Armor 25
18 Metallic Messenger 25

PERFORMANCE

19 Continuity Test of Center and Outer Conductors and Shields 25
20 D-C Resistance Test of Center Conductors 26
20.1 Requirements 26
21 Cold Bend Test of the Complete Cable 30
22 Smoke and Flame Testing of Plenum Cables 31
23 Flame Testing of Riser Cables 31
24 VW-1 (Vertical-Specimen) Flame Test of Limited-Use Cables 31
25 Alternative Vertical-Tray Flame Tests of General-Purpose Cables 32
25.1 Choice of test by the manufacturer 32
25.2 Changes in construction 32
25.3 UL test 32
25.4 FT4/IEEE 1202 test 33
26 Sunlight-Resistance Test 33

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27 Alternative Spark and Dielectric Voltage-Withstand Tests of All Coaxial Members 33
27.1 Choice of test by the manufacturer 33
27.2 Spark test of members before cable assembly 34
27.3 Dielectric voltage-withstand test of members after cable assembly 34
28 Crushing Resistance Test of Center-Conductor Insulation 34
29 Crushing Test of Cable Marked for Direct Burial 35
30 Copper Sulphate Test of Zinc Coating on Steel Strip for and from Interlocked Steel Armor . .36
31 Tension Test of Interlocked Steel or Aluminum Armor 38
32 Flexibility Test of Cable Having Interlocked Armor or a Smooth or Corrugated Metal Sheath .41
33 Durability Test of Ink Printing 42
34 Limited Combustible 42

MARKINGS

35 Intervals 42
36 Coding 43
37 Information on or in the Cable 43
38 Information on the Tag, Reel, or Carton 46
39 Multiple Markings 46
40 Date of Manufacture 47

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INTRODUCTION

1 Scope

1.1 This Standard states the construction, test, and marking requirements covering the safety of single and multiple coaxial and coaxial/optical-fiber cables for the distribution of radio frequency signals such as employed in a community antenna television system, and for supplying low-energy power at a potential not exceeding 60 volts to equipment directly associated with the signal distribution. These are power-limited cables and are of the following types for installation and use as the CATV cables specified in Article 820 and other applicable parts of the National Electrical Code (NEC), NFPA 70. Electrically nonconductive material separates each optical-fiber member from the rest of the cable.

a) PLENUM CABLES – Type CATVP (coaxial) and Type CATVP-OF (coaxial/optical-fiber). These cables are for installation as specified in Section 820.179(A) of the National Electrical Code, ANSI/NFPA 70 in a duct, plenum, or other space used to transport environmental air without the cable being enclosed in raceway in that space.

b) RISER CABLES – Type CATVR (coaxial) and Type CATVR-OF (coaxial/optical-fiber). These cables are for installation as specified in Section 820.179(B) of the National Electrical Code, ANSI/NFPA 70 in vertical runs in a shaft or for vertical runs that penetrate more than one floor.

c) GENERAL-PURPOSE CABLES – Type CATV (coaxial) and Type CATV-OF (coaxial/optical-fiber). These cables are general-applications commercial cables for use as specified in Section 820.179(C) of the National Electrical Code, ANSI/NFPA 70.

d) LIMITED-USE CABLES – Type CATVX (coaxial) and Type CATVX-OF (coaxial/optical-fiber). These are limited use cables as specified in Section 820.179(D) of the National Electrical Code, ANSI/NFPA 70.

1.2 This Standard does not specify the impedance or other signal-carrying characteristics of these cables. This Standard does not cover tests for the signal-carrying performance of these cables.

1.3 Armored cables are covered by interlocked metal strip or a smooth or corrugated metal sheath with or without a jacket over the armor. Cables for encasement in concrete, mortar, other masonry, plaster, or the like have metal armor and a jacket over the armor. Cables for direct burial in the earth (see markings in 1.8) are subject to a 1000-pound crushing test. Cables for direct burial are not required to be armored. Cables for direct burial that are armored have a jacket over the armor. All other cables (unarmored, flat or round) have an overall jacket. Some overall jackets incorporate a nonmetallic messenger. A metallic messenger may be joined to the cable jacket by an interconnecting web.

1.4 Cables of a CATV type do not have a voltage rating.

1.5 Cables of materials that qualify for temperatures above 60°C (140°F) are marked with a temperature rating of 75, 90, 105, 125, 150, 200°C or 250°C (167, 194, 221, 257, 302, 392°F or 482°F). Temperature marking is not required for cables that qualify for a temperature rating of 60°C (140°F).

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1.6 Cables that contain one or more electromagnetic shields in addition to the outer conductors of the coaxial members (these shields are identified as ″additional″ in 9.1) are not required to be marked to indicate the presence of the additional shielding. A shielded cable that is marked has ″shielded″ on the tag and either on the overall cable jacket or legible through the jacket.

1.7 Cables that qualify for exposure to sunlight (720-hour sunlight-resistance test – see 26.1) have the designation ″sun res″ or ″sunlight resistant″ on the tag and either on the overall cable jacket or legible through the jacket.

1.8 Cables that qualify for burial directly in the earth (1000-pound crushing test – see 29.1) have the designation ″dir bur″, ″direct burial″, or ″for direct burial″ on the tag and either on the overall cable jacket or legible through the jacket.

1.9 Optical performance is not evaluated. Cables with optical fibers are to have a tag marking in accordance with 10.3 and 38.1(d). Where there are conductive parts in an optical-fiber member or in a group of such members, a tag marking [36.1(e)] indicates the presence of these parts.

1.10 These requirements do not cover antenna-rotator or other coaxial/electrical cables - that is, coaxial cables with additional conductors for electric-light, power, control, non-power-limited fire-alarm, Class 1, Class 2, or Class 3 circuits.

1.11 Smoke and flame tests are as follows for the cables covered in these requirements:

a) PLENUM CABLES – All Type CATVP and Type CATVP-OF cables are tested for smoke and flame characteristics as specified in Smoke and Flame Testing of Plenum Cables, Section 22, which references the National Fire Protection Association Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, ANSI/NFPA 262. A cable that complies exhibits a maximum flame-propagation distance that is not greater than 5 ft, 0 in or 152 cm, a peak optical density of smoke produced of 0.50 or less (32 percent light transmission), and an average optical density of smoke produced of 0.15 or less.

b) RISER CABLES – Jacketed Type CATVR and Type CATVR-OF cables are tested for flame-propagation characteristics as specified in Flame Testing of Riser Cables, Section 23, which references the Standard for Test for Flame-Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts, UL 1666. A cable that complies exhibits a flame-propagation height under 12 ft, 0 in or 366 cm and attains a temperature no higher than 850.0°F (454.4°C) at a height of 12 ft, 0 in or 366 cm.

c) GENERAL-PURPOSE CABLES – Jacketed Type CATV and Type CATV-OF cables are to comply with one of the two 70,000 Btu/h (20.5 kW) vertical-tray flame tests specified in Alternative Vertical-Tray Flame Tests of General-Purpose Cables, Section 25. The cable manufacturer is to choose one of the following tests:

1) The UL test referenced in 25.1.1 –25.3.2. These paragraphs apply the test method described as the UL Flame Exposure (smoke measurements are not applicable) in the Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables, UL 1685.

2) The FT4/IEEE 1202 test referenced in 25.1.1 and 25.4.1. These paragraphs apply the test method described as the FT4/IEEE 1202 Type of Flame Exposure (smoke measurements are not applicable) in the Standard for Vertical-Tray Fire-Propagation

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and Smoke-Release Test for Electrical and Optical-Fiber Cables, UL 1685. A cable that complies is eligible to be marked ″FT4/IEEE 1202″ or ″FT4″ on the surface or on a marker tape as indicated in 37.1(h).

d) LIMITED-USE CABLES – All Type CATVX and Type CATVX-OF cables are subjected to the VW-1 flame test specified in VW-1 (Vertical-Specimen) Flame Test of Limited-Use Cables, Section 24, which references the test method described as the VW-1 (Vertical-Specimen) Flame Test in Section 1080 of UL 1581. These cables are not marked ″VW-1″.

1.12 These requirements do not specify or test for the electrostatic/electromagnetic performance of a shield.

2 Units of Measurement

2.1 In addition to being stated in the inch/pound units that are customary in the USA, each of the requirements is also stated in units that make the requirement conveniently usable in countries employing the various metric systems (practical SI and customary). Equivalent - although not exactly identical - results are to be expected from applying a requirement in USA or metric terms. Equipment calibrated in metric units is to be used when a requirement is applied in metric terms.

3 References

3.1 Wherever the designation ″UL 1581″ is used in this wire standard, reference is to be made to the designated part(s) of the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581.

CONSTRUCTION

4 Materials

4.1 Each material used in a cable shall be compatible with all of the other materials used in the cable.

4.2 Cables of a CATV type shall comply in all respects with the applicable requirements for construction details, test performance, and markings.

5 Center Conductor of Coaxial Members

5.1 The center conductor of each coaxial member shall be round and of solid 30 – 1 AWG soft-annealed copper, of stranded 30 AWG – 500 kcmil soft-annealed copper, of solid 30 – 6 AWG medium-drawn or hard-drawn copper, of solid 30 – 6 AWG copper-clad steel, of solid 30 – 1 AWG copper-clad aluminum, or of a smooth or corrugated copper tube. A stranded conductor shall consist of round strands with a right- or left-hand direction of lay. Seven strands, concentric, is the stranding assumed in these requirements; however, individual strand diameter, the number of strands, and the stranding type are not specified. See Metal Coating of Center Conductor, Section 6.

5.2 The nominal diameters indicated in Table 5.1 for solid and stranded center conductors are to be used in calculating the dimensions needed for various parts of the cable when using Tables 15.1, 15.2, 16.1, and 16.2. The length of lay of the wires (strands) of a stranded center conductor is not specified.

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5.3 All solid, stranded, and tubular center conductors are to be identified as a particular AWG or circular-mil size in the marking on or in the cable and on the tag, reel, or carton. The size of a solid center conductor shall be verified either by determination of the d-c resistance or by determination of the diameter as described in 5.4. The size of a stranded or tubular center conductor shall be verified either by determination of the d-c resistance, as described in 5.5, or by determination of the cross-sectional area. Determination of the conductor size by measurement of the d-c resistance as described in D-C Resistance Test of Center Conductor, Section 20, is the referee method in all cases.

5.4 Where measured as the means of size verification (see 5.3), the diameter of a solid center conductor shall not be smaller than the minimum diameter indicated for the size in Table 5.1 when the diameter of the conductor is determined from measurements made as follows:

a) Measurements of the diameter of a solid conductor are to be made over the metal-coated or uncoated conductor by optical means or by means of a machinist's micrometer caliper having flat surfaces both on the anvil and on the end of the spindle. In either case, the equipment is to be calibrated to read directly to at least 0.001 in or 0.01 mm, with each division of a width that facilitates estimation of each measurement to 0.0001 in or 0.001 mm. The maximum and minimum diameters at a given point on the solid conductor are each to be recorded to the nearest 0.0001 in (0.1 mil) or 0.001 mm, added together, and divided by 2 without any rounding of the sum or resulting average.

b) Each minimum diameter indicated in Table 5.1 is an absolute minimum. The unrounded average of the two diameter readings is therefore to be compared directly with the minimum in the table for the purpose of determining whether the solid conductor does or does not comply with the diameter requirement.

5.5 Where measured as the means of size verification (see 5.3), the cross-sectional area of a stranded or tubular center conductor shall not be smaller than the minimum area indicated for the size in Table 5.1. The cross-sectional area of a stranded conductor is to be determined as the sum of the areas of its component round strands. However, where the sum of the strand areas does not comply, the conductor area is to be determined by the weight method outlined in Conductor Cross-Sectional Area by the Weight Method, Section 210 of UL 1581.

Table 5.1
Dimensions of center conductor of a coaxial member

Size of conductor	Diameter of solid conductor				Cross-sectional area of tubular or stranded conductor				Nominal diameter of stranded conductor (7 strands)	
	Nominal See 5.2		Minimum See 5.4(b) mils are 0.99 x nominal except where note [a] applies		Nominal		Minimum cmil = 0.98 xnominal			
	mils	mm	mils	mm	cmil	mm^2	cmil	mm^2	mils	mm
30 AWG	10.0	0.254	9.5[a]	0.241[a]	100	0.0507	98	0.0497	11.3	0.287
29	11.3	0.287	10.7[a]	0.272[a]	128	0.0647	125	0.0633	12.8	0.325
28	12.6	0.320	12.0[a]	0.305[a]	159	0.0840	156	0.0790	14.3	0.363
27	14.2	0.361	13.5[a]	0.343[a]	202	0.102	198	0.100	16.1	0.409
26	15.9	0.404	15.1[a]	0.384[a]	253	0.128	248	0.126	18.0	0.457
25	17.9	0.455	17.0[a]	0.432[a]	320	0.162	314	0.159	20.3	0.516

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Table 5.1 Continued

Size of conductor	Diameter of solid conductor				Cross-sectional area of tubular or stranded conductor				Nominal diameter of stranded conductor (7 strands)	
	Nominal See 5.2		Minimum See 5.4(b) mils are 0.99 x nominal except where note [a] applies		Nominal		Minimum cmil = 0.98 xnominal			
	mils	mm	mils	mm	cmil	mm^2	cmil	mm^2	mils	mm
24	20.1	0.511	19.1[a]	0.485[a]	404	0.205	396	0.201	22.8	0.579
23	22.6	0.574	21.5[a]	0.546[a]	511	0.259	501	0.254	25.6	0.650
22	25.3	0.643	24.0[a]	0.610[a]	640	0.324	627	0.318	28.7	0.729
21	28.5	0.724	27.1[a]	0.688[a]	812	0.412	796	0.404	32.3	0.820
20	32.0	0.813	30.4[a]	0.772[a]	1020	0.519	1000	0.509	36.2	0.919
19	35.9	0.912	34.1[a]	0.866[a]	1290	0.653	1264	0.641	40.7	1.03
18	40.3	1.02	40.2	1.016	1620	0.823	1588	0.807	45.6	1.16
17	45.3	1.15	44.9	1.140	2050	1.04	2009	1.02	51.3	1.30
16	50.8	1.29	50.3	1.278	2580	1.31	2528	1.28	57.6	1.46
15	57.1	1.45	56.5	1.435	3260	1.65	3195	1.62	64.7	1.64
14	64.1	1.63	63.5	1.613	4110	2.08	4028	2.04	72.7	1.85
13	72.0	1.83	71	1.81	5180	2.63	5076	2.58	81.6	2.07
12	80.8	2.05	80	2.03	6530	3.31	6399	3.24	91.5	2.32
11	90.7	2.30	90	2.28	8230	4.17	8065	4.09	103	2.62
10	101.9	2.588	101	2.56	10380	5.261	10172	5.16	116	2.95
9	114.4	2.906	113	2.88	13090	6.631	12828	6.50	130	3.30
8	128.5	3.264	127	3.23	16510	8.367	16180	8.20	146	3.71
7	144.3	3.665	143	3.63	20820	10.55	20404	10.34	164	4.17
6	162.0	4.115	160	4.07	26240	13.30	25715	13.03	184	4.67
5	181.9	4.620	180	4.57	33090	16.77	32428	16.43	206	5.23
4 AWG	204.3	5.189	202	5.14	41740	21.15	40905	20.73	232	5.89
3	229.4	5.827	227	5.77	52620	26.67	51568	26.14	260	6.60
2	257.6	6.543	255	6.48	66360	33.62	65033	32.95	292	7.42
1	289.3	7.348	286	7.27	83690	42.41	82016	41.56	332	8.43
1/0	–	–	–	–	105600	53.49	103488	52.42	372	9.45
2/0	–	–	–	–	13310	67.43	130438	66.08	418	10.62
3/0	–	–	–	–	167800	85.01	164444	83.31	470	11.94
4/0	–	–	–	–	211600	107.2	207368	105.1	528	13.41
250 kcmil	–	–	–	–	250 kcmil	127	245	124.1	575	14.61
300	–	–	–	–	300	152	294	149.0	630	16.00
350	–	–	–	–	350	177	343	173.8	681	17.30
400	–	–	–	–	400	203	392	198.6	728	18.49

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Table 5.1 Continued

Size of conductor	Diameter of solid conductor				Cross-sectional area of tubular or stranded conductor				Nominal diameter of stranded conductor (7 strands)	
	Nominal See 5.2		Minimum See 5.4(b) mils are 0.99 x nominal except where note [a] applies		Nominal		Minimum cmil = 0.98 xnominal			
	mils	mm	mils	mm	cmil	mm^2	cmil	mm^2	mils	mm
450	–	–	–	–	450	228	441	223.5	772	19.61
500	–	–	–	–	500	253	490	248.3	813	20.65

[a] Minimum diameter (0.95 x nominal) of a reduced-diameter solid conductor. See corresponding resistance (1.1 x nominal) in Table 20.1.

5.6 Each center and outer conductor and each shield shall be continuous throughout the entire length of the finished cable as determined by the Continuity Test of Center and Outer Conductors and Shields, Section 19.

5.7 A joint in a solid center conductor or in one of the individual wires of a stranded center conductor shall be made in a workmanlike manner, shall be smooth, and shall not have any sharp projections. A joint in a stranded conductor is to be made by separately joining each individual wire or by machine brazing or welding of the conductor as a whole so that the resulting solid section of the stranded conductor is not longer than 1/2 in or 13 mm, there are no sharp points, and the distance between brazes or welds in a single conductor does not average less than 3000 ft or 915 m in any reel length of insulated single conductor. A joint made before insulation is applied to a center conductor shall not increase the diameter of the solid conductor or individual wire (strand). A joint made after insulating shall not increase the diameter of the solid conductor or individual wire (strand) by more than 20 percent. Joints made after insulating shall be insulated by applying a bonded patch or by molding. The insulation shall comply with the requirements in this Standard. An individual member jacket or an overall cable jacket that is damaged to the point of exposing the underlying assembly or that is opened for the purpose of making any repair under the jacket either shall be stripped and replaced in its entirety or a second, duplicate jacket shall be applied over the first for the entire length of the member or cable. The total thickness of the two jackets shall not exceed any limitation determined for a particular cable in an applicable flame or smoke-and-flame test or other test specified in this Standard.

5.8 Any section of a center conductor that includes a factory joint shall have a tensile strength that is not less than 85 percent of the tensile strength of an adjacent section of the conductor not having a joint.

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6 Metal Coating of Center Conductor

6.1 Where the insulation adjacent to the copper center conductor or copper cladding on the steel or aluminum center conductor is of a material that corrodes unprotected copper in the test described in Conductor Corrosion, Section 500 of UL 1581, the copper conductor or copper cladding shall be covered with a coating of tin, a tin/lead alloy, nickel, silver, or of another (evaluation required) metal or alloy.

6.2 Use of a metal coating is not specified on a solid center conductor or the individual wires (strands) of a stranded center conductor on which a coating is not required for corrosion protection. The metal coating shall be on both the inside and outside of the copper tube when the metallic coating is used to increase the temperature rating of the conductor.

6.3 The maximum temperature rating of the cable is not specified relative to the small-diameter copper wires used in the outer conductor. The temperature rating of a cable in which the center conductor is of copper, copper tube, or copper-clad steel shall not exceed the temperature indicated in Table 6.1 for the diameter and coating of the solid conductor or individual strands (see 15.3.1 regarding application of Table 6.1). The temperature rating of a cable in which the center conductor is aluminum shall not exceed 90°C.

6.3 effective April 1, 2010

Table 6.1
Maximum temperature rating of cable relative to diameter and coating of solid copper center conductor or of copper center-conductor strands

Metal coating of copper strands or of solid copper conductor or tube, or copper-clad steel conductor	Diameter of each strand or of the solid conductor or thickness of copper tube	
	Smaller than 0.015 inch or 0.38 mm	At least 0.015 inch or 0.38 mm
Uncoated or coated with tin or a tin/lead alloy	150°C (302°F)	200°C (392°F)
Coated with silver	200°C (392°F)	200°C (392°F)
Coated with nickel	over 200°C (392°F)	over 200°C (392°F)

7 Insulation

7.1 Material and application

7.1.1 The center conductor of each coaxial member shall be insulated for its entire length. An air-gap dielectric shall be permitted. The insulation material is not specified. The insulation shall be solid or expanded (foamed) with or without a solid dielectric skin (a thin, solid, extruded layer that is or is not separable) applied over the solid or foamed insulation. A skin is not required to be of the same material as the insulation. An air-gap coaxial member shall consist of a solid spacer (thread) that has a nominally circular cross section and is applied to the center conductor helically in a continuous length (the length and direction of lay are not specified) with or without a solid insulating tube overall. Otherwise, the insulation shall be applied directly to the center conductor, shall have a circular cross section, and shall fit tightly to the conductor with no more than nominal adherence (a test is not specified). The insulation shall be uniform and shall not have any defects (bubbles, open spots, rips, tears, cuts, or foreign material) that are visible with normal or corrected vision without magnification.

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7.1.2 Neither flexibility nor physical properties testing is specified for 60°C (140°F) insulation. Flexibility or physical properties testing in accordance with 7.1.3 – 7.1.5 is required for all insulations rated 75°C (167°F) or greater.

7.1.3 Specimens of solid single-layered insulations removed from finished insulated conductors shall comply with the values of unaged elongation and tensile strength shown in the applicable physical-properties table for the material referenced in Section 50 of UL 1581, and when tested in accordance with the test procedures in UL 1581. Specimens of solid single-layered insulations except PVDF rated 125°C shall comply with the values of aged retention of elongation and tensile strength shown in the applicable physical-properties table for the material referenced in Section 50 of UL 1581, and when tested in accordance with the test procedures in UL 1581. PVDF rated 125°C, foamed, and multi-layered insulations shall comply with 7.1.4.

7.1.4 Solid or foamed 125°C (257°F) PVDF and PVDF copolymer insulations with or without a skin and other insulations with a skin shall comply with the flexibility test in 15.2 (conditioning per Table 50.185 of UL 1581) using specimens consisting of the insulated center conductor and wound onto a mandrel having a diameter equal to the diameter over the insulation (1 x OD). Solid or foamed 150°C (302°F) PVDF and PVDF copolymer insulations without a skin and all other solid insulations without a skin shall comply with the tensile strength and ultimate elongation requirements for unaged and aged specimens of the particular material in the applicable table of physical properties in Specific Materials, Section 50 of UL 1581. All specimens are to be prepared from samples taken from the finished cable.

7.1.5 Insulation that is of material generically different from any insulation material for which there is a table of physical properties in Specific Materials, Section 50 of UL 1581 (new material), or that is of material for which physical properties are tabulated in UL 1581 yet does not comply with the applicable short-term tests in the UL 1581 table, shall be of a material and in thicknesses and with a temperature rating appropriate for a CATV-series cable. The material shall be evaluated for the requested temperature rating as described in Long-Term Aging, Section 481 of UL 1581. Investigation of the electrical, mechanical, and physical characteristics of the cable using either material shall show the material to be comparable in performance to the insulation materials in UL 1581 through tests such as crushing, impact, abrasion, deformation, heat shock, and dielectric voltage-withstand.

7.2 Thicknesses

7.2.1 General

7.2.1.1 The dimensions of the spacer (thread) portion of the material insulation in an air-gap coaxial member are not specified. The average thickness and the minimum thickness at any point of solid or foamed insulation on the center conductor of a coaxial member are not specified but the thicknesses used shall be measured. The thicknesses used shall be adequate to result in compliance with the tests specified or referenced in this Standard. The thicknesses of solid and foamed insulations (including any skin) are to be determined by means of measurements made as described in Thicknesses of Insulation on Flexible Cord and on Fixture Wire, Section 250 of UL 1581, with the following modifications for a stranded conductor that leaves one or more strand impressions in the insulation that are too small to accommodate the smaller pin referred to in 250.11 of UL 1581. For this application, the pin is to be 0.0200 in (20.0 mils) or 0.508 mm in diameter:

a) The 0.003-in (3-mil) or 0.08-mm thickness-reduction allowance in 250.5 of UL 1581 is to be applied only to insulation that is from a stranded center conductor that leaves the impressions described above in this paragraph and has an average thickness (including any skin) of at least 0.015 in or 0.38 mm.

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b) Only an optical method as applicable from 7.2.1.2 and 7.2.1.3 is to be used for thickness measurements of insulation that is from a stranded center conductor that leaves the impressions described above in this paragraph and has an average thickness (including any skin) less than 0.015 in or 0.38 mm.

7.2.1.2 A simply manipulated optical device that is accurate to 0.001 in (1 mil) or 0.01 mm is to be used for measuring the insulation, with each measurement recorded to the nearest 0.001 in or 0.01 mm.

7.2.1.3 The center conductor is to be removed from the insulation before measuring the thicknesses of the insulation as discussed in 7.2.1.1(b). A thin slice of the insulation plus any skin is then to be cut perpendicular to the longitudinal axis of the resulting hollow tube. Measurements are to be made of the maximum and minimum wall thicknesses of the slice. The recorded maximum and minimum thicknesses are to be added together and then divided by 2 without any rounding of the sum. The resulting average is to be rounded (see 7.2.2.1 - 7.2.5.1, which apply the American Society of Testing and Materials Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications, ASTM E 29) to the same degree as stated in 7.2.1.2 for the recorded measurements. The average thickness so determined and the recorded minimum thickness are to be taken as the average and minimum-at-any-point thicknesses that are established for the construction as the result of the Crushing Resistance Test of Center-Conductor Insulation, Section 28.

7.2.2 Rounding to the nearest 0.0001 inch

7.2.2.1 A figure in the fourth decimal place is to remain unchanged where the figure in the fifth decimal place is 0 - 4 and the figure in the fourth decimal place is odd or even, or where the figure in the fifth decimal place is 5 and the figure in the fourth decimal place is even (0, 2, 4, and so forth). A figure in the fourth decimal place is to be increased by 1 where the figure in the fifth decimal place is 6 - 9 and the figure in the fourth decimal place is odd or even, or where the figure in the fifth decimal place is 5 and the figure in the fourth decimal place is odd (1, 3, 5, and so forth).

7.2.3 Rounding to the nearest 0.001 inch

7.2.3.1 A figure in the third decimal place is to remain unchanged where the figure in the fourth decimal place is 0 - 4 and the figure in the third decimal place is odd or even, or where the figure in the fourth decimal place is 5 and the figure in the third decimal place is even (0, 2, 4, and so forth). A figure in the third decimal place is to be increased by 1 where the figure in the fourth decimal place is 6 - 9 and the figure in the third decimal place is odd or even, or where the figure in the fourth decimal place is 5 and the figure in the third decimal place is odd (1, 3, 5, and so forth).

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