UL 83

Thermoplastic-Insulated Wires and Cables

UL Standard for Safety for Thermoplastic-Insulated Wires and Cables, UL 83

Sixteenth Edition, Dated July 28, 2017

Summary of Topics:

This revision of ANSI/UL 83 dated April 10, 2020 includes the modification of Requirements for Conductor Stranding Marking on Product; 6.1.5, Table 42

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.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated December 20, 2019.

No Text on This Page

Association of Standardization and Certification
NMX-J-010-ANCE-2017
Sixth Edition

CSA Group
CSA C22.2 No. 75-17
Eleventh Edition

Underwriters Laboratories Inc.
UL 83
Sixteenth Edition

Thermoplastic-Insulated Wires and Cables

July 28, 2017

(Title Page Reprinted: April 10, 2020)

Approved American National Standard

ANSI/UL 83-2020

Commitment for Amendments

This standard is issued jointly by the Association of Standardization and Certification (ANCE), the Canadian Standards Association (operating as "CSA Group"), and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to ANCE, CSA Group, or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of ANCE, CSA Group, and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue. ANCE will incorporate the same revisions into a new edition of the standard bearing the same date of issue as the CSA Group and UL pages.

ISBN 978-1-4883-0433-0 © 2017 Canadian Standards Association

This Standard is subject to review withinin five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup. org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

To purchase CSA Group Standards and related publications, visit CSA Group's Online Store at store.csagroup.org or call toll-free 1-800-463-6727 or 416-747-4044.

This ANSI/UL Standard for Safety consists of the Sixteenth Edition including revisions through April 10, 2020. The most recent designation of ANSI/UL 83 as an American National Standard (ANSI) occurred on April 10, 2020. 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 83 on February 27, 1984. 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.

To purchase UL Standards, visit UL's Standards Sales Site at http://www. shopulstandards. com/HowToOrder.aspx or call toll-free 1-888-853-3503.

CONTENTS

TABLES

No Text on This Page

PREFACE

This is the harmonized ANCE, CSA Group, and UL Standard for Thermoplastic-Insulated Wires and Cables. It is the Sixth edition of NMX-J-010-ANCE, the Eleventh edition of CAN/CSA-C22.2 No. 75, and the Sixteenth edition of UL 83. This edition of NMX-J-010-ANCE supersedes the previous edition published March 28, 2014. This edition of CAN/CSA-C22.2 No. 75 supersedes the previous edition published March 28, 2014. This edition of UL 83 supersedes the previous edition published March 28, 2014. This harmonized standard has been jointly revised on April 10, 2020. For this purpose, CSA Group and UL are issuing revision pages dated April 10, 2020, and ANCE is issuing a new edition dated April 10, 2020.

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 Cable, 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.

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 the 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 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, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

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.

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.

Thermoplastic-Insulated Wires and Cables

1 Scope

1.1 This Standard specifies the requirements for 600 V single-conductor, thermoplastic-insulated wires and cables, for use as follows:

a) In Canada, in accordance with CSA C22.1, *Canadian Electrical Code (CE Code)*, *Part I;*

b) In Mexico, in accordance with NOM-001-SEDE, *Standard for Electrical Installations;* and

c) In the United States, in accordance with ANSI/NFPA 70, *National Electrical Code (NEC)*.

Note: See Annex A for the complete list of wire types and voltage ratings covered by this Standard and the specific electrical codes for which they are intended.

1.2 This Standard also specifies the requirements for submersible-pump cables, with or without jackets (see Section 7). No type-letter designations are assigned to these cables.

1.3 In Mexico, the requirements for multiple-conductor thermoplastic-insulated and -jacketed cables rated 600 V are specified in Annex B.

In Canada and the United States, requirements for multiple-conductor thermoplastic-insulated and -jacketed cables are covered in other standards.

1.4 Products for which this Standard provides requirements might have applications not described in the electrical codes listed in Clause 1.1.

2 General

2.1 Units of measure

Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information. This applies to all values with the exception of conductor size.

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 Conductors – Specifications

NMX-J-014-ANCE,
Wires and Cables – Rope Lay Stranded Copper Conductors Having Bunch Stranded Members for Electrical Applications

NMX-J-036-ANCE,
Soft or Annealed Copper Wire for Electrical Purposes – Specifications

NMX-J-040-ANCE,
Determination of Moisture Absorption in Insulations and Jackets of Electrical Conductors – Test Method

NMX-J-066-ANCE,
Determination of Diameters on Electrical Conductors – Test Method

NMX-J-093-ANCE,
Wire and Cables – Determination of the Resistance to Fire Propagation on Electrical Conductors – Test Methods

NMX-J-177-ANCE,
Determination of Thickness of Semiconductive Shielding, Insulations, and Jackets of Electrical Conductors – Test Method

NMX-J-178-ANCE,
Ultimate Strength and Elongation of Insulation, Semiconductive Shielding and Jackets of Electrical Conductors – Test Method

NMX-J-186-ANCE,
Accelerated Aging in Forced-Convection Ovens of Semiconductive Shielding, Insulations and Jackets of Electrical Conductors – Test Method

NMX-J-189-ANCE,
Electrical Products – Wires and Cables – Room Temperature Flexibility Test for PVC Insulated Electrical Conductors – Test Method

NMX-J-190-ANCE,
Heat Shock Resistance of PVC Insulations and Protective Coverings of Electrical Conductors – Test Method

NMX-J-191-ANCE,
Heat Distortion of Semiconductive Shielding, Insulations and Protective Coverings of Electrical Conductors – Test Method

NMX-J-192-ANCE,
Flame Test on Electrical Wires – Test Method

NMX-J-193-ANCE,
Cold Bend of Thermoplastic Insulation and Protective Jackets, Used on Insulated Wire and Cable – Test Method

NMX-J-194-ANCE,
Wires and Cables – Oil Immersion Aging for Insulations and Jackets of Electrical Conductors – Test Method

NMX-J-212-ANCE,
Electrical Resistance, Resistivity and Conductivity – Test Method

NMX-J-293-ANCE,
Wires and Cables – Alternating Current and Direct Current Dielectric Voltage Withstand – Test Method

NMX-J-294-ANCE,
Insulation Resistance – Test Method

NMX-J-297-ANCE,
Wires and Cables – Flexible Cords Copper Conductors for Electrical and Electronic Applications – Specifications

NMX-J-472-ANCE,
Electrical Products – Wires and Cables – Determination of the Amount of Halogen Acid Gas Evolved During the Controlled Combustion of Polymeric Materials Taken from Electrical Cables – Test Method

NMX-J-473-ANCE,
Wires and Cables – Spark Test – Test Method

NMX-J-474-ANCE,
Electrical Products – Wires and Cables – Determination of Specific Optical Density of Smoke Generated by Electrical Wires and Cables – Test Methods

NMX-J-498-ANCE,
Wires and Cables – Vertical Tray Flame Test – Test Method

NMX-J-516-ANCE,
Wires and Cables – Weather Resistance of Insulation of Jacket of Electrical Conductors – Test Method

NMX-J-553-ANCE,
Wires and Cables – Weather Resistance of Insulation or Jacket of Electrical Conductors – Test Method

NMX-J-556-ANCE,
Wire and Cable Test Methods

CSA Group Standards

C22.1-15,
Canadian Electrical Code, Part I

CAN/CSA C22.2 No. 0,
General Requirements – Canadian Electrical Code, Part II

CAN/CSA C22.2 No. 2556,
Wire and Cable Test Methods

UL Standards

UL 2556
Wire and Cable Test Methods

ASTM (American Society for Testing and Materials) Standards

B3-13,
Standard Specification for Soft or Annealed Copper Wire

B8-11,
Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B33-10,
Standard Specification for Tinned – Coated Soft or Annealed Copper Wire for Electrical Purposes

B172-10,
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors

B173-10,
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors

B174-10,
Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors

B801-07(2012),
Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation

B835-04(2009),
Standard Specification for Compact Round Stranded Copper Conductors Using Single Input Wire Construction

B836-00(2011),
Standard Specification for Compact Round Stranded Aluminum Conductors Using Single Input Wire Construction

B901-04(2011),
Standard Specification for Compressed Round Stranded Aluminum Conductors Using Single Input Wire Construction

B902-13,
Standard Specification for Compressed Round Stranded Copper Conductors, Hard, Medium-Hard, or Soft Using Single Input Wire Construction

IEC (International Electrotechnical Commission) Standards

60228 (2004-11),
Conductors of insulated cables

NFPA (National Fire Protection Association) Publication

NFPA 70-2014,
National Electrical Code

2.3 Summary of requirements

As a guide to users of this Standard, a summary of requirements is provided in Annex C.

2.4 General requirements

In Canada, general requirements applicable to this standard are given in CAN/CSA-C22.2 No. 0.

3 Definitions

3.1 The following definitions apply in this Standard:

Equipment-grounding conductor – a conductor that is defined in Mexico, in NOM-001-SEDE, and in the United States, in the *NEC*, as "Grounding Conductor, Equipment", and in Canada, in the *CE Code, Part I*, as "Bonding conductor".

PVC – a thermoplastic compound whose characteristic constituent is polyvinyl chloride or a copolymer of vinyl chloride and vinyl acetate.

Thermoplastic – a polymeric material that can repeatedly be softened by heating and hardened by cooling and that in the softened state can be shaped through the application of force.

4 Construction

4.1 Conductors

4.1.1 General

Circuit and equipment-grounding conductors shall be of either copper, copper-clad aluminum, or aluminum.

4.1.2 Aluminum conductors

In Canada and the United States, aluminum conductors shall be of aluminum conductor material (ACM), AA 8000 series alloy.

Annex D provides the chemical composition of recognized aluminum alloy conductor materials.

In Mexico, aluminum conductors shall not be used in thermoplastic-insulated wires and cables in accordance with NOM-001-SEDE.

4.1.3 Copper-clad aluminum conductors

In the United States, the requirements of Annex E shall apply to solid conductors or the individual wires of stranded conductors prior to stranding.