C22.2 No. 38-18
National Standard of Canada

Thermoset-insulated wires and cables

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Revision History

C22.2 No. 38-18, Thermoset-insulated wires and cables — originally published January 2018

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Update No. 1 — May 2021	**Revision symbol (in margin)**
Title page, copyright page, preface, Clause 6.1.5, and Table 49 **Note:** *Only the revised pages have been provided.*	|

Standard for Safety for Thermoset-Insulated Wires and Cables

Eleventh Edition, Dated January 9, 2018

Summary of Topics

This revision of ANSI/UL 44 dated May 14, 2021 includes a Modification of Requirements for Conductor Stranding Marking on Product; 6.1.5 and Table 49

Association of Standardization and Certification
NMX-J-451-ANCE-2018
Sixth Edition

CSA Group
CSA C22.2 No. 38-18
Eleventh Edition

Underwriters Laboratories Inc.
UL 44
Ninteenth Edition

Thermoset-Insulated Wires and Cables

January 9, 2018

(Title Page Reprinted: May 14, 2021)

ANSI/UL 44-2021

Commitment for Amendments

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This ANSI/UL Standard for Safety consists of the Nineteenth Edition including revisions through May 14, 2021. The most recent designation of ANSI/UL 44 as an American National Standard (ANSI) occurred on May 14, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

The Department of Defense (DoD) has adopted UL 44 on April 5, 1985. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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 https://csds.ul.com.

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PREFACE

This is the harmonized ANCE, CSA Group, and UL standard for Thermoset-Insulated Wires and Cables. It is the Sixth edition of NMX-J-451-ANCE, the Eleventh edition of CSA C22.2 No. 38, and the Nineteenth edition of UL 44. This edition of NMX-J-451-ANCE supersedes the previous edition published in March 28, 2014. This edition of CSA C22.2 No. 38 supersedes the previous edition published in March 28, 2014. This edition of UL 44 supersedes the previous edition published in March 28, 2014. This harmonized standard has been jointly revised on May 14, 2021. For this purpose, CSA Group and UL are issuing revision pages dated May 14, 2021, and ANCE is issuing a new edition dated May 14, 2021.

This harmonized standard was prepared by the Association of Standardization and Certification, (ANCE), CSA Group and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee for Electrical Wires and Cables, of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA), are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

The present Mexican Standard was developed by the CT 20 Conductores from the Comite de Normalizacion de la Asociacion de Normalizacion y Certificacion, A.C., CONANCE, with the collaboration of the SC 20B Conductores para Baja Tensión.

This standard was reviewed by the CSA Integrated Committee on Fixed Installation Wires and Cables, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of this standard to judge its suitability for their particular purpose.

Level of Harmonization

This standard uses the IEC format but is not based on, nor is it considered equivalent to, an IEC standard.

This standard provides requirements for insulated wires and cables for use in accordance with the electrical installation codes of Canada, Mexico, and the United States. At present there is no IEC standard for wires and cables for use in accordance with these codes. Therefore, this standard does not employ any IEC standard for base requirements.

This standard is published as an equivalent standard for ANCE, CSA Group and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic,

In the United States, items (a), (b), (c), (d), (e) and (f) apply.

The use of either a comma or a period signifies a decimal. For printing on products, the use of "mm2" in place of "mm^2" shall be allowed.

The nominal cross-sectional area in square millimeters shall be as shown in Table 5.

6.1.5 Conductor stranding

A wire or cable employing stranded conductors that are more finely stranded than Class B or C stranding (including Class B and Class C compact) shall be marked with the conductor class or classes. For conductor class, refer to 4.1. For the number of strands on Class B or C conductors, see Table 49.

Note: A wire or cable employing SIW or combination unilay stranding need not be marked.

6.1.6 Aluminum conductors

6.1.6.1 AA 8000 conductors shall be marked "AL". The additional marking "AA 8000" or "AA 8000" shall be optional.

6.1.6.2 Conductors of 1350 aluminum alloy shall be marked "AL 1350".

6.1.7 Compact copper conductors

In the United States, compact-stranded copper conductors shall be marked "Compact Copper" or "Compact Cu" or "Cmpct Cu" after the conductor size.

In Canada and Mexico, this requirement does not apply.

6.1.8 Voltage marking

A wire or cable shall be marked with its voltage rating(s), using "V", "volts", or "VOLTS".

6.1.9 Low-temperature marking (optional)

A wire or cable complying with the requirements for minus 40°C cold bend and cold impact specified in 5.11 may be marked "(-40°C)".

6.1.10 Flame test marking (optional)

6.1.10.1 General

Insulated conductors with the following markings shall have met the requirements of the corresponding clause:

a) "FT1": 5.14.3 applies;

b) "FV2" or "VW-1": 5.14.4 applies;

c) "CT": 5.14.5 or 5.14.6 applies (see 6.1.10.2 for applicability);

Table 47 Continued

Conductor size		For insulation thickness in accordance with Table 17									
		EP, EPCV, XL		CP, CPE		SBR/IIR		Composite EP, XL, or EPCV inner with EPCV, XL, CP, CPE outermost		Silicone or silicone composite	
mm^2	AWG or kcmil	GΩ·m	MΩ·10-00 ft	GΩ·m	MΩ·10-00 ft	GΩ·m	MΩ·10-00 ft	GΩ·m	MΩ·10-00 ft	GΩ·m	MΩ·10-00 ft
811	1600	230	760	20	75	90	305	335	1100	95	[illegible]
861	1700	225	740	20	74	90	295	325	1070	90	[illegible]
887	1750	220	730	20	70	90	290	320	1055	90	300
912	1800	220	720	20	70	90	290	315	1040	[illegible]	300
963	1900	215	705	20	70	85	280	310	1020	90	300
1010	2000	210	685	20	70	85	275	300	990	85	290

[a] See Table 20 for acceptable insulation.

Table 48
Thickness of overall jacket on deep-well water pump cable

(See 7.2.4 and 7.2.6.2)

Calculated diameter of cable under jacket		Thickness of jacket			
		Minimum average		Minimum at any point	
mm	inch	mm	mils	mm	mils
Up to 17.8	Up to 0.700	1.14	45	0.91	36
17.9 – 26.7	0.701 – 1.051	1.52	60	1.21	48
26.8 – 38.1	1.052 – 1.500	2.03	80	1.62	64
38.2 – 50.1	1.501 – 1.972	2.41	95	1.93	76
50.2 – 76.2	1.973 – 3.000	2.79	110	2.23	88
76.3 and larger	3.001 and larger	3.18	125	2.54	100

Note: *For flat cable, the calculated major core dimension under the jacket shall be used to determine the jacket thickness required.*

Table 49
Conductor stranding

(See Clause 6.1.5.)

Conductor size		Number of strands					
		Copper		Aluminum		Copper-clad aluminum	
mm²	(AWG or kcmil)	Class B	Class C	Class B	Class C	Class B	Class C
8.08 – 33.6	(14 – 2)	7	19	7[a]	19[a]	7[a]	19[a]
42.4 – 107	(1 – 4/0)	19	37	19	37	19	37
127 – 253	(250 – 500)	37	61	37	61	37	61
304 – 507	(600 – 1000)	61	91	61	91	61	91
633 – 760	(1250 – 1500)	91	127	–	–	–	–

Table 49 Continued on Next Page

Table 49 Continued

Conductor size		Number of strands					
		Copper		Aluminum		Copper-clad aluminum	
mm^2	(AWG or kcmil)	Class B	Class C	Class B	Class C	Class B	Class C
887 – 1010	(1750 – 2000)	127	169	–	–	–	–

[a] Aluminum and copper-clad aluminum 14 AWG (2.08 mm^2) are not available.

Note: In Canada and Mexico, copper-clad aluminum conductors shall not be used in thermoset-insulated wires and cables.

Standards Update Service

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Title: *Thermoset-insulated wires and cables*

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Thermoset-insulated wires and cables

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CONTENTS

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Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

Thermoset-Insulated Wires and Cables

1 Scope

1.1 This Standard specifies the requirements for single-conductor and multiple-conductor thermoset-insulated wires and cables rated 600 V, 1000 V, 2000 V, and 5000 V, for use in accordance with the rules of the Canadian Electrical Code, Part I, CSA C22.1, in Canada, Standard for Electrical Installations, NOM-001-SEDE, in Mexico, and the National Electrical Code (NEC), NFPA 70, in the United States of America.

See Annex A for the complete list of types and voltage ratings covered by this Standard and the specific electrical codes for which they are intended, and Annex B for a summary of construction and test requirements for these types.

1.2 Table 1 provides a summary of the maximum conductor temperature, voltage ratings, and the number of insulated conductors for the types to which this Standard applies.

1.3 This Standard also specifies the requirements for submersible pump cables, with or without jackets, in Deep Well Submersible Water-Pump Cable, Section 7. No type-letter designations are assigned to these cables.

1.4 Products within this Standard might have applications not covered by the electrical codes listed in 1.1.

2 General

2.1 Units of measure

Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2 Reference publications

Where reference is made to any Standards, such reference shall be considered to refer to the latest editions and revisions thereto available at the time of printing, unless otherwise specified.

Secretary of Energy

NOM-001-SEDE,
Standard for Electrical Installations

ANCE Standards

NMX-J-008-ANCE,
Tinned Soft or Annealed Copper Wire for Electrical Purposes – Specifications

NMX-J-012-ANCE,
Wires and Cables – Concentric Lay Stranded Copper Conductors for Electrical Purposes – Specifications

NMX-J-013-ANCE,
Wires and Cables – Rope Lay Stranded Copper Conductors Having Concentric Stranded Members for Electrical Purposes – Specifications