

UL 719

ISBN 0-7629-1151-4

Nonmetallic-Sheathed Cables

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Underwriters Laboratories Inc. (UL)
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UL Standard for Safety for Nonmetallic-Sheathed Cables, UL 719

Twelfth Edition, Dated February 9, 2006

SUMMARY OF TOPICS

1. Revision of UL 719 to Reference the Correct Physical Properties Requirements in UL 1581 for PVC Jacket Material for Type NM Cable

The following table lists the future effective dates with the corresponding reference.

Future Effective Dates	References
February 9, 2007	Paragraphs 1.2, 14.1, and 25.14.

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Text that has been changed in any manner 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 new and revised requirements are substantially in accordance with UL's Proposal(s) on this subject dated October 12, 2006 and November 24, 2006.

The revisions dated January 9, 2007 include a reprinted title page (page1) for this Standard.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

As indicated on the title page (page1), this UL Standard for Safety has been adopted by the Department of Defense.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net.ul.com/ulforeword.html>

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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This Standard consists of pages dated as shown in the following checklist:

Page	Date
1	January 9, 2007
2-5	August 2, 2006
6-8	February 9, 2006
9-10	August 2, 2006
11	February 9, 2006
12-12B	January 9, 2007
13-14	February 9, 2006
15-16	August 2, 2006
17-22	February 9, 2006
23	August 2, 2006
24	February 9, 2006
25	August 2, 2006
26	February 9, 2006
27	August 2, 2006
28-36	February 9, 2006
SR1-SR2	February 9, 2006

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FEBRUARY 9, 2006

(Title Page Reprinted: January 9, 2007)



ANSI/UL 719-2007

1

UL 719

Standard for Nonmetallic-Sheathed Cables

First Edition – April, 1927
Second Edition – July, 1933
Third Edition – September, 1937
Fourth Edition – July, 1941
Fifth Edition – February, 1957
Sixth Edition – August, 1968
Seventh Edition – June, 1974
Eighth Edition – November, 1979
Ninth Edition – August, 1985
Tenth Edition – July, 1996
Eleventh Edition – March, 2002

Twelfth Edition

February 9, 2006

The most recent designation of ANSI/UL 719 as an American National Standard (ANSI) occurred on January 3, 2007.

This ANSI/UL Standard for Safety, which consists of the Twelfth Edition with revisions through January 9, 2007 is under continuous maintenance, whereby each revision is ANSI approved upon publication.

The Department of Defense (DoD) has adopted UL 719 on June 7, 1985. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements. 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	4
2 Units of Measurement	4
3 References	6

CONSTRUCTION

4 General	6
5 Conductors	7
6 Insulation	7
7 Protective Sheath in Type NM Cable	8
8 Assembly	8
8.1 General	8
8.2 Circuit conductors	9
8.3 Grounding conductor	10
8.4 Fillers	11
9 Overall Thermoplastic Jacket	12
9.1 General	12

PERFORMANCE

10 Separability Test of Cable Parts	15
11 Continuity Test of Conductors	15
12 Vertical Flame Test	16
13 Vertical-Tray Flame Test	16
14 Vertical-Tray Fire-Propagation and Smoke-Release Test	17
15 Tray-Cables Sunlight-Resistance Test	17
16 Dielectric Voltage-Withstand Test	17
17 Tension and Elongation Test	18
18 Unwinding Tests at Low Temperature	20
18.1 General	20
18.2 Preparation of specimens	20
18.3 Test equipment	20
18.4 Conduct of the test	22
18.5 Results	22
19 Conductor Pullout Test	22
20 Crushing Resistance Test for Flat Cable	23
20.1 General	23
20.2 Flatwise	23
20.3 Edgewise	24
21 Crushing Resistance Test for Round Cable	25
22 Abrasion Resistance Test of Jacket on Flat Cable	25
23 Pulling-Through-Joists Test	27
24 Flow Test	31

MARKINGS

25 Details	32
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INTRODUCTION

1 Scope

1.1 These requirements cover nonmetallic-sheathed cables containing 2 – 4 thermoplastic-insulated circuit conductors, with a grounding conductor, in the constructions indicated in Table 1.1. These cables are intended for use in accordance with Article 334 and other applicable parts of the National Electrical Code (NEC), ANSI/NFPA 70. Type NMC cable is for use in dry, moist, damp, and corrosive locations, and Type NM cable is for use in normally dry locations. Both types carry the suffix letter “-B” to designate the use of conductors with 90°C insulation.

1.2 A cable to which the designation “ST1” (signifying “limited smoke”) is applied as a type-letter suffix complies with the test criteria for smoke release and for cable damage height stated in the Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables, UL 1685.

1.2 effective February 9, 2007

Table 1.1
Cables covered in this standard

Type	Construction	Number of circuit conductors	Size of circuit conductors
NMC	flat	2 or 3	14 – 10 AWG copper or 12 – 10 AWG aluminum or copper-clad aluminum
NM	flat	2	14 – 2 AWG copper or 12 – 2 AWG aluminum or copper-clad aluminum
	round	2, 3, or 4	14 – 2 AWG copper or 12 – 2 AWG aluminum or copper-clad aluminum

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 in this standard 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 necessarily 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.

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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.

3.2 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

4 General

4.1 Only materials that are acceptable for the particular use shall be employed in a cable.

4.2 A cable shall be one of the following types and shall comply in all respects with the applicable requirements for construction details, test performance, and marking.

4.3 Type NMC cable is required to comply with a flame test and to be resistant to moisture, fungi, and corrosion and also to have some degree of inherent protection against mechanical abuse.

4.4 Type NM cable is required to comply with a flame test, to be resistant to moisture, and to have some degree of inherent protection against mechanical abuse.

4.5 Each of the materials used for the insulation, spacers, fillers, jacket, and other nonmetallic parts of a Type NMC cable shall be resistant to fungi, moisture, and corrosion.

4.6 Polypropylene, PVC, and glass are known to be resistant to fungi and hence, are acceptable in this respect without exposure tests. Tests to determine the degree of resistance to fungi are to be made as indicated in the American Society for Testing and Materials (ASTM) the Standard for Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi, ASTM G 21, on materials not known to have the requisite property. Cotton, paper, jute, hemp, and the like are not acceptable in the construction of Type NMC cable.

4.7 The requirement in 4.5 that the insulation used in the construction of a Type NMC cable be resistant to moisture is intended to indicate that the insulation be acceptable for use where it is only occasionally and temporarily exposed to dampness or wetness. It is not intended that the insulation be for use in wet locations.

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5 Conductors

5.1 Only soft-annealed copper, copper-clad aluminum, or an acceptable aluminum alloy shall be used for the conductor or conductors in a cable. Soft-annealed copper shall comply with the Standard Specification for Soft or Annealed Copper Wire, ASTM B 3. Solid aluminum conductors in size 12 – 8 AWG shall comply with the requirements for aluminum-wire stock (aluminum-alloy conductor material). All other aluminum conductors shall comply with Requirements for Aluminum Conductors of an 8000 Series Alloy, Section 10 in UL 1581. Copper-clad aluminum conductors shall comply with Requirements for Copper-Clad Aluminum Conductors, Section 11 in UL 1581. In a given cable, all conductors shall be of the same metal.

5.2 A copper circuit conductor shall not be smaller than 14 AWG and shall not be larger than 2 AWG. An aluminum or copper-clad aluminum circuit conductor shall not be smaller than 12 AWG and shall not be larger than 2 AWG.

5.3 An 8 AWG or larger circuit conductor and a 6 AWG or larger grounding conductor shall be stranded. Conductors shall comply with the requirements in Clause 4.1 of the Standard for Thermoplastic-Insulated Wires and Cables, UL 83 except as modified in this Section.

5.4 A joint in a solid conductor or in one of the individual wires of a stranded conductor shall be made in a workmanlike manner and shall not increase the diameter of the solid conductor, the individual wire strand, or the overall stranded conductor. A joint shall not be made in a stranded conductor as a whole but shall be made by separately joining each individual wire. A joint shall be made only before coverings, if any, are applied to an insulated conductor. The insulation applied to such joints shall be equivalent to that removed and, if of PVC, shall have insulation-resistance ($K = 4000$ at 15.6°C or 60.0°F) and dielectric-withstand characteristics complying with the requirements for the thermoplastic-insulated wire.

6 Insulation

6.1 Both before and after assembly into finished cable, the insulation employed on the circuit conductors shall comply with (a) or (b):

a) THHN Construction – Jacketed insulation for a Type NM or NMC cable shall have a nylon or similar jacket and shall comply with the thickness and other applicable requirements for Type THHN thermoplastic-insulated wire without (see 25.18) any surface marking of "THHN", "-B", or any ampacity or temperature rating.

b) TW Construction – Insulation without a nylon jacket shall comply with the thickness requirements for a Type TW thermoplastic-insulated wire. The insulation material shall comply with (1) or (2):

1) For TYPE NM or Type NMC Cable – The insulation material shall be a dry-location PVC that complies with the requirements for Type THHN insulation without any surface marking of the ampacity or temperature rating (the surface marking "-B" is optional on the insulation). The tensile strength and elongation are to comply with Table 50.155 of UL 1581. The deformation test is to be conducted at $121.0 \pm 1.0^{\circ}\text{C}$ ($249.8 \pm 1.8^{\circ}\text{F}$) with a decrease of not more than 50 percent in the thickness of the PVC insulation.

2) For TYPE NM only – Type NM is eligible to use a thermoplastic insulating material other than PVC. The performance and ratings of the material as insulation shall be determined by investigation and shall be:

i) Electrically comparable to the PVC insulation in Type THHN wire, and

ii) Mechanically comparable to the nylon or similarly jacketed PVC insulation of Type THHN wire, and

iii) In accordance with Table 50.144 of UL 1581.

6.2 The grounding conductor shall be bare or shall be insulated (with or without a nylon jacket) in compliance with 6.1 and 8.3.1.

6.3 An insulation or jacket that is of material generically different from any insulation or jacket material specified in 6.1 or 9.1.1 for the construction (new material), or that is of material specified in 6.1 or 9.1.1 yet does not comply with the short-term tests applicable to the insulation or jacket material, shall be of a material and in thicknesses and with the temperature rating required for the specific nonmetallic-sheathed cable type. 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 the material shall show the material to be comparable in performance to the insulation or jacket material specified in 6.1 or 9.1.1 for the required temperature rating. The investigation shall include tests such as crushing, impact, abrasion, deformation, heat shock, insulation resistance, and dielectric voltage-withstand.

7 Protective Sheath in Type NM Cable

7.1 Except for cable on which a 30-mil or 0.76-mm jacket is used, a continuous, tight-fitting, protective sheath (not the nylon or similar jacket on a Type THHN conductor) of tough, nonmetallic material shall cover either the insulation on each circuit conductor or the entire assembly of insulated conductors and (if any) the spacer, grounding conductor, or both in Type NM cable. The character, shape, and dimensions of the material used and the manner of application shall not damage the insulation either during manufacture of the cable or during the unwind test on the cable (see 18.1.1 – 18.5.2).

8 Assembly

8.1 General

8.1.1 At least two but not more than four circuit conductors shall be used in a Type NM cable. Two or three circuit conductors shall be used in a Type NMC cable. In a given cable all of the circuit conductors shall be of the same size.

8.1.2 One grounding conductor shall be used in every cable.

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