UL 62

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Flexible Cords and Cables

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Flexible Cords and Cables, UL 62

Seventeenth Edition, Dated May 31, 2006

Summary of Topics

This Seventeenth edition of the Standard for Flexible Cords and Cables, UL 62, harmonizes the ANCE, CSA, and UL requirements previously published as NMX-J-436-ANCE, CSA C22.2 No. 49, and UL 62, respectively.

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

Future Effective Dates	References
May 31, 2008	Paragraphs 4.1.1.8.3, 4.3.9.5, 4.3.14.1, 5.1.8.1, 5.1.8.2, 5.2.2, 5.2.4.1.1, 5.2.4.1.2, 5.2.4.2.2, 5.3.1, 6.2.1.1, 6.2.3(c), 6.2.5, 6.4.4(b), and Tables 8, 11, 13, 27, 28, 34, and 45.

The new requirements are substantially in accordance with UL's Bulletin(s) on this subject dated January 30, 2004, November 11, 2005, and February 10, 2006. The bulletin(s) is now obsolete and may be discarded.

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://ulstandardsinfonet.ul.com/ulforeword.html

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

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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 preface. 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.

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

Page	Date
1-126	May 31, 2006

No Text on This Page

Association of Standardization and Certification
NMX-J-436-ANCE
Third Edition

Canadian Standards Association
CSA C22.2 No. 49
Twelfth Edition

Underwriters Laboratories Inc.
UL 62
Seventeenth Edition

Flexible Cords and Cables

May 31, 2006

ANSI/UL 62-2006

Commitment for Amendments

This standard is issued jointly by the Association of Standardization and Certification (ANCE), the Canadian Standards Association (CSA), and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to ANCE, CSA, or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of ANCE, CSA, and UL. CSA 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 and UL pages.

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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.

The most recent designation of ANSI/UL 62 as an American National Standard (ANSI) occurred on May 15, 2006.

This ANSI/UL Standard for Safety, which consists of the Seventeenth edition is under continuous maintenance, whereby each revision is ANSI approved upon publication. 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.

The Department of Defense (DoD) has adopted UL 62 on November 6, 1987. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

CONTENTS

Preface

This is the common ANCE, CSA, and UL standard for Flexible Cords and Cables. It is the Third edition of NMX-J-436-ANCE, the Twelfth edition of CAN/CSA-C22.2 No. 49, and the Seventeenth edition of UL 62. This edition of CAN/CSA-C22.2 No. 49 supersedes the previous edition(s) published in 1998, 1992, 1989, 1988, 1981, 1973, 1962, 1960, 1956, 1941, and 1937. This edition of UL 62 supersedes the previous edition(s) published in 1997.

This common standard was prepared by the Association of Standardization and Certification (ANCE), the Canadian Standards Association (CSA), and Underwriters Laboratories Inc. (UL). The efforts and support of the CANENA Technical Harmonization Committee are gratefully acknowledged.

This standard was reviewed by the CSA Subcommittee on Flexible Cords 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 approved by the American National Standards Institute (ANSI) as an American National Standard.

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.

Where reference is made to a specific number of samples to be tested, the specified number shall 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 to be considered equivalent to, an IEC standard. This standard is published as an equivalent standard for ANCE, CSA, 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 cords and cables in accordance with the codes of Canada, Mexico, and the United States. At present there is no IEC standard for cords 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.

ANCE effective date

The effective date for ANCE will be announced through the Diario Oficial de Ia Federación (Official Gazette) and is indicated on the cover page.

CSA effective date

The effective date for CSA International will be announced through CSA Informs or a CSA certification notice.

UL effective date

As of May 31, 2006, all products Listed or Recognized by UL must comply with the requirements in this standard except for clauses, figures, and tables in the following list, which are effective May 31, 2008.

Clauses 4.1.1.8.3, 4.3.9.5, 4.3.14.1, 5.1.8.1, 5.1.8.2, 5.2.2, 5.2.4.1.1, 5.2.4.1.2, 5.2.4.2.2, 5.3.1, 6.2.1.1, 6.2.3(c), 6.2.5, 6.4.4(b), and Tables 8, 11, 13, 27, 28, 34, and 45.

Between May 31, 2006, and May 31, 2008, new product submittals to UL may be evaluated under all requirements in this standard or, if requested in writing, evaluated under presently effective requirements only. The presently effective requirements are contained in the Sixteenth edition of UL 62.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

1 Scope

1.1 General

This standard specifies the requirements for flexible cords, elevator cables, and hoistway cables, rated 600 V maximum, and intended for use in accordance with CSA C22.1, Canadian Electrical Code (CEC), Part I and CAN/CSA-C22.2 No. 0, General Requirements – Canadian Electrical Code, Part II, in Canada, NOM-001-SEDE, La Norma de Instalaciones Electricas (Mexican Electrical Code [MEC]), in Mexico, and NFPA 70, National Electrical Code (NEC), in the United States.

1.2 Products included

This standard covers the following products:

a) service cords;

b) elevator cables;

c) hoistway cables;

d) heater cords;

e) range and dryer cords;

f) cords for decorative lighting;

g) tinsel and lamp cords; and

h) special use cords.

1.3 National differences

In cases where product types are not approved in all three countries, a national difference is indicated by superscripts, as shown below:

Superscript letter	National difference
c	For use in Canada only
m	For use in Mexico only
u	For use in United States only
c,m	For use in Canada and Mexico only
c,u	For use in Canada and United States only
m,u	For use in Mexico and United States only

2 Reference publications

2.1 ANCE, CSA, and UL standards

Where reference is made to ANCE, CSA, or UL standards, such reference shall be considered to refer to the latest edition and all amendments published to that edition.

ANCE (Association of Standardization and Certification)

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

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

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

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

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

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

NMX-J-190
Thermal Shock Resistance of PVC insulations and PVC Protective Coverings – Test Method

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

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

NMX-J-193
Cold Bend of Thermoplastic Insulation and Protective Coverings of Insulated Wire and Cable – Test Method

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

NMX-J-293
Alternating Current and Direct Current Dielectric Voltage Withstand – Test Method

NMX-J-294
Insulation Resistance – Test Method

NMX-J-417
Convection Laboratory Ovens for Evaluation of Electrical Insulation – Specification and Test Method

NMX-J-473
Spark Test – Test Method

NMX-J-498
Vertical Tray Flame Test – Test Method

NMX-J-553
Weather Resistance of Insulation or Jacket of Electrical Conductors – Test Method

CSA (Canadian Standards Association)

CSA C22.1-06
Canadian Electrical Code, Part I

CAN/CSA-C22.2 No. 0-M91 (R2001)
General Requirements – Canadian Electrical Code, Part II

CSA C22.2 No. 0.3-01
Test Methods for Electrical Wires and Cables

CAN/CSA-Z240 RV Series-99 (R2004)
Recreational Vehicles

UL (Underwriters Laboratories Inc.)

UL 1581
Reference Standard for Electrical Wires, Cables, and Flexible Cords

UL 1685
Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

2.2 Other reference standards

ASTM (American Society for Testing and Materials)

B 3-01
Standard Specification for Soft or Annealed Copper Wire

B 33-00
Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes

NFPA (National Fire Protection Association)

NFPA 70-05
National Electrical Code

NOM (Norma Oficial Mexicana)

NOM-001-SEDE
Mexican Electrical Code

3 Definitions and units of measurement

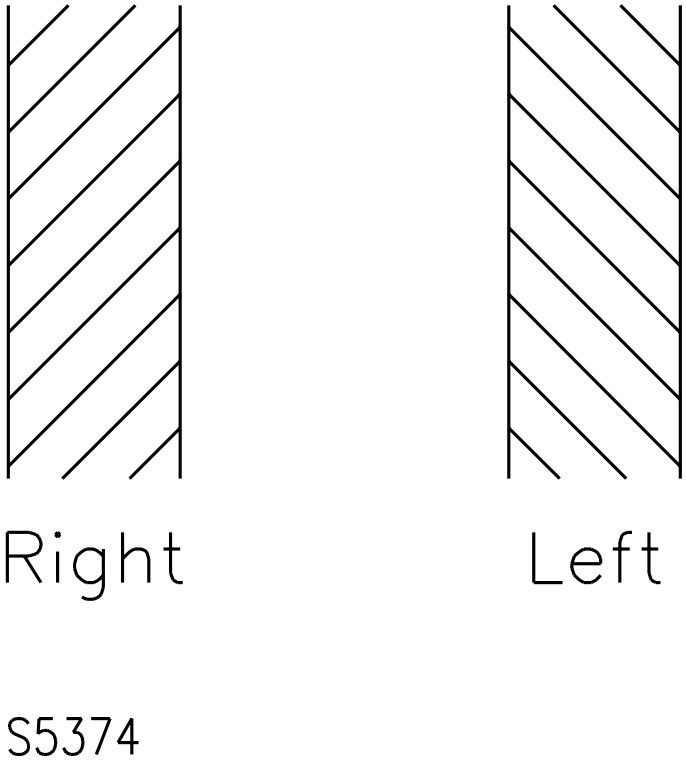
3.1 Definitions

The following definitions apply in this standard:

Breather tube – element placed in cords intended to equalize pressure.

Bunch stranding – a group of wires twisted together without a predetermined pattern.

Direction of lay – the longitudinal direction, designated as left-hand (counterclockwise) or right-hand (clockwise), in which the wires of a member or units of a conductor run over the top of the member or conductor as they recede from an observer looking along the axis of the member or conductor.



Elevator traveling cable – a cable intended for use as a flexible connection between an elevator or dumbwaiter car and its hoistway.

Extra-hard-usage cord – a cord intended for use with heavy equipment and for hand-held appliances and tools, classified as the highest grade in mechanical serviceability.

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 *CEC*, as "Bonding conductor".

Hard-usage cord – a cord intended for use with moderately heavy equipment and for hand-held appliances and tools, classified as the medium grade in mechanical serviceability.

Heater cord – a cord intended for connection to equipment that has a heating element.

Hoistway cable – a cable for control and signal applications in an elevator hoistway.

Not-for-hard-usage cord – a cord intended for use with light equipment, classified as the lowest grade in mechanical serviceability.

Rope-lay-stranded conductor – a conductor composed of groups of twisted strands having one or more layers.

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

Thermoplastic elastomer (TPE) – a thermoplastic that complies with the deformation test in Clause 5.1.3 for compound classes 14, 15, 16, 1.9, 1.10, 1.11 and the heat-shock resistance test in Clause 5.1.8 for TPE materials.

Thermoset – a cross-linked polymeric-based material that will not soften to the point of flowing with subsequent application of heat.

Tinsel cord – a very flexible cord in which each conductor comprises a number of strands or group of strands, twisted together, each strand being composed of one or more flattened wires of copper or copper alloy, helically wound on a thread of cotton, polyamide, or similar material.

3.2 Units of measurement

The values given in SI (metric) units shall be normative. Except for conductor sizes, the equivalent "inch/pound" values are in parentheses.

4 Construction requirements

4.1 General construction requirements

4.1.1 Conductors

4.1.1.1 General

The conductors of all types of cables and cords shall use flexible stranding, except as detailed under specific constructions. Circuit conductors of mixed sizes shall be permitted for cords containing five or more circuit conductors.

4.1.1.2 Material

Conductors shall be of annealed copper in compliance with ASTM B 3 or NMX-J-036-ANCE, or annealed coated copper in compliance with ASTM B 33 or NMX-J-008-ANCE.

4.1.1.3 Size

4.1.1.3.1 The conductor size shall be determined by either:

(a) the cross-sectional area (stranded conductor) or the diameter (solid conductor) complying with the minimum values given in Table 1 when determined in accordance with the method specified in CSA C22.2 No. 0.3, Clause 4.1.1; UL 1581, Sections 200 or 210; or NMX-J-066; or

(b) the maximum dc resistance complying with Clause 4.1.1.9.

In case of dispute, dc resistance shall be the referee method.

4.1.1.3.2 The individual wires used in a stranded conductor are usually drawn to a specified diameter, which in some cases does not correspond with the diameter of any gauge number. Not all of the individual strands of the completed conductor are required to have the same diameter.

4.1.1.3.3 For DRT[c] cables with circuit conductor sizes 5.26 mm^2 (10 AWG) and larger, reducing the size of the neutral conductor by not more than two AWG gauge sizes from that of the circuit conductor shall be permitted (e.g., for a 5.26 mm^2 (10 AWG) circuit conductor, the neutral may be 3.31 mm^2 (12 AWG)).

4.1.1.4 Joints

4.1.1.4.1 A joint or splice in one of the individual wires of a stranded conductor shall neither increase the diameter nor decrease the strength of the conductor or the individual wire. A joint or splice shall not be made in a stranded conductor as a whole. For rope-lay-stranded conductor construction, the splicing of a stranded member (primary group) as a unit shall be permitted, provided that no joints are made closer than two lay lengths apart.

4.1.1.4.2 A joint or splice in a solid conductor shall neither increase the diameter nor decrease the strength of the conductor.

4.1.1.5 Coating

If the conductor and insulation have been shown to be mutually compatible in accordance with Clause 5.2.8, omission of the coating shall be permitted. Otherwise, if a separator is not provided over the conductor, all the individual wires of the conductor shall be separately tinned.

4.1.1.6 Separator

4.1.1.6.1 When the conductor is neither coated nor shown to be mutually compatible with the insulation in accordance with Clause 5.2.8, a separator as described in Clause 4.1.1.6.3 shall be provided over the conductor.

4.1.1.6.2 A separator shall be permitted on other constructions, but is not required.

4.1.1.6.3 A separator, when provided, is not required to cover the conductor completely unless it is required in order to comply with the conductor corrosion test specified in Clause 5.2.8. It shall be of a color contrasting to that of the conductor, except clear or green or green/yellow shall not be permitted. The separator shall consist of a:

a) close spiralling of fine fibrous yarn, paper, cellophane, or polyester tape;

b) braid of fine fibrous yarn; or

c) longitudinally applied wrap of paper, cellophane, or polyester.

4.1.1.7 Stranding

4.1.1.7.1 General

Flexible conductors shall be bunch-stranded or rope-lay stranded and shall be composed of wires as shown in Table 2, except that conductors 13.3 mm^2 (6 AWG) and larger shall be rope-lay stranded.

4.1.1.7.2 Lay of strands

4.1.1.7.2.1 The length of lay of rope-stranded and bunch-stranded conductors shall be not greater than the values shown in Table 3. The direction of lay is not specified.

4.1.1.7.2.2 The length of lay of the individual strands comprising each bunch-stranded member in a rope-lay conductor shall be not more than 30 times the overall diameter of the member. The direction of lay of the individual strands comprising each bunch-stranded member is not specified.

4.1.1.7.2.3 For 8.37 mm^2 (8 AWG) and larger conductors with rope-lay-stranded conductors, the conductor shall be laid up as follows:

(a) The length of lay of the outer layer of a rope-lay-stranded conductor shall be as specified in Table 3. The length of lay of other layers is not specified.

(b) The length of lay of the individual strands comprising each concentric-lay-stranded member in a rope-lay conductor shall be neither less than 8 nor more than 16 times the outside diameter of the member. The direction of lay of the individual strands comprising each concentric-lay-stranded member is not specified. Bunch stranded members shall be in accordance with Clause 4.1.1.7.2.2.

4.1.1.7.2.4 The length of lay of the wires of a seven-strand conductor shall be not less than 8 nor more than 16 times the overall diameter of the conductor.

4.1.1.8 Grounding (bonding) conductors

Note: *Currently, the term "bonding" is preferred in Canada, and "grounding" is preferred in Mexico and the United States.*

4.1.1.8.1 When a grounding conductor is incorporated into a flexible cord or cable, it shall be insulated. For Type DRT[c], an uninsulated grounding conductor shall be permitted for sizes 3.31 and 5.26 mm^2 (12 and 10 AWG) utilizing a seven-strand construction. Grounding conductors for type DRT[c] utilizing more than 7 strands shall be insulated.

4.1.1.8.2 For flexible cord or cable with conductor sizes 5.26 mm^2 (10 AWG) and smaller, the grounding conductor shall be the same size or larger than the largest circuit conductors, except for Type DRT[c], where a 3.31 mm^2 (12 AWG) grounding conductor shall be permitted for use with 5.26 mm^2 (10 AWG) circuit conductors.

4.1.1.8.3 For flexible cord or cable with conductor sizes 8.37 mm^2 (8 AWG) and larger, the reduction of the grounding conductor by not more than two AWG sizes from the largest ungrounded circuit conductor shall be permitted (e.g., a cord having an 8.37 mm^2 (8 AWG) ungrounded circuit conductor shall be permitted to have a minimum 5.26 mm^2 (10 AWG) grounding conductor).

4.1.1.8.4 A grounded circuit conductor larger (oversized neutral) than the largest ungrounded circuit conductor shall be permitted.

4.1.1.9 DC resistance

4.1.1.9.1 The dc resistance of uncoated copper or tin-coated copper conductors shall be as specified in Tables 4, 5, 6, and 7. A plus tolerance of 2% shall be permitted, in the case of a conductor in a twisted multiconductor product having a single layer of conductors. For a twisted multiconductor having more than one layer, a plus tolerance of 3% shall be permitted.

4.1.1.9.2 Compliance with the dc resistance test shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.1.2; UL 1581, Section 220; or NMX-J-212-ANCE.

4.1.2 Insulation

4.1.2.1 General

The classes of insulation covered in this standard are shown in Table 8. The insulation shall be applied directly over the conductor or the separator if one is used; if applied in more than one layer of the same insulation grade or combination thereof, adjacent layers shall not be readily separable. The insulation shall be applied concentrically about the conductor, except for parallel cords. Insulation from one of the following three groups – PVC, TPE, or thermoset – shall be permitted to be interchanged within their group from classes shown in Table 8 provided the material to be substituted is included in the construction tables for use on the same product type having a higher temperature rating.

Note: *Due to possible incompatibility, TPE material of the styrenic type is in same cases not suitable for use in cords where direct contact with PVC can occur. A separator is one acceptable means of avoiding direct contact. Other combinations of materials that could be incompatible, if any, have yet to be detected.*

4.1.2.2 New materials

In Mexico and the United States, the following applies. Insulation materials that are generically different from those named in the index tables shown in Table 8 shall be evaluated for the requested temperature rating as described in Clause 5.1.13. Investigation of the electrical, mechanical, and physical characteristics of the construction using the new material shall show the new material to be comparable in performance to the materials currently indicated for the application.

In Canada, this requirement does not apply.

Note: *In Canada, requirements for evaluation of new insulating materials are under development.*

4.1.3 Covering

4.1.3.1 General

When a covering is used, the requirements of Clauses 4.1.3.2 to 4.1.3.4 apply.

4.1.3.2 Braids

4.1.3.2.1 A fibrous braid shall be so constructed that the angle of weave between the yarn and the axis of the underlying insulation or assembly is within the range of 35° to 60°, with a minimum coverage of 76% when calculated in accordance with the method in Annex A.

4.1.3.2.2 Where two braids are specified, the diameter, D, for the outer braid shall be taken as the diameter over the inner braid.

4.1.3.2.3 Except where indicated otherwise, braids shall be of cotton or synthetic yarn and shall be fabricated on a machine having the same number of ends per carrier throughout. Each end shall consist of the same size, ply, and kind (i.e., soft or glazed).

4.1.3.2.4 Where two or more braids are required for the outer covering, the final or outermost braid shall conform to the requirements of Clauses 4.1.3.1 to 4.1.3.2.3; however, these requirements need not apply to inner braids if such are used instead of a tape. The size of yarn of each carrier of an inner braid shall be not less than that used in the outer braid, and the number of carriers of each adjacent braid shall not differ by more than four.

4.1.3.2.5 A braid used as the final outer covering of a wire or cord intended for use in damp places shall be saturated with a moisture-resistant compound, which may be of any desired color. A coating of lacquer shall be permitted in place of a saturating compound. When used on HPD^{u} cord, the threads in the braid shall not rupture when the finished cord is tightly wrapped around itself for six complete turns at room temperature.

4.1.3.3 Tapes

4.1.3.3.1 Tape shall not be used as the final outer covering on flexible cord and shall not be used instead of a braid directly over the conductor assembly of Types E, EO, and ETT elevator cable, but shall be permitted as an inner fibrous covering.

4.1.3.3.2 Tapes for Types E and EO shall be of the rubber-filled woven cloth type and shall be not less than 0.25 mm (0.01 in) in thickness. They shall be applied helically, so as to overlap by at least 3 mm (0.12 in).

4.1.3.4 Nylon covering

An extruded nylon covering applied over the individual insulated conductors of jacketed flexible cords shall have a minimum thickness of 0.05 mm (0.002 in) at any point. It shall comply with the bend test specified in Clause 5.1.9.

4.1.4 Conductor assembly

4.1.4.1 Lay of conductors

Flexible cords with cabled conductors shall have the individual conductors twisted together with a length of lay not greater than that shown in Table 10. When cords covered in Table 10 have mixed conductor sizes, the lay shall be based on the number of conductors and the largest conductor size found in the cord. Constructions not covered in Table 10 shall have the individual conductors laid up so that the lay shall be not more than 15 times the overall diameter of the conductor assembly. For CXTW[u], CXWT[c], and TX[c], the lay shall not be more than 30 times the overall diameter of the insulated conductor. For multiple-layer cords, the conductors in each layer shall be twisted, but the lay is not specified, except that in the outer layer the lay shall be not more than 15 times the overall diameter of that layer.

Note: *An acceptable method of measuring the length of lay of insulated conductors is described in Annex B.*

4.1.4.2 Fillers

If fillers are used, they shall be of suitable material and shall be twisted with the individual conductors to form a compact assembly having an essentially circular cross section.

4.1.4.3 Binder

The application of a binder, consisting of a braid, tape, or wrap of suitable material over the conductor assembly, shall be permitted.

4.1.5 Shielding

4.1.5.1 A shield shall be permitted over one or more of the circuit conductors or over the entire assembly under the jacket.

4.1.5.2 The shield shall be a braid of copper wires, copper wire wrapped shields, a metallized polyester tape with a drain wire, or a metal tape with or without a drain wire.

4.1.5.3 A braided or wrapped shield shall be composed of 0.013 mm^2 or 0.020 mm^2 (36 AWG or 34 AWG) copper wires for flexible cords with conductors of 5.26 mm^2 (10 AWG) and smaller, and of 0.032 mm^2 or 0.051 mm^2 (32 AWG or 30 AWG) copper wires for flexible cords with conductors larger than 5.26 mm^2 (10 AWG). For thermoset constructions, the copper wires shall be coated with tin, unless a separator is used. The braided or wrapped shield shall provide a minimum coverage of 85% when calculated in accordance with the method in Annex C.

4.1.5.4 A laminated tape of polyester film and aluminum foil shall be applied longitudinally or helically so that it has at least a 1.52 mm (0.060 in) overlap. The total thickness of the tape shall be 0.038 mm (0.0015 in) minimum for flexible cords with conductors 5.26 mm^2 (10 AWG) and smaller and 0.0635 mm (0.0025 in) for flexible cords with conductors 8.37 mm^2 (8 AWG) and larger. The minimum size of drain wire shall be 0.325 mm^2 (22 AWG) (seven-strand) tinned copper for flexible cords with conductors 2.08 mm^2 (14 AWG) and smaller, 0.519 mm^2 (20 AWG) (seven-strand minimum) tinned copper for flexible cords with conductors of 3.31 mm^2 and 5.26 mm^2 (12 and 10 AWG), and 0.824 mm^2 (18 AWG) (seven-strand minimum) tinned copper for flexible cords with conductors of 8.37 mm^2 (8 AWG) and larger. The drain wire shall be in contact with the aluminum.

4.1.5.5 The overall diameters of shielded cords shall comply with the overall diameters in Table 13, plus the additional increase due to the shield.

4.1.5.6 Flexible cords and cables employing shields of different materials or constructions than those described in Clauses 4.1.5.1 to 4.1.5.5 shall be examined and tested in accordance with Clause 5.2.9.

4.1.6 Jackets

4.1.6.1 General

If a jacket is required, the conductor assembly of the cord or cable shall be covered by and properly centered within the jacket. The jacket shall be applied directly to the conductor assembly or binder, if one is used, and shall fill all the spaces, if any, around the conductor assembly.

Jackets with a total thickness of 1.52 mm (0.060 in) and greater shall be permitted to have a reinforcement consisting of an open weave or the like, placed between adjacent layers of the same class, that shall not be readily separable. Jackets with a total thickness of 2.41 mm (0.095 in) and greater shall be permitted to consist of separable or non-separable adjacent layers of the same class. If separable, the outside layer shall be at least 50% of the total thickness measured. If applied in more than one layer, both layers shall be of the same class. Adjacent layers shall not be readily separable when the total jacket thickness is less than 2.41 mm (0.095 in).

All jackets shall provide an essentially circular cross-section for the finished cord or cable, except for Type DRT^c that shall be used with a moulded-on male plug only and for non-integral parallel cords. The classes of jacket provided in this Standard are shown in Table 11.

4.1.6.2 Interchangeable jackets

Jackets in PVC, TPE, and thermoset groups shall be permitted to be interchanged within their group from classes shown in Table 11, provided the material to be substituted is included in the construction tables for use on the same product Type having a higher temperature rating.

Note: *Due to possible incompatibility, TPE material of the styrenic type is in some cases not suitable for use in cords where direct contact with PVC can occur. A separator is one acceptable means of avoiding direct contact. Other combinations of materials that could be incompatible, if any, have yet to be detected.*

4.1.6.3 New materials

In Mexico and the United States, the following applies. Jacket materials that are generically different from those named in the index tables shown in Table 11, if selected for use, shall be evaluated for the requested temperature rating as described in Clause 5.1.13. Investigation of the electrical, mechanical, and physical characteristics of the construction using the new material shall show the new material to be comparable in performance to the materials indicated for the application.

In Canada, this requirement does not apply.

Note: *In Canada, requirements for evaluation of new jacket materials are under development.*

4.1.7 Overall dimensions

Unless otherwise permitted, the average overall diameter of the finished cord or cable shall be neither smaller nor larger than as indicated in Table 13.

4.1.8 Coiled cords

4.1.8.1 Coiled cords shall comply with the requirements specified for the standard construction and, except as noted in Clause 4.1.8.2, all tests and measurements shall be conducted on specimens obtained from the straight ends at each end of the coiled portion of the cord.

4.1.8.2 The dielectric strength test of Clause 5.2.2 shall be conducted on the entire length of the coiled cord. The mechanical strength test of Clause 5.1.4 shall be conducted on the coiled portion of the cord. The minimum thickness of the jacket on the coiled portion of round cords and the minimum thickness of the insulation and/or jacket on the coiled portion of parallel cords shall be not less than the applicable value given in this standard. See Note (1) of Table 13 for diameters.

4.1.9 Method of distinguishing conductors

4.1.9.1 Conductors shall be distinguished as follows:

(a) Grounded (neutral) conductors shall be distinguished by the colors white or gray, and these colors shall be restricted to such use.

(b) Grounding conductors shall be distinguished by the color green or a combination of the colors green and yellow. On a grounding conductor colored green, one or more yellow stripes that cover no less than 5% and not more than 70% of the calculated circumference of the finished conductor insulation shall be permitted.

Note: *Other acceptable methods of color coding the individual conductors are shown in Annex D.*

4.1.9.2 The use of a thin, non-separable colored coating of a suitable material that is compatible with the insulation over the surface of the insulation on the individual conductors, in lieu of colored insulation, shall be permitted.

4.1.9.3 For integral constructions, one conductor shall be distinguishable by physical or visual means (e.g., ridges, grooves, ink printing, insulation color).

4.1.10 Breather tubes

4.1.10.1 Types STW, STOW, STOOW, SJTW, SJTOW, SJTOOW, SJEW^{u}, SJEOW^{u}, SJEOOW^{u}, SEW^{u}, SEOW^{u}, and SEOOW^{u} flexible cords having conductor sizes 5.26 mm^2, 3.31 mm^2, 2.08 mm^2, 1.31 mm^2, 1.04 mm^2, or 0.824 mm^2 (10 AWG, 12 AWG, 14 AWG, 16 AWG, 17 AWG, or 18 AWG) shall be permitted to have a breather tube incorporated in their construction.

4.1.10.2 The flexible cords specified in Clause 4.1.10.1 and having a breather tube shall comply with all of the requirements for the standard construction of these cords, except that the length of lay shall comply with the lay specified for such cords with an additional conductor; the average overall diameter of these cords shall comply with the overall diameters specified for such cords with an additional circuit conductor.

4.1.10.3 The breather tube shall not crack when specimens of the finished cords are subjected to the cold bend and mechanical strength tests specified for these cords.

4.1.11 Support members

4.1.11.1 The incorporation of a supporting member in the center of the flexible cord assembly shall be permitted. Supporting members of steel, nonmetallic material, fibrous material, or other suitable material shall be permitted.

4.1.11.2 When metal is used, the support member shall consist of a flexible, stranded metal that is insulated with the same grade and thickness of insulation as used on the circuit conductors.

4.1.11.3 The overall jacket shall be marked to show that a metal support member is present (see Clause 6.2.4, Item (c)).

4.2 Thermoset-insulated cords (including range and dryer cords and special use cords C^{u} and PD^{u})

4.2.1 General

Clauses 4.2.2 to 4.2.12 set out specific requirements for thermoset-insulated flexible cords except heater cords. (See Tables 14 to 17.) See Clause 4.4 for heater cords.

4.2.2 Conductors

Conductors shall comply with Clause 4.1.1.

4.2.3 Insulation

4.2.3.1 The classes, thickness, and required testing of insulation to be used on a particular type shall be as shown in Tables 14 to 17.

4.2.3.2 The average and minimum thickness of insulation shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX-J-177-ANCE.

4.2.4 Covering

The application of a covering, in accordance with Clause 4.1.3, over the insulation of individual conductors of jacketed cords, shall be permitted.

4.2.5 Conductor assembly

Conductor assembly, fillers, and binders shall be in accordance with Clause 4.1.4.

4.2.6 Shielding

A shield over the assembled conductors, if provided, shall comply with Clause 4.1.5.

4.2.7 Jackets

4.2.7.1 The classes, thicknesses, and required testing of jackets to be used on a particular type shall be as shown in Tables 14 to 16.

4.2.7.2 The average and minimum thickness of the jacket shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX-J-177-ANCE.

4.2.8 Overall dimensions

The overall diameter of the finished cord or cable shall conform to Clause 4.1.7, except in the case of shielded constructions, where the provisions of Clause 4.1.5.5 shall apply.

4.2.9 Types SP-1^{m,u}, SP-2^{m,u}, SP-3^{m,u}, NISP-1^{m,u}, and NISP-2^{m,u} two- or three-conductor (coiled and uncoiled)

These types shall comply with the construction, test, and marking requirements for corresponding integral and non-integral as indicated in Tables 14 and 15.

The construction of NISP-1^{m,u} and NISP-2^{m,u} shall involve the use of a separate jacket and conductor insulation (see Figure 1).

4.2.10 Coiled cords

Coiled cords shall comply with Clause 4.1.8.

4.2.11 Method of distinguishing conductors

The method of distinguishing conductors shall comply with Clause 4.1.9.

4.2.12 Insulated conductor identification

Insulated conductor identification shall comply with Clause 4.1.9.

4.3 Thermoplastic-insulated cords (including decorative and range and dryer cords)

4.3.1 General

Clauses 4.3.2 to 4.3.14 set out specific requirements for thermoplastic-insulated flexible cords and cables (see Tables 16 and 18 to 23.)

4.3.2 Conductors

Conductors shall comply with Clause 4.1.1.

4.3.3 Insulation

4.3.3.1 The classes, thicknesses, and required testing of insulation to be used on a particular type are shown in Tables 16 and 18 to 23.

4.3.3.2 The average and minimum thickness of insulation shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX-J-177-ANCE.

4.3.4 Covering

The application of a covering, in accordance with Clause 4.1.3, over the insulation of individual conductors of jacketed cords shall be permitted.

4.3.5 Conductor assembly

Conductor assembly, fillers, and binders shall be in accordance with Clause 4.1.4.

4.3.6 Shielding

A shield over the assembled conductors, if provided, shall comply with Clause 4.1.5.

4.3.7 Jacket

4.3.7.1 The classes, thicknesses, and required testing of jackets used on a particular cord shall be as shown in Tables 16 and 18 to 21.

4.3.7.2 The average and minimum thickness of the jacket shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX J 177-ANCE.

4.3.8 Overall dimensions

The overall diameter of the finished cord or cable shall comply with Clause 4.1.7, except in the case of shielded constructions, where the provisions of Clause 4.1.5.5 shall apply.

4.3.9 Integral constructions

4.3.9.1 Types PXT[c], PXWT[c], XTW[u], and two-conductor SPT-0[m], SPT-1W[u], SPT-2W[u], SPT-1, SPE-1[u], SPT-2, SPE-2[u], SPT-3 , SPE-3[u], shaver cord[u], and clock cord[u] shall be of an integral construction and shall be such that the two insulated conductors can be separated readily for any distance only when slit at the end and intentionally torn apart (see Figure 2).

4.3.9.2 Three-conductor Type SPT-3 and SPE-3[u] shall consist of the integral construction, except that they shall have centrally located, non-integral grounding conductors of the same size as the other conductors. Three-conductor Types SPT-1, SPE-1[u], SPT-2, and SPE-2[u] shall consist of the integral construction, except that a centrally located non-integral grounding conductor of the same size as the other conductors shall be permitted (see Figures 3 and 4). The grounding conductor shall be provided with an insulation of green with or without yellow stripe(s) (see Clause 4.1.9.1). The construction of the cord shall be such that the insulated (circuit) conductors can be separated readily for any desired distance when slit at the end and intentionally torn apart. In addition, the grounding conductor shall be readily separable from the two insulated (circuit) conductors so as to expose the green insulation throughout the entire length of the torn section of the cord.

4.3.9.3 The thickness of the insulation on integral cords, before and after separation of the conductors, and the other dimensions of these cords shall be in accordance with Tables 16 and 18 to 23, when determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX-J-177-ANCE.

4.3.9.4 For type SPT-1 cord, a nylon jacket over the finished cord shall be permitted. The average thickness of the nylon, other than on the slopes and the bottoms of the valleys, shall not be less than 0.08 mm (0.003 in). The minimum thickness of the nylon at any point on the slopes and at the bottoms of the valleys shall not be less than 0.03 mm (0.001 in). The finished cord shall comply with the requirements of Clause 5.1.9.

4.3.9.5 The construction and dimensions of three-conductor parallel (integral) Types SRDE[m,u] and SRDT[m,u] range and dryer cables shall be as indicated in Figure 5. The thickness (see A in Figure 5) of the complete insulation shall not be less than 2.54 mm (0.100 in) at any point outside the point P or X (defined in Figure 6) in the groove or valley between the conductors. The thickness B of the web (the distance between copper conductors) shall not be less than 2.79 mm (0.110 in) at any point. The thickness C of the insulation on any conductor at any point after separation shall not be less than 1.04 mm (0.041 in). When a grounding conductor is used, it shall be the center conductor (see marking requirements in Clause 6.2.4, Item (e)). For circuit conductors size 8.37 mm^2 (8 AWG) or larger, the grounding conductor shall be permitted to be smaller than the circuit conductors (see Clause 4.1.1.8.3).

4.3.10 Types NISPT-1, NISPT-2, NISPE-1[m,u], NISPE-2[m,u], two- or three-conductor (coiled and uncoiled)

These types shall comply with the construction, test, and marking requirements for corresponding integral types rated at 60 °C, 75 °C, 90 °C, and 105 °C, except that the construction shall involve the use of a separate jacket and conductor insulation (see Figure 1), and the dimension of the insulation, jacket, and web shall be as indicated in Tables 18 and 19. The insulation and jacket classes shall be as listed in Tables 20 and 21.

4.3.11 Coiled cords

Coiled cords shall comply with Clause 4.1.8.

4.3.12 Method of distinguishing conductors

The method of distinguishing conductors shall comply with Clause 4.1.9.

4.3.13 Insulated conductor identification

Insulated conductor identification shall comply with Clause 4.1.9.

4.3.14 Low-leakage flexible cords

4.3.14.1 General

A Type SJT, SJTO, ST, and STO cord that is intended for use as a low-leakage cord in a power-supply cord or cord set for earth-grounded direct-patient-contact medical and dental equipment shall contain two circuit conductors and one grounding conductor, with all conductors having Class 8 or 9 PE insulation or Class 20 FEP insulation.

4.3.14.2 Overall diameter of low-leakage cords

The overall diameter of low-leakage cords shall comply with Table 13, plus the additional increase due to any filler-spacers.

4.3.14.3 AC leakage current test

The finished cord shall be tested in accordance with the ac leakage current test described in Clause 5.2.11 and shall comply with the requirements in Table 24.

4.3.14.4 Marking for low-leakage cords

Low-leakage cords shall be marked in accordance with Clause 6.2.4, Item (f).

4.4 Heater cords – HPN, HSJO, HSJOO, HPD[u], HSJ

Note: *Clause 4.4 includes specific requirements for heater cords (see Tables 25 and 26).*

4.4.1 Conductors

4.4.1.1 General

Conductors employed in heater cords shall comply with Clause 4.1.1.

4.4.1.2 Stranding

The individual conductors shall be bunch or rope-lay stranded, consisting of wires having a diameter in accordance with Table 2 and a lay length in accordance with Table 3.

4.4.2 Separator

If the conductor is neither coated nor shown to be compatible with the insulation as determined by the test in Clause 5.2.8, a separator as described in Clause 4.1.1.6 shall be provided over the conductor.

4.4.3 Insulation

4.4.3.1 General

The class of insulation and testing required for a particular type of heater cord is shown in Tables 25 and 26. The insulation shall be applied directly over the conductor or the separator, if one is used.

4.4.3.2 Type HPN

The thickness of insulation, as applicable for use on Type HPN cord, before and after separation of the conductor, and the other dimensions of the cord, shall be in accordance with Table 27 for two-conductor cord and with Table 28 for three conductor cord when determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX-J-177-ANCE.

4.4.3.3 Types HSJOO, HSJO, HSJ, and HPD[u]

The average and minimum thickness of the insulation shall be not less than the values given in Table 29 when determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.2.1; or UL 1581, Section 250; or NMX-J-177-ANCE.

4.4.4 Conductor assembly

4.4.4.1 Type HPN

Two- and three-conductor Type HPN cords shall be of integral construction and shall comply with the requirements of Clause 4.4.3.2, except that the insulation on the grounding conductor shall be of a green color with or without yellow stripe(s) (see Clause 4.1.9.1).

4.4.4.2 Types HSJOO, HSJO, HSJ, and HPD[u]

The individual insulated conductors shall be twisted together with a length of lay not greater than that shown in Table 10. Fillers, if used in the assembly of these cords, shall be twisted with the conductors to form a compact assembly having an essentially circular cross-section.

4.4.4.3 Coiled cords

Coiled cords shall comply with Clause 4.1.8.

4.4.5 Jackets

4.4.5.1 Types HSJOO, HSJO, and HSJ cords shall be covered by, and properly centered in, a thermoset jacket of the class specified in Tables 25 and 26. The jacket shall provide an essentially circular cross-section for the finished cord.

4.4.5.2 The average and minimum thickness of the jacket shall be as indicated in Tables 25 and 26 when determined in accordance with the method in CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX-J-177-ANCE.

4.5 Tinsel cords (TST, TPT, shaver cord[u])

Note: *Clause 4.5 includes specific requirements for tinsel cords (see Table 30).*

4.5.1 General

Tinsel cords are intended for use only in lengths that do not exceed 2.4 m (8 ft) where they are attached either directly or by means of a special type of attachment plug to a portable electric appliance rated at 0.5 A or less.

4.5.2 Conductors

4.5.2.1 Construction

4.5.2.1.1 The conductors of tinsel cords shall consist of one of the following styles of construction:

(a) an assembly of 18 strands, which shall consist of three groups having a rope lay, each group consisting of six strands, and each strand consisting of a flattened 0.006 mm^2 (39 AWG) annealed copper wire wrapped around a core of No. 30 two ply cotton thread, or equivalent fibrous material;

(b) an assembly of six strands, which shall have a rope lay around a center core of No. 10 three-ply cotton thread, or equivalent. Each strand shall consist of two flattened 0.010 mm^2 (37 AWG) annealed copper wires wrapped around a core of No. 20 three-ply cotton thread, or equivalent;

(c) an assembly of seven strands, in the form of six strands having a rope lay about the seventh. Each strand shall consist of two flattened 0.008 mm^2 (38 AWG) annealed copper wires wrapped concentrically around a No. 270 denier polyester thread;

(d) an assembly of 18 strands consisting of six groups having a rope lay and each group consisting of three strands. Each strand shall consist of a flattened 0.006 mm^2 (39 AWG) annealed copper wire wrapped around a core of No. 50 two-ply cotton thread, or equivalent;

(e) an assembly of seven strands, in the form of six strands having a rope lay about the seventh. Each strand shall consist of two flattened 0.010 mm^2 (37 AWG) cadmium copper wires wrapped concentrically around a core of No. 250 denier polyester fiber thread, or equivalent; or

(f) an assembly consisting of flattened copper or copper alloy wires having a total cross-sectional area of no less than 0.100 mm^2 (198 cmil). The construction and arrangement of the strands is not specified, but the finished cord shall be acceptable for the purpose, as determined by an investigation that includes a flexibility test.

4.5.2.1.2 A 20 AWG or smaller flexible cord having tinsel conductors not complying with Clause 4.5.2.1.1 (a) to (f) or having a stranded copper construction may be used as shaver cord[u] without any type-letter designation if it is acceptable for the purpose as determined by an evaluation that includes a flexibility test.

4.5.2.2 DC Resistance

The dc resistance of each individual (not twisted) finished conductor shall not exceed 0.27 Ω/m (0.08 Ω/ft) at 25°C when determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.1.2; UL 1581, Section 220; or NMX-J-212-ANCE.

4.5.3 Insulation

4.5.3.1 The classes of insulation and testing required for a particular type are shown in Table 30.

4.5.3.2 For Type TST cords, the average and minimum thickness of the insulation shall be in accordance with Table 30.

4.5.3.3 For Type TPT cords and shaver cords[u], the thickness of insulation before and after separation of the conductors and the thickness of the web shall be in accordance with Table 30.

4.5.3.4 The average and minimum thickness of insulation shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX J 177-ANCE.

4.5.3.5 The application of a covering in accordance with Clause 4.1.3, over the insulation of individual conductors of jacketed cords, shall be permitted.

4.5.4 Conductor assembly

4.5.4.1 Type TPT and shaver cords[u]

Type TPT cord and shaver cords[u] shall be of a parallel, integral construction and shall be such that the two insulated conductors can be separated readily for any distance only when slit at the end and intentionally torn apart.

4.5.4.2 Type TST

4.5.4.2.1 The individual conductors shall be twisted together with a length of lay not greater than 35 mm (1.38 in).

4.5.4.2.2 If fillers are used, they shall be of suitable material and shall be twisted with the individual conductors to form a compact assembly having an essentially circular cross-section.

4.5.4.2.3 A binder consisting of a braid, tape, or wrap of suitable material may be applied over the conductor assembly.

4.5.5 Jacket

4.5.5.1 A jacket in accordance with Table 30 shall be applied directly over the conductor assembly of Type TST cord or the binder, if one is used.

4.5.5.2 The average and minimum thickness of the jacket shall be in accordance with Table 30 when determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX-J-177-ANCE.

4.5.6 Coiled cords

Coiled cords shall comply with Clause 4.1.8.

4.5.7 Method of distinguishing conductors

The method of distinguishing conductors shall comply with Clause 4.1.9.

4.6 Elevator travelling cables – Types E, EO, ETT, and ETP

Note: *Clause 4.6 includes specific requirements for elevator travelling cables (see Table 31).*

4.6.1 Conductors

Conductors shall comply with Clause 4.1.1.

4.6.2 Insulation

4.6.2.1 The classes of insulation and required testing to be used on a particular type are shown in Table 31.

4.6.2.2 Insulation thickness shall be not less than the values shown in Table 32.

4.6.2.3 Insulation shall comply with Clause 4.1.2.

4.6.2.4 The average and minimum thickness of insulation shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.1; or UL 1581, Section 250; or NMX-J-177-ANCE.

4.6.3 Braids

4.6.3.1 General

Braids shall comply with Clause 4.1.3.2.

4.6.3.2 Conductor braids

A braid shall be applied over the insulation on the individual conductors for Types E and EO. The provision of a conductor braid for Types ETT and ETP is optional.

4.6.3.3 Outer braids

4.6.3.3.1 A braid shall be applied over the twisted conductor assembly for Types E, EO, and ETT, and is optional over the conductor groups found in Type ETP.

4.6.3.3.2 The outer braid on Type E cable shall be saturated with a flame- and moisture-resistant compound. In accordance with Clause 4.1.3.3, a rubber-filled fibrous tape or tapes may be used between the inner and outer braids on Type E cable. The minimum size and ply of yarn and the thickness of the outer braid shall be not less than the values indicated in Table 33.

4.6.4 Conductor assembly

4.6.4.1 Lay of conductors

The individual conductors of Types E, EO, and ETT and the conductor groups of Type ETP shall be twisted together with a length of lay not greater than the values specified in Table 34.

4.6.4.2 Types E, EO, and ETT

The conductors shall be cabled around a core composed of fibrous material, PVC insulated steel wires, fibrous-covered PVC insulated steel wires, or a combination of these materials. PVC insulation shall have an average thickness of at least 0.25 mm (0.010 in). If desired, cabling suitable fillers with the individual insulated conductors shall be permitted.

4.6.4.3 Type ETP

The assembly shall consist of two or more insulated conductors or groups of insulated conductors, laid in parallel to form a flat cable. One or more webs composed of the same material as the jacket shall be permitted. Support members, placed in the center of the group(s) or in other suitable position(s) and composed of materials as outlined in Clause 4.6.4.2, shall be permitted. When support members are used outside of the group construction, the insulation on steel members is optional, and webs shall be provided between the support members and adjacent conductors or groups.

4.6.4.4 Duplex cables

4.6.4.4.1 General

When required, the incorporation of duplex cables for use as telephone circuits in Types E, EO, ETT, and ETP cables shall be permitted. Each duplex cable shall consist of two insulated conductors not smaller than 0.519 mm^2 (20 AWG), a shield, and a jacket. A cable that consists entirely of twisted pairs shall be permitted.

4.6.4.4.2 Insulation

Each conductor shall be insulated to the thickness required for Type SV, SVO, or SVT cord, and with a compound that complies with the physical requirements for those types.

4.6.4.4.3 Assembly of conductors

The insulated conductors shall be twisted together in accordance with Table 34.

4.6.4.4.4 Shield

4.6.4.4.4.1 General

A shield consisting of a copper braid or a polyester and aluminum foil laminated tape shall be applied over the twisted conductors.

4.6.4.4.4.2 Braid

For thermoset insulation, a coated copper braid shall be used. For thermoplastic insulation, the copper braid shall be bare or coated. Braided shields shall comply with Clause 4.1.5.3.

4.6.4.4.4.3 Tape

Laminated polyester and aluminum foil tape shields shall comply with Clause 4.1.5.4, except that the minimum size of the drain wire shall be 0.519 mm^2 (20 AWG), the minimum thickness of the tape shall be 0.025 mm (0.001 in), and for thermoplastic insulations a coated or uncoated drain wire shall be used.

4.6.4.4.5 Jacket

One of the following shall be applied over the shield:

(a) a jacket having a minimum average thickness of 0.38 mm (0.015 in) and a minimum thickness at any point of 0.33 mm (0.013 in) of a compound that meets the physical requirements for the jacket of Type SV, SVO, or SVT cord;

(b) a nylon covering having a minimum thickness at any point not less than 0.05 mm (0.002 in). In the case of a duplex cable using a bare or tinned copper braided shield, the application of a separator under or over the shield, if desired, shall be permitted; or

(c) for Type ETP, when pairs are used and the shields are not in contact with each other or the circuit conductors, the jacket over the shielded pairs is optional, and webs shall be provided between the support members, between pairs, and between adjacent conductors or groups.

4.6.4.5 Coaxial cable

When required, coaxial cable in Types E, EO, ETT, and ETP shall be permitted as follows:

(a) A coaxial cable shall consist of a center conductor, insulation, shield, and an overall covering in accordance with Item (b).

(b) The overall covering on the coaxial cable shall be one of the following:

(i) PVC jacket with a minimum average thickness of 0.38 mm (0.015 in) and a minimum thickness at any point of 0.33 mm (0.013 in);

(ii) two laps of polyester tape, each with a minimum thickness of 0.025 mm (0.001 in);

(iii) rayon braid; or

(iv) a nylon covering having a minimum thickness at any point of 0.05 mm (0.002 in).

4.6.4.6 Optical-fiber component or cable (optional)

Optical fiber members shall be permitted to contain a metallic element.

4.6.5 Shield

An overall shield in accordance with Clause 4.1.5 shall be permitted.

4.6.6 Jacket

4.6.6.1 The class of jacket to be used on a particular type is shown in Table 31.

4.6.6.2 Jackets shall comply with Clause 4.1.6.

4.6.6.3 The average and minimum thickness of jackets shall be in accordance with Tables 35 and 36.

4.6.6.4 The average and minimum thickness of the jacket shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX J 177-ANCE.

4.6.7 Method of distinguishing conductors

Conductors in Types E and EO cables shall be of readily distinguishable colors.

Conductors in Types ETT and ETP elevator cables shall be coded by one of the following methods:

(a) readily distinguishable colors;

(b) numbers printed in ink on the surface of the insulation; or

(c) a combination of colors and number coding.

4.6.8 Flame test

All finished constructions shall be tested in accordance with Clause 5.1.5.1 (FT1).

4.7 Hoistway cables

Note: *Clause 4.7 includes specific requirements for hoistway cables (see Table 37).*

4.7.1 General

4.7.1.1 These requirements apply to hoistway cables for control and signal applications in elevator hoistways, in accordance with the Rules of the *Canadian Electrical Code, Part I*, the *National Electrical Code*, and the *Mexican Electrical Code*. These cables have a temperature rating of 60 °C or 90 °C and a voltage rating of 300 or 600 V.

4.7.1.2 Constructions rated at 300 V shall consist of twisted assemblies of 2 to 75 conductors.

4.7.1.3 Constructions rated at 600 V shall consist of twisted assemblies of 2 to 75 conductors or parallel constructions of 2 to 4 conductors.

4.7.1.4 Except for short runs not exceeding 1.5 m (5 ft) in length, the parallel constructions are intended for use in raceways into which the cables are laid.

4.7.2 Construction

4.7.2.1 Parallel construction

The parallel construction shall consist of 2 to 4 solid or stranded 0.824 mm^2 (18 AWG) conductors.

4.7.2.2 Twisted construction

The twisted conductor constructions shall consist of 2 to 75 conductors of the following sizes or combination of sizes:

(a) 0.824 mm^2, 1.31 mm^2, 2.08 mm^2, or 3.31 mm^2 (18 AWG, 16 AWG, 14 AWG, or 12 AWG) for 600 V constructions; or

(b) 0.519 mm^2, 0.824 mm^2, 1.31 mm^2, 2.08 mm^2, or 3.31 mm^2 (20 AWG, 18 AWG, 16 AWG, 14 AWG, or 12 AWG) for 300 V constructions.

Twisted constructions of telephone conductor pairs, coaxial cables, optical fiber, or any combination thereof shall be permitted. An overall PVC jacket shall be permitted.

4.7.3 Conductors

4.7.3.1 General

Conductors shall comply with Clause 4.1.1.

4.7.3.2 Stranding

4.7.3.2.1 Solid or stranded conductors shall be permitted.

4.7.3.2.2 Stranded conductors shall have not less than seven wires.

4.7.3.2.3 No special combination of the individual wires of a stranded conductor is required, but simple bunching (untwisted wires) shall not be permitted. The lay of a layer of wires in a concentric assembly shall be not less than 8 nor more than 16 times the layer diameter (the overall diameter of that layer). The lay of the wires in bunch-stranded conductors shall be not more than 64 mm (2.50 in).

4.7.4 Insulation

4.7.4.1 The parallel construction shall be such that the insulated conductors can be readily separated for any distance only after being slit at the end and intentionally torn apart. The parallel construction shall be of individual insulated conductors heat-fused or of conductors laid parallel and insulated in one extrusion.

4.7.4.2 The classes of insulation to be used and the required testing shall be as shown in Table 37.

4.7.4.3 Insulation thickness shall not be less than the values shown in Table 38.

4.7.4.4 The average and minimum thickness of insulation shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.1; UL 1581, Section 250; or NMX J 177-ANCE. In the case of parallel constructions, the minimum wall thickness at the tear after separation shall be not less than the minimum shown in Table 38.

4.7.4.5 Insulation shall comply with Clause 4.1.2 and the test requirements of Clause 5.

4.7.5 Conductor assembly

4.7.5.1 General

The twisted construction shall have the conductors twisted together with a length of lay not exceeding 915 mm (36 in).

4.7.5.2 Duplex cables – telephone pairs (optional)

Duplex cables shall comply with Clause 4.6.4.4.

4.7.5.3 Coaxial cables (optional)

Coaxial cables shall comply with Clause 4.6.4.5.

4.7.5.4 Optical fiber component or optical fiber cable (optional)

Optical fiber members shall be permitted to contain a metallic element.

4.7.5.5 Binder

A suitable binder shall be permitted over the twisted conductor assembly.

4.7.5.6 PVC jacket (optional)

If provided, the classes of jacket to be used and the required testing shall be as shown in Table 37 and shall comply with Clause 4.1.6. The jacket thickness shall not be less than is shown in Table 39. The minimum average and minimum thickness of the jacket shall be determined in accordance with CSA C22.2 No. 0.3, Clause 4.2.6; UL 1581, Section 280; or NMX-J-177-ANCE.

4.7.6 Method of distinguishing conductors

The conductors in the twisted and parallel constructions shall be made distinguishable from each other in accordance with Clause 4.1.9.

4.7.7 Marking

Product and package markings shall be in accordance with Clause 6.5.

5 Performance and test requirements

5.1 Physical properties

5.1.1 Insulation

The physical properties of the various classes of insulation, when tested before and after accelerated aging, shall comply with the applicable requirements given in Table 9. Compliance shall be determined in accordance with the methods described in CSA C22.2 No. 0.3, Clauses 4.3.1, 4.3.2, and 4.3.3; UL 1581, Sections 470 and 480; or NMX-J-178-ANCE.

5.1.2 Jackets

The physical properties of the various classes of jackets, when tested before and after accelerated aging, shall comply with the applicable requirements given in Table 12. Compliance shall be determined in accordance with the methods described in CSA C22.2 No. 0.3, Clauses 4.3.1, 4.3.2, and 4.3.3; UL 1581, Sections 470 and 480; or NMX-J-178-ANCE.

5.1.3 Deformation

5.1.3.1 Insulation

The insulation on single-conductor wires, and on the individual conductors (separated, in the case of parallel cords), shall not decrease by more than 50% in thickness when subjected to a force caused by a mass as shown in Table 40, and while maintained at the temperature shown in Table 40 for 1 h.

5.1.3.2 Jacket

Smoothed specimens of jackets from finished cords and cables shall not decrease by more than 50% in thickness when subjected to a force caused by a mass of 2000 g, and while maintained at the temperature shown in Table 40 for 1 h.

5.1.3.3 Method

Compliance with Clauses 5.1.3.1 and 5.1.3.2 shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.3.6.1; UL 1581, Section 560; or NMX-J-191-ANCE.

5.1.4 Mechanical strength

5.1.4.1 General

In Canada and the United States, the following applies. The mechanical strength of finished jacketed two- or three-conductor 0.824 mm^2 (18 AWG) cords shall be such that no conductor will break when subjected to a force caused by a mass of 68 kg (150lb) for 1 min. For two- or three-conductor 1.04 mm^2 (17 AWG) finished cords, no conductor shall break when subjected to a force caused by a mass of 77 kg (170 lb) for 1 min. Compliance shall be determined in accordance with the method described in Clauses 5.1.4.2 to 5.1.4.5 or CSA C22.2 No. 0.3, Clause 4.17. The weight method shall be considered the referee method.

In Mexico, the following applies. The mechanical strength test is not required.

5.1.4.2 Apparatus

The equipment shall consist of:

(a) a tensile testing machine having a speed of jaw separation of 0.4 mm/s (1 in/min); or

(b) a weight of the value specified for the strength of the specimen and a means for slowly lifting it.

Also required are two clamps or equivalent, capable of tightly holding the specimen while it is under tension, without allowing any strengthening cords to slip and without damaging the cable to the extent of reducing its performance in the test.

5.1.4.3 Specimen preparation

The finished cord shall be secured in the clamps such that there is a minimum 450 mm (18 in) spacing between clamps.

5.1.4.4 Procedure

The required load shall be applied gradually to the specimen. If applied by the lifting of a weight, it shall be centered directly under the lifting point and shall be prevented from rotating. The load shall be maintained for 1 min, after which it shall be removed.

5.1.4.5 Examination

Following application of the load, the specimen shall be removed from the clamps and examined for conductor breakage. Only the straight section between the clamps shall be considered.

5.1.5 Flame tests

5.1.5.1 Vertical flame test – FT1 or FV1

Finished cords and cables shall neither convey flame nor continue to burn for more than 60 s after five 15 s applications of a standard test flame. Compliance shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.11.1; UL 1581, Section 1060; or NMX-J-192-ANCE. A specimen shall be considered to have conveyed flame if more than 25% of the extended portion of the indicator is burned. In parallel construction, the major diameter shall face the burner.

5.1.5.2 Vertical flame test – FT4

Finished cords or cables shall not have a char length in excess of 1.5 m (59 in) when tested in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.11.4; UL 1685, Section 16; or NMX-J-498-ANCE.

5.1.5.3 Horizontal flame test – FT2 or FH

The length of the charred portion of the specimen of cord shall not exceed 100 mm (3.9 in), nor shall flaming particles ignite cotton, when tested in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.11.2; UL 1581, Section 1100; or NMX J 192 ANCE. In parallel constructions, the major diameter shall be in the vertical plane for testing. For non-jacketed constructions, the finished product shall be tested, and the greatest char length on any conductor shall be the char length measured.

5.1.5.4 Vertical flame test – VW-1 or FV2

When the finished cable and the individual insulated conductors within the cable are tested separately, they shall not convey flame, drop flaming particles that ignite cotton, or continue to burn for more than 60 s after any of five 15 s applications of a standard test flame. Compliance shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.11.7; UL 1581, Section 1080; or NMX-J-192-ANCE. A specimen shall be considered to have conveyed flame if more than 25% of the extended portion of the indicator is burned. In parallel construction, the major diameter shall face the burner.

5.1.5.5 Coiled cords

Where sufficient straight (non-coiled) length is not available, coiled cords shall be positioned for testing by pulling the specimen taut, without any unwinding, and then clamping the specimen in place.

5.1.6 Cold bend – all types

The insulation and jacket (if applicable) shall show no cracks when a specimen of the finished cord or cable is conditioned at the temperature specified in Table 41 for 4 h and, while still at the specified temperature, wound the required number of turns around the mandrel having a diameter as specified in Table 42. Compliance shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.12.1; UL 1581, Section 580; or NMX-J-193-ANCE.

5.1.7 Weather resistance – all ″W″ cords

5.1.7.1 General

The insulation on a specimen of the individual conductor of types CXWT[c] and CXTW[u] and on finished Type PXWT[c] and the jacket of other Type "W" cords shall comply with the following requirements:

(a) It shall show no cracks when wound one complete turn around a mandrel having a diameter as shown in Table 42 while at a temperature of –30 °C ± 1 °C for a period of 1 h. During the bending, the conditioned surface shall be opposite the surface contacting the mandrel. The specimen shall be allowed to rest 16 h to 96 h before conducting the cold bend test.

(b) It shall have a retention of average tensile strength and elongation of not less than 80%. Conditioned and unaged sets (five specimens each) shall be allowed to rest 16 h to 96 h, followed by physical properties testing. Conditioned surfaces required to be diecut shall not be buffed or skived away.

5.1.7.2 Test method

Weather resistance conditioning shall be performed using 720 h xenon arc in accordance with CSA C22.2 No. 0.3, Clause 4.10.3; UL 1581, Section 1200; or NMX-J-553 ANCE.

5.1.8 Heat-shock resistance

5.1.8.1 PVC and TPE insulations

The insulation shall show no cracks when specimens of finished unjacketed cords and specimens of the individual conductors from jacketed cords and types CXWT[c], CXTW[u], and TX[c] are exposed to a temperature of 121 °C ± 2 °C for PVC or TPE rated at 60 °C, or 150 °C ± 2 °C for TPE rated in excess of 60 °C for 1 h while wound six close turns around a mandrel having a diameter as shown in Table 43. The specimen shall show no cracks when unwound from the mandrel after cooling to room temperature.

5.1.8.2 PVC- and TPE-jacketed cords and cables

The jacket and insulation on specimens of the finished cords and cables shall show no cracks after being subjected to a temperature of 121 °C ± 2 °C for PVC or TPE rated at 60 °C, or 150 °C ± 2 °C for TPE rated in excess of 60 °C for 1 h while wound around a mandrel having a diameter as shown in Table 44. The jacket and insulation shall not crack when unwound from the mandrel after cooling to room temperature.

5.1.8.3 Test method

Compliance with Clauses 5.1.8.1 and 5.1.8.2 shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.23.1; UL 1581, Section 540.1; or NMX-J-190-ANCE.

5.1.9 Bend test on nylon-covered conductors

A nylon covering over an individual insulated conductor (see Clause 4.1.3.4) or on a SPT-1 cord (see Clause 4.3.9.4) shall not show any cracks when wound six complete close turns around a mandrel having the same diameter (minor diameter in the case of a SPT-1 cord) as the finished conductor after specimens have been subjected to the air oven aging test applicable to the insulation class. Following the air oven test, the specimen shall be allowed to cool for 16 h to 96 h prior to flexing. Wrinklings or folds in the nylon do not constitute failures.

5.1.10 Tightness of insulation test

5.1.10.1 The insulation of Types CXWT[c] and CXTW[u] shall be applied tightly to reduce slipping of the conductor in the insulation when each conductor is subjected to the procedure outlined in Clause 5.1.10.2. The insulation on parallel cords other than Type TPT, shaver cords[u], NISP[m,u], NISPE[m,u], or NISPT cords shall be applied tightly to reduce slipping of the insulation when subjected to the procedure outlined in Clause 5.1.10.3.

5.1.10.2 A straightened sample of each conductor, 275 mm (10.8 in) long, shall have 50 mm (2 in) of insulation and any separator stripped from one end. At the other end of the sample, the insulation shall be split longitudinally for 75 mm (3 in), thereby providing a specimen of insulated conductor 150 mm (6 in) long. The 75 mm (3 in) conductor shall be cut and removed and the empty insulation and any separator shall be taped back together. A weight of 1.81 kg (4 lb) shall be attached to the specimen by tying the taped insulation to the weight. The bare conductor at the other end shall be secured in a clamp or other support device, and the weight shall be gently lowered and released for a period of 30 s. With the weight and specimen thus suspended vertically, slipping of the conductor, separator, or combination thereof shall not exceed 3 mm (0.11 in). Measurement shall be made at the top of the specimen at the point at which the bare conductor enters the insulation.

5.1.10.3 A 407 mm (16 in) length of cord shall have 50 mm (2 in) of insulation and any separator stripped from both circuit conductors at each end to provide a 305 mm (12 in) test specimen. One bare circuit conductor shall be cut off even with the insulation at one end of the specimen, and the other bare circuit conductor shall be cut off even with the insulation at the other end of the specimen. Any grounding conductor shall be cut off even with the insulation at both ends of the specimen. A weight of 3.63 kg (8 lb) shall be attached to the stripped circuit conductor at one end, and the weight and attached specimen shall then be supported at the stripped end of the other circuit conductor for a period of 30 s. With the weight and specimen thus suspended, slipping of either single conductor, separator, or combination thereof shall not exceed 3 mm (0.11 in). Measurement shall be determined from the point where the conductor is cut off even with the insulation.

5.1.11 Swelling and blistering – Types SJOW, SJOOW, SOW, and SOOW

5.1.11.1 General

The jacket of a 10 m (33 ft) length of finished cord shall neither blister nor increase the cord diameter by more than 20% after the specimen of finished cord has been immersed continuously in water for two weeks at 50 °C±1 °C. Compliance shall be determined with the apparatus and in accordance with the method described in Clauses 5.1.11.2 and 5.1.11.3; CSA C22.2 No. 0.3, Clause 4.27; or UL 1581, Section 1043.

5.1.11.2 Procedure

The specimen shall be marked at 1 m (40 in) from each end of the specimen and at intervals of 2 m (80 in) between these outer marks. Diameter measurements shall be made at these marks using a micrometer caliper. The average diameter shall be calculated and recorded as *d*. The specimen, except for the ends, shall be immersed in water and maintained at the required temperature for the specified period. Following immersion, the specimen shall be taken from the water and blotted with a clean, lint-free cloth to remove excess liquid.

5.1.11.3 Examination

The specimen shall immediately be examined for blisters, re-measured at each of the marked locations, and the average diameter recorded as d_1.

5.1.11.4 Calculation

The following calculation for diameter increase shall be made:

Percentage increase in diameter = $[(d_1 - d)/d]$ x 100

5.1.12 Durability of printing

5.1.12.1 General

Surface-printed markers shall be complete and legible after two samples have been tested in accordance with Clauses 5.1.12.2 to 5.1.12.6.

5.1.12.2 Specimen preparation

Two 300 mm (1 ft) specimens of the finished wire bearing the surface-applied markings shall be tested.

5.1.12.3 Apparatus

The apparatus shall consist of a:

(a) forced-air oven complying with CSA C22.2 No. 0.3, Clause 4.3.2.1; UL 1581, Section 420.9; or NMX-J-417; and

(b) 450 g ± 5 g (1.00 lb ± 0.01 lb) weight having a layer of craft felt (not having more than 30% wool content, the remainder being rayon) approximately 1.2 mm (0.05 in) thick securely attached to a machined flat surface with dimensions of 25 × 50 mm (1 × 2 in).

5.1.12.4 Exposure

One specimen shall be heated in a forced-air oven at the rated temperature of the flexible cord for 24 h, and the second specimen shall be at room temperature for a minimum of 24 h.

5.1.12.5 Procedure

Upon removal from the oven, the specimen shall be allowed to cool to room temperature for 1 h. Following the rest period, the specimen shall be laid on a solid flat surface with the printing up. The weight having the 50 mm (2 in) dimension with the attached felt shall be slid back and forth over the length of the specimen. The time to perform the operation shall be 5 s to10 s. This operation shall be repeated two more times. The same procedure shall be performed on the “as received’’ specimen conditioned at room temperature.

5.1.12.6 Result

The printing on both specimens shall be examined for legibility.

5.1.13 Dry temperature rating of new materials (long-term aging test)

5.1.13.1 Scope

This test verifies the dry temperature rating of new materials and establishes short-term air-oven aging parameters and requirements.

Notes:

(1) The long-term aging test evaluates a material for its dry temperature rating only. Other properties are evaluated based on requirements in the applicable wire and cable standard.

(2) For the product standard, after sufficient experience with a new material has been compiled, the material will be submitted for inclusion in the standard in a timely manner.

5.1.13.2 Apparatus

The apparatus shall be as specified in CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE.

5.1.13.3 Preparation of specimens

5.1.13.3.1 Specimens shall be prepared as described in CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE.

5.1.13.3.2 The total number of specimens in the oven shall enable removal of specimens in sets of six at a time, in intervals of 90 d, 120 d, and 150 d and, at the manufacturer's request, in additional intervals of 180 d and 210 d.

5.1.13.4 Procedure

5.1.13.4.1 The specimens shall be aged at the temperature determined in Clause 5.1.13.4.2 as described in CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE.

5.1.13.4.2 The oven temperature, *T*test, shall be 102% of the desired temperature rating expressed on the Kelvin scale. This temperature shall be calculated, in °C, using the following formula (Ttest shall be rounded to the nearest whole number):

$$T\text{test (°C)} = 1.02 \times (273.15 + T\text{rating (°C)}) - 273.15$$

Note: The test temperatures applied for the most common temperature ratings are as follows:

Test temperature for dry temperature rating of new materials

Temperature rating (°C)	60	75	80	90	105	125	150	180	200	250
Aging temperature (°C)	67	82	87	97	113	133	158	189	209	260

5.1.13.4.3 Sets of six specimens shall be removed at the intervals specified in Clause 5.1.13.3.2.

5.1.13.4.4 Test specimens in each set shall be tested individually for ultimate elongation and tensile strength as described in CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE. The ultimate elongation and tensile values for each set of specimens shall be averaged for each aging time interval. If the results of one or more of the six specimens differ significantly, discarding the results from only one specimen shall be permitted.

5.1.13.5 Results and calculations

5.1.13.5.1 The ultimate elongation and tensile strength shall be calculated in accordance with CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE.

5.1.13.5.2 The ultimate elongation or tensile strength at 300 d shall be determined by the following formula:

$$U(t) = U90 \times e^{-R(t - 90)}$$

where

$U(t)$ = ultimate elongation, %, or tensile strength, MPa (lbf/in^2)

$U90$ = regression constant (ultimate elongation or tensile strength computed at 90 d)

R = decay constant as determined in Clause 5.1.13.5.4

t = time, d

See Annex F for a sample calculation.

5.1.13.5.3 The variables in the formula, transformed as $Y = \ln[U(t)]$, $B = \ln[U90]$, and $T = (t - 90)$, convert the formula into linear form $Y = B + RT$.

5.1.13.5.4 Using the 90 d and longer-term data, the constants B and R shall be determined by least squares linear regression. The projected ultimate elongation or tensile strength at 300 d shall then be calculated using the formula in Clause 5.1.13.5.2.

5.1.13.5.5 The ultimate elongation calculated for 300 d shall not be less than 50%. The tensile strength calculated for 300 d shall not be less than 2 MPa (300 lbf/in^2) for insulation intended for use under a jacket or armour and not less than 4 MPa (600 lbf/in^2) for jackets and for unjacketed insulation.

5.1.13.5.6 Following the determination of the temperature rating, the parameters and requirements for the short-term air-oven aging test as described in CSA C22.2 No. 0.3, Clauses 4.3.1 to 4.3.3; UL 1581, Sections 460 and 480; or NMX-J-178-ANCE shall be established in accordance with Annex G.

5.1.13.6 Report

The report shall include, as a minimum, the following:

(a) verification of the dry temperature rating; and

(b) short-term air-oven aging parameters and requirements.

5.2 Electrical properties

5.2.1 Spark test

All individual insulated conductors and the jacket of finished duplex or coaxial cable intended for incorporation in completed Type E, EO, ETT, and ETP cables; all individual insulated conductors (including the grounding conductor) intended for incorporation in completed cords and cables; and all finished integral constructions shall withstand a spark test using an ac test voltage as shown in Table 45. For the spark test on three conductor integral constructions, the grounding conductor need not be connected to either of the other conductors, to the ground, or to any part of the electrical test circuit while the cord is being run through the electrode. DC spark testing is optional (see Note to Table 45). Compliance shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.28.3; UL 1581, Section 900; or NMX J 473 ANCE. As an alternative to the spark test, the finished cord or cable shall comply with the dielectric strength test described in Clause 5.2.2.

5.2.2 Dielectric strength for all finished types

The individual insulated conductors of finished flexible cords and cables shall be capable of withstanding for 1 min, without breakdown, the application of an alternating (rms) voltage as indicated in Table 46, between each insulated conductor and between the insulated conductors and any other conductive components and ground, on a specimen at least 15 m (50 ft) in length. All “W” Type cords shall be conditioned in water for a period of at least 6 h prior to testing. All indoor cords shall be conditioned in air at room temperature for a period of at least 6 h prior to testing.

The dielectric strength test shall be performed in accordance with CSA C22.2 No. 0.3, Clause 4.28.1.2, Method No. 1; UL 1581, Section 800; or NMX-J-293-ANCE.

5.2.3 Insulation resistance

5.2.3.1 Insulation resistance for all ″W″ Type cords at 15°C

The insulation resistance of the insulated conductors shall be not less than shown in Table 47 or 48 when a specimen of at least 15 m (50 ft) of the finished cord is tested in water at 15 °C immediately following the dielectric strength test described in Clause 5.2.2. If tested at temperatures different than 15 °C, the values shall be corrected to 15 °C.

5.2.3.2 Insulation resistance for all indoor cords at room temperature

The insulation resistance of the insulated conductors shall be not less than 0.76 GΩ•m (2.5 MΩ•1000 ft) at 15 °C when a specimen of the finished cord at least 15 m (50 ft) in length is tested in air at 15 °C or higher after conditioning for at least 6 h and immediately following the dielectric strength test described in Clause 5.2.2.

5.2.3.3 Test method

Compliance with all insulation resistance tests shall be determined in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.28.2.1 and Table 15; UL 1581, Section 920; or NMX-J-294-ANCE.

5.2.4 Permittivity and stability factor

5.2.4.1 Permittivity –″W″ Type cords

5.2.4.1.1 When tested in accordance with CSA C22.2 No. 0.3, Clause 4.28.4; UL 1581, Section 1020; or NMX-J-040-ANCE, the permittivity of the insulation shall be as follows:

(a) after 14 d of immersion the capacitance shall not be more than 10% greater than the capacitance measured after the first day; and

(b) after 14 d of immersion the capacitance shall not be more than 3% greater than the capacitance measured after 7 d.

5.2.4.1.2 Tests shall be made using three 5 m (16 ft) specimens of insulated conductor. Specimens shall be

(a) tested without any polyester tape or similarly non-absorptive separator; and

(b) selected before assembly into finished cord.

The middle 3 m (10 ft) of each specimen shall be immersed continuously in tap water in a temperature of 50 °C ± 1 °C for thermoset insulation or 60 °C ± 1°C for thermoplastic insulations for 14 d. The 1 m (3 ft) end portions of each specimen shall be kept dry above the water as leakage insulation. A cover for the tank shall be placed directly above the surface of the water. The water level shall be kept constant.

5.2.4.2 Stability factor – ″W″ Type cords

5.2.4.2.1 When tested in accordance with Clause 5.2.4.2.2; UL 1581, Section 1000; or NMX-J-040-ANCE, the insulation shall meet the following requirements:

(a) the stability factor (the numerical difference between the percentage power factors measured with current at average stresses of 3150 V/mm and 1575 V/mm (80 V/mil and 40 V/mil)) after the fourteenth day of immersion shall not be greater than 1.0; or

(b) the difference between the stability factors measured after the first and fourteenth days shall not be greater than 0.5.

5.2.4.2.2 Tests shall be made using three 5 m (16 ft) specimens of insulated conductor. Specimens shall be:

(a) tested without any polyester tape or similarly non-absorptive separator; and

(b) selected before assembly into finished cord.

The middle 3 m (10 ft) of each specimen shall be immersed continuously in tap water at a temperature of 50 °C ± 1 °C for thermoset insulations or 60 °C ± 1 °C for thermoplastic insulations for 14 d. The 1 m (3 ft) end portions of each specimen shall be kept dry above the water as leakage insulation. A cover for the tank shall be placed directly above the surface of the water. The water level shall be kept constant.

5.2.4.2.3 The percentage power factor of each specimen shall be measured with a 60 Hz current at average stresses of 3150 V/mm and 1575 V/mm (80 V/mil and 40 V/mil) after 1 d and 14 d total immersion, and each result shall be expressed to the nearest 0.1. The stability factor of each specimen shall then be computed and expressed to the nearest 0.1.

5.2.4.2.4 The stability factor difference shall then be computed for each specimen. This value is the numerical difference between the stability factors measured after 1 d and 14 d and shall be expressed to the nearest 0.1.

5.2.5 Standard arcing test for Type HPN

5.2.5.1 General

Type HPN cord shall not arc when a specimen of finished cord is connected at one end to a 120 V (rms) source of supply through a 15 A fuse or circuit breaker and subjected to a standard test flame applied 13 mm (0.5 in) from the other end of the specimen for 2 min. Compliance shall be determined in accordance with the method described in Clause 5.2.5.2; CSA C22.2 No. 0.3, Clause 4.28.12; or UL 1581, Section 1670.

5.2.5.2 Test method

The specimen for test shall be of any suitable length. One end shall be cut off square, care being taken that the conductor ends are flush with the cut end of the cord. The cord shall be laid across a nonconductive surface, the square cut end protruding approximately 0.1 m (4.0 in) beyond the surface edge. The opposite end shall be connected to the voltage source between the conductors of a two-conductor cord and between the circuit conductors joined together and the grounding conductor of a three-conductor cord. Using a Tirrill, Bunsen, or similar appropriate gas burner, a standard test flame (as described in Clause 5.1.5.1) shall be obtained. With its barrel vertical, the burner shall be placed under the free end of the cord with the tip of the inner blue cone touching the flat underside of the specimen midway between the conductors and 13 mm (0.5 in) from the square end for a 2 min period. The cord does not comply if arcing occurs between the conductors during application of the flame or if the fuse or circuit breaker opens.

5.2.6 Flex arcing test for Type HPN

5.2.6.1 Specimen preparation

At least three separate specimens of Type HPN cord, each 1 m (3 ft) long, shall be tested. Specimens of two- and three-conductor cords shall be flexed until all of the strands in one circuit conductor break. This shall be achieved by:

(a) clamping the cord in a flexing machine so that approximately 60 cm (2 ft) of the cord is free to hang from the clamping device (e.g., appropriate strain-relief-type bushing);

(b) applying a weight as specified below to the cord that hangs from the clamping device on the flexing machine, 216 mm (8.5 in) below the clamping device; and

Size of conductor, mm^2 (AWG)	Weight, g (lb)
0.824 (18)	907 (2)
1.04 (17)	1134 (2.5)
1.31 (16)	1360 (3)
2.08 (14)	1814 (4)
3.31 (12)	2268 (5)

(c) using a flexing cycle consisting of bending the cord (i.e., edgewise, not flatwise) to a position 90° from the vertical, back through 180° from that position, and then back to the vertical.

After one circuit conductor breaks, the flexing machine shall stop automatically, and the specimen shall be examined for deterioration of the insulation. If there is evidence of splitting or cracks in the insulation, or of conductor strands protruding through the insulation, such specimens shall be discarded, and the value of the weight reduced as necessary to obtain sufficient specimens that do not exhibit this deterioration. To detect breakage, the test circuit shall consist of 24 V ac and a maximum current of 200 mA.

5.2.6.2 Procedure

The procedure shall be as follows:

(a) Each specimen shall be wrapped closely with four single layers of cheesecloth,* approximately 5 cm (2 in) wide, over the location of the break in the circuit conductor, and the combination of the cord and the cheesecloth shall then be clamped by a strain-relief device (e.g., a strain-relief bushing) which is then secured in a sheet metal bracket mounted on a wooden base (see Figure 7). The cord shall be positioned in the strain-relief device so that the break in the circuit conductor is located approximately 0.6 cm (0.25 in) from the front face of the strain-relief device. The strain-relief device shall be secured in the bracket so that its axis is in a horizontal position.

*** Bleached cheesecloth running 8 to 9 m^2/kg (16 to 17 yd^2/lb) and having a count of approximately 28 by 24 is acceptable.**

(b) The ends of each specimen of the circuit conductor (with the break) shall be connected in a 120 V ± 2 V ac circuit in series with a resistive load as indicated in Figure 8. The variable resistor shall be adjusted so that the following currents are flowing in the circuit conductor under test:

Size of conductor, mm^2 (AWG)	Current flowing in cord, A
0.824 (18)	10 ±0.5
1.04 (17)	13 ±0.5
1.31 (16)	15 ±0.5
2.08 (14)	20 ±0.5
3.31 (12)	30 ±0.5

(c) With power ON, the cord shall be grasped approximately 20 cm (8 in) from the break in the circuit conductor and the cord moved about so that contact is made and broken, at a rate of 15 to 20 cycles per min, between the ends of the circuit conductor where it is broken. A make and break is considered one cycle.

A minimum of three specimens of Type HPN cord shall be tested, and each specimen shall be caused to make and break the circuit for 20 cycles.

If there is perforation of the insulation due to arcing, as evidenced by burning or charring of the cheesecloth, the test shall be stopped. Perforation in 20 cycles or less indicates a failure.

If 20 cycles cannot be completed on a specimen because contact can no longer be made between the broken ends of the circuit conductor, that specimen shall be replaced and the foregoing test repeated.

5.2.7 Continuity of conductors

5.2.7.1 General

The conductors in every length of finished flexible cord and cable shall be continuous. Compliance shall be determined in accordance with Clauses 5.2.7.2 and 5.2.7.3 or CSA C22.2 No. 0.3, Clause 4.28.11.

5.2.7.2 Procedure

Each of the conductors of the flexible cord shall be connected in series with an ac or dc source of voltage less than 30 V, and a means of indicating an unbroken circuit (e.g., an incandescent lamp, a bell, or a buzzer).

5.2.7.3 Indication of continuity

Operation of the indicator shall be evidence of continuity of the conductor under test.

5.2.8 Conductor corrosion

5.2.8.1 General

A bare (uncoated) copper insulated conductor shall show no evidence of corrosion when tested in accordance with Clause 5.2.8.2 or UL 1581, Section 500.

5.2.8.2 Procedure

Bare copper conductors shall be removed from specimens of the finished cable or cord and from aged specimens subjected to the air oven test described in Table 9 for the compound class used and shall not show any evidence of corrosion (normal oxidation or discoloration of the copper shall be disregarded) when examined under normal or corrected-to-normal vision.

5.2.9 Flexing of shielded cords (see Clause 4.1.5.6)

5.2.9.1 Six specimens, each approximately 5 m (15 ft) long, shall be cut from a sample length of the finished shielded flexible cord. The test shall be conducted at 23 °C ± 5 °C using the apparatus as described in Figure 9. The pulleys shall be mounted on the shuttle so that the specimen is horizontal as it passes between the pulleys. The weight, pulleys, and current used in the test shall be as indicated in Table 49. The clamps at the ends of the specimens shall be positioned as shown in relation to the stops so that the pull is always applied by the weight away from which the shuttle is moving. The circuit conductors in the specimen(s) shall be connected in series and shall carry the current indicated in Table 49 throughout the test. The circuit shall include a means for counting the number of cycles until 15 000 cycles have been completed or until a circuit conductor opens, thereby opening the circuit and stopping the test.

5.2.9.2 With a specimen in place and rated current flowing in the circuit conductors, the shuttle shall be started in its horizontal reciprocating motion. The motion shall be constant at the rate of 0.4 m/s (1.3 ft/s) or 12 cycles per min, each cycle consisting of one complete back-and-forth motion through a stroke of approximately 1 m (3 ft). The motion shall be continued until 15 000 cycles have been completed or until a circuit conductor opens and the test stops automatically after fewer cycles.

5.2.9.3 The cord is not acceptable if any circuit conductor opens in fewer than 15 000 cycles in any of the six specimens tested.

5.2.10 Jacket resistance

5.2.10.1 A nonintegral jacket of thermoplastic or thermosetting material shall exhibit 100 mΩ or more resistance when a specimen of the finished cord is tested in accordance with Clause 5.2.10.2 or UL 1581, Section 1340.

5.2.10.2 A length of at least 100 mm (4 in) of the finished cord shall be tested at any humidity and at a temperature of 23.0 °C ± 2.0 °C. For referee purposes, the relative humidity shall be 50% ± 5%. The entire length and circumference of the outer surface of the jacket shall be wiped with a soft, clean, lintless, absorbent cloth with nothing but the cloth touching the center 50 mm (2 in) portion of the specimen. Two strips of metal foil 13 mm (0.5 in) wide shall then be wrapped snugly around the cord with the strips separated by a distance of 13 mm (0.5 in). Only air shall touch the jacket between the strips during application of the foil and during the rest of the test. Each of the foil strips shall be connected to a megohmeter. The direct reading shall be taken after 500 V dc has been impressed on the sample for 1 min.

5.2.11 AC leakage current test for low-leakage cords

5.2.11.1 Test method

The ac leakage current test shall be performed in accordance with Clauses 5.2.11.2 and 5.2.11.3 or UL 1581, Section 1320.

5.2.11.2 Each circuit conductor to grounding conductor

A 3 m (10 ft) length of finished cord shall be formed into a coil of 2 complete turns and placed on a wooden surface. At one end, the cord shall be cut flush and perpendicular to its axis. On the other end, the circuit conductors and the grounding conductor shall be connected to 120 V or 240 V ac voltage with a series resistance. The leakage current shall be determined by dividing the voltage indicated by the voltmeter by the accurately known resistance of the resistor.

5.2.11.3 Each circuit conductor through jacket to foil

The test procedure described in Clause 5.2.11.2 shall be followed, except a metal foil wrapped tightly around the cord shall be used in lieu of the grounding conductor.

5.3 Tests for hoistway cables

5.3.1 Flame test

Finished parallel constructions, finished twisted constructions, and the individual insulated conductors of twisted constructions shall be tested in accordance with Clause 5.1.5.1.

5.3.2 Heat-shock resistance test

5.3.2.1 General

When tested in accordance with the method described in CSA Standard C22.2 No. 0.3, Clause 4.23.1; UL 1581, Section 540; or NMX-J-190-ANCE, the insulation shall show no cracks, either externally or internally. A finished parallel construction or one of the insulated conductors of the twisted construction shall be wound six adjacent turns around a mandrel having a diameter equal to the minor axis of the cable, in the case of the parallel construction, or equal to the diameter of the specimen of the insulated conductor, in the case of the twisted construction. The sample shall then be exposed for 1 h to a temperature of 121 °C ± 2 °C. After exposure and while still on the mandrel, specimens shall withstand the dielectric strength test of Clause 5.3.4. The insulation shall show no cracks when the specimen is unwound from the mandrel following the dielectric strength test.

5.3.2.2 Twisted conductor construction of hoistway cables with an overall jacket rated 60 °C

The jacket and insulation on twisted conductor hoistway cables rated 60 °C shall show no cracks when specimens of the finished cable are exposed to a temperature of 121 °C± 2 °C, for a period of 1 h while wound around a mandrel having a diameter as specified in Table 50.

5.3.2.3 Twisted conductor construction of hoistway cables with an overall jacket rated at 90 °C

The jacket and insulation on twisted conductor construction of hoistway cables rated at 90 °C shall show no cracks when specimens of the finished cable are exposed to a temperature of 121 °C ± 2 °C for a period of 1 h while wound around a mandrel having a diameter as specified in Table 51.

5.3.2.4 Test method

The test referenced in Clauses 5.3.2.2 and 5.3.2.3 shall be performed in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.23.1; UL 1581, Section 540; or NMX-J-190-ANCE.

5.3.3 Cold bend test

5.3.3.1 The tests in Clauses 5.3.3.2 and 5.3.3.3 shall be performed in accordance with the method in CSA C22.2 No. 0.3, Clause 4.12.1; UL 1581, Section 580; or NMX J-193-ANCE.

5.3.3.2 The insulation shall show no cracks when a specimen of finished parallel construction, or of one of the insulated conductors of a twisted construction, is wound six close turns around a mandrel having a diameter as specified in Table 52, immediately following exposure at –20 °C ± 1 °C for 4 h.

5.3.3.3 The jacket and insulation on the individual conductors of twisted conductor construction hoistway cables with an overall jacket shall show no cracks when a specimen of the finished cable is conditioned at –20 °C ± 1 °C for 4 h and, while still at this temperature, is wound the required number of turns around a mandrel having a diameter as specified in Table 53.

5.3.4 Dielectric strength

The insulation on a specimen of finished parallel construction and on a specimen of insulated conductor of a twisted construction subjected to the heat-shock resistance test of Clause 5.3.2 shall withstand for 1 min, without breakdown, an alternating (rms) potential of 1500 V between the conductor and the tap water in which the specimen has been immersed, except for its ends, for a period of 1 h, when tested in accordance with the method described in CSA C22.2 No. 0.3, Clause 4.28.1.1; UL 1581, Section 820; or NMX-J-293-ANCE.

6 Marking

6.1 General

In addition to the required markings for finished cords and cables covered in Clauses 6.2 and 6.3, additional marks necessary for specific national applications shall be permitted. See Annex E for marking translations.

6.2 Product marking

6.2.1 General

6.2.1.1 Unless otherwise specified, the marking shall consist of surface printing, indent marking, embossing, or a marker tape under the jacket. No ampacity or other current designation (except as noted in Clauses 6.2.4, Item (f), 6.6.3, and 6.7.3) or the word “outdoor” shall appear on the flexible cord, elevator cable, or hoistway cable.

6.2.1.2 In Mexico and the United States, the following applies. In the absence of smooth areas on the surface of a jacketed cord, the markings shall be acceptable if durably and legibly printed at intervals no longer than 600 mm (24 in) on a marker tape in the cord. In Canada, the following applies. The use of a marker tape under the jacket shall be permitted only if the print is legible through the jacket.

6.2.2 Intervals

If the marking is not continuous, it shall appear at a maximum interval of 600 mm (24 in).

6.2.3 Required markings on all cords

See Clause 6.5.1 for hoistway cables, Clause 6.6.3 for additional markings for recreational vehicles, and Clause 6.7.3 additional markings for mobile homes and recreational vehicles. All other flexible cords or cables covered by this Standard shall have the following markings:

(a) a durable distinctive marking throughout its entire length by which the organization responsible for the product is readily identified (examples of acceptable means are name, trademark, or an assigned combination of colored marker threads);

(b) the type designation;

(c) the maximum temperature rating;

(d) the number of conductors and sizes.

In Canada and Mexico, the size marking shall be mm^2 (AWG).

In the United States, the size marking shall be AWG with optional mm^2; and

Note: *"mm^2" may be replaced by "mm2". The use of either a comma or a period signifies a decimal. For example:*

(1) **3 X 3.31 mm^2 (12 AWG) or 3 X 3,31 mm^2 (12 AWG); and**

(2) **3/C 3.31 mm^2 (12 AWG) or 3/C 12 AWG (3.31mm^2).**

e) voltage rating.

6.2.4 Additional surface markings on finished product

The following markings, where applicable, shall be surface-marked on the finished product:

(a) the low temperature rating for "W" type cords, when rated –50 °C, –60 °C, or –70 °C;

(b) the word "SHIELDED" for cords that are provided with a shield;

(c) the words "METAL SUPPORT MEMBER" for cords that are provided with a metal core in accordance with Clause 4.1.11.3;

(d) for cords consisting of TPE insulation and jacket other than "E"[u] type cords, the marking "(TPE)" following the type designation, e.g., "SJT (TPE)";

(e) "Green conductor for Grounding Only" or "Green conductor with yellow stripes for Grounding Only" for all integral parallel types, and

(f) for low-leakage cords conforming to Clause 4.3.14, the wording "Max leakage/3m at __V: __ µA to green and µA thru jacket" or "Max. leakage/10 ft. at __V: __ µA to green and µA thru jacket" with applicable values from Table 24 inserted.

6.2.5 Flame test marking

In Canada and the United States, the following applies. Products complying with the applicable flame test shall be marked with at least one of the following:

(a) the legend “FT1”, to indicate compliance with the flame test requirements of Clause 5.1.5.1;

(b) the legend “FT4”, to indicate compliance with the flame test requirements of Clause 5.1.5.2;

(c) the legend “FT2”, to indicate compliance with the flame test requirements of Clause 5.1.5.3; or

(d) the legend “VW-1”, to indicate compliance with the flame test requirements of Clause 5.1.5.4.

Note: *Products marked with ″***FT4***″ need not be marked ″***FT1***″ or ″***FT2***″.* *Products marked with ″***VW-1***″ need not be marked ″***FT1***″ or ″***FT2***″.* *Products marked with ″***FT1***″ need not be marked ″***FT2***″.*

In Mexico, the following applies. Flame test markings shall be optional. Use of the following flame markings shall be permitted: “FH” or “FT2”; “FV2” or “VW-1”; “FV1” or “FT1”; and “FT4”.

6.2.6 Oil-resistance marking

6.2.6.1 Oil-resistance jacket

A cord having an oil-resistant jacket complying with the specified oil test in Table 12 shall have the letter “O” included in the type designation (e.g., SJO, STOW, and SEO^{U}).

6.2.6.2 Oil-resistant insulation and jacket

A cord having both an oil-resistant insulation and jacket complying with the specified oil test in Tables 9 and 12 shall have the letter suffix “OO” included in the type designation (e.g., SJOOW, STOO, and SEOO^{U}).

6.3 Optional markings

The following additional information may be printed on the finished product if desired by the manufacturer:

(a) the wording “water resistant” or “water resistant 60 °C” for “W” type cords;

(b) a part, specification, or catalog designation or other required information, providing it is in no way confusing or misleading;

(c) compound identification expressed in a singular form when the insulation and jacket are of the same material (e.g., “CPE”) or expressed in a dual form listing the insulation first and the jacket last when not using common materials (e.g., “PVC/TPE”); and

(d) the marking “–40 °C” for “W” type cords complying with the mandatory –40 °C test.

6.4 Package marking

Notes:

(1) *See Annex E for information on translation of caution markings.*

(2) *For hoistway package marking, see Clause 6.5.2.*

6.4.1 A tag on which the information specified in Items (a) to (f) is indicated plainly shall be attached to every shipping length of finished wire or cable. However, if the wire or cable is wound on a reel or coiled in a carton, the tag shall be glued, tied, stapled, or otherwise acceptably attached to the reel or carton instead of to the wire or cable, or the tag shall be eliminated and the information printed or stenciled directly onto the reel or carton. The required information is as follows:

(a) manufacturer's name, assigned file number, registered trade name, or trademark;

(b) manufacturer's marker, if marker threads are used;

(c) date of manufacture by month and year (a code is acceptable);

(d) type designation: "clock" in the case of clock cord[u]; "shaver cord" in the case of shaver cord[u];

(e) voltage rating; and

(f) the conductor size(s) and number of conductors.

6.4.2 Products complying with Note (2) of Table 13 shall be tagged, marked, or otherwise labelled "Small or large diameter cord in process" and "Not for general use".

6.4.3 A cable that contains one or more optical fibers shall be tagged, marked, or otherwise labelled with the following statement or another statement to the same effect:

″Optical-fiber portion(s) of cable are for installation (optical and electrical functions associated) as described in applicable parts of the Canadian Electrical Code, Part I, the National Electrical Code (NFPA 70), and the Mexican Electrical Code (NOM 001-SEDE), with levels of energy transmitted not exceeding those of Class I laser radiation (21 CFR Part 1040).″

For a cable that contains one or more optical-fiber members with any individual optical fiber member or group of such members having a metal or other electrically conductive part, the following wording or other wording to the same effect shall be provided:

″Optical-fiber portion(s) of cable contain non-current-carrying metal or other electrically conductive parts″.

6.4.4 In Canada and the United States, the following applies. The tag, reel, or carton shall show the following information:

(a) for Type SPT-2 cords having conductors composed of 0.051 mm^2 (30 AWG) wires: "For use in general use extension cord sets only"; and

(b) for Types PXT[c] and SPT-1 0.519 mm^2 (20 AWG): "Not for sale to the general public".

In Mexico, these requirements do not apply.

6.5 Hoistway cables

6.5.1 Product marking

The manufacturer's name, "Hoistway Cable", voltage rating, flame rating, and temperature rating shall be durably and legibly printed in ink on the surface of at least one of the conductors of a parallel construction or a twisted construction without a jacket (in a multi-layer cable, the marking shall appear on one of the wires in the outer layer), or on the surface of the jacket of twisted constructions with a jacket. Each conductor shall have its size durably and legibly printed in ink, except in the case of the parallel construction, where marking one conductor with the number and size of conductors indicated in Clause 6.2.3, Item (d), shall be permitted. The number and size of the conductors shall also be marked on the surface of jacketed cables. The distance between the required markings shall not exceed 600 mm (24 in).

6.5.2 Marking on coils, spools, and reels

A tag on which the information specified in Items (a) to (f) is indicated plainly shall be attached to every shipping length of finished wire or cable. However, if the wire or cable is wound on a reel or coiled in a carton, the tag shall be glued, tied, stapled, or otherwise acceptably attached to the reel or carton instead of to the wire or cable, or the tag shall be eliminated and the information printed or stenciled directly onto the reel or carton. The required information is as follows:

(a) manufacturer's name;

(b) date of manufacture by month and year;

(c) type designation "Hoistway Cable"

(d) voltage rating;

(e) conductor size(s) and number of conductors;

(f) temperature rating;

(g) for a cable that contains one or more optical fibers, the following statement or another statement to the same effect: ″Optical-fiber portion(s) of cable are for installation (optical and electrical functions associated) as described in applicable parts of the Canadian Electrical Code, Part I, the National Electrical Code (NFPA 70), and the Mexican Electrical Code NOM-001-SEDE with levels of energy transmitted not exceeding those of Class I laser radiation (21 CFR Part 1040)″; and

(h) for a cable that contains one or more optical-fiber members with any individual optical-fiber member or group of such members having a metal or other electrically conductive part, the following wording or other wording to the same effect: ″Optical-fiber portion(s) of cable contain non-current-carrying metal or other electrically conductive parts.″

6.6 Recreational vehicle cord

6.6.1 General

In Mexico and the United States, Clauses 6.6.2 and 6.6.3 apply. In Canada, the requirements of the CAN/CSA-Z240RV Series apply.

6.6.2 Construction

A flexible cord to be employed in a cord set or power-supply cord that is intended for use in recreational vehicles shall be a Type SOOW, SOW, STOOW, STOW, STW, SEOOW^u, SEOW^u, or SEW^u cord. Such a cord shall have two insulated 2.08 mm^2 (14 AWG), 3.31 mm^2 (12 AWG), or 5.26 mm^2 (10 AWG) circuit conductors and one insulated grounding conductor of the same size as the circuit conductors. For use in the marking specified for the cord surface in Clause 6.6.3, a current rating of 15 A shall apply to cord having 2.08 mm^2 (14 AWG) circuit conductors, a current rating of 20 A shall apply to cord having 3.31 mm^2 (12 AWG) circuit conductors, and a current rating of 30 A shall apply to cord having 5.26 mm^2 (10 AWG) circuit conductors.

6.6.3 Product marking

Type SEW^u, SOW, SEOW^u, SEOOW^u, SOOW, STW, STOOW, or STOW cord that complies with the requirements for recreational-vehicle use in Clause 6.6.2 shall be durably surface marked in accordance with Clause 6.2 and with the following wording using the applicable current rating from Clause 6.6.2: “For recreational-vehicle use: _____amperes”.

6.7 Mobile home and recreational vehicle cord

6.7.1 General

In Mexico and the United States, Clauses 6.7.2 and 6.7.3 apply. In Canada, the requirements of the CAN/CSA-Z240RV Series apply.

6.7.2 Construction

A flexible cord to be employed in a power-supply cord intended for use in mobile homes and recreational vehicles shall be a Type SOOW, SOW, STOOW, STOW, STW, SEOOW^u, SEOW^u, or SEW^u cord. Such a cord shall either have three insulated 8.37 mm^2 (8 AWG) circuit conductors and one insulated grounding conductor of the same size as the circuit conductors or have three insulated 13.3 mm^2 (6 AWG) circuit conductors and one insulated 13.3 or 8.37 mm^2 (6 or 8 AWG) grounding conductor. For use in the marking specified for the cord surface in Clause 6.7.3, a current rating of 40 A shall apply to this cord having 8.37 mm^2 (8 AWG) circuit conductors and a current rating of 50 A shall apply to this cord having 13.3 mm^2 (6 AWG) circuit conductors.

6.7.3 Product marking

A Type SEW[u], SOW, SEOW[u], SEOOW[u], SOOW, STW, STOOW, or STOW cord that complies with the requirements in Clause 6.7.2 shall be durably surface marked in accordance with Clause 6.2 and with one of the following wordings using the applicable current rating from Clause 6.7.2: “For mobile-home use:___ amperes” or “For mobile-home or recreational-vehicle use: _____ amperes.″

Table 1
Cross-sectional area of stranded conductors and diameter of solid conductors

(See Clause 4.1.1.3.1.)

Conductor size,		Minimum diameter of solid conductors,		Nominal circular mil area,	Minimum cross-sectional area			
					Composed of wires larger than 0.254 mm (0.010 in),		Composed of wires 0.254 mm (0.010 in) and smaller,	
mm^2	(AWG)	mm	(in)	circular mils	mm^2	(circular mils)	mm^2	(circular mils)
0.325	(22)	0.630	(0.025)	640	–	–	0.314	(621)
0.519	(20)	0.801	(0.032)	1 020	0.507	(1000)	0.500	(989)
0.824	(18)	1.00	(0.039)	1 620	0.805	(1590)	0.796	(1570)
1.04	(17)	1.13	(0.045)	2 050	1.02	(2009)	1.01	(1989)
1.31	(16)	1.26	(0.050)	2 580	1.28	(2530)	1.27	(2500)
2.08	(14)	1.59	(0.063)	4 110	2.04	(4030)	2.01	(3990)
3.31	(12)	2.01	(0.079)	6 530	3.24	(6400)	3.21	(6330)
5.26	(10)	–	–	10 380	5.15	(10 170)	5.10	(10 070)
8.37	(8)	–	–	16 510	8.20	(16 180)	8.12	(16 018)
13.30	(6)	–	–	26 240	13.00	(25 720)	9.93	(25 463)
21.20	(4)	–	–	41 740	20.70	(40 910)	20.50	(40 501)
33.60	(2)	–	–	66 360	33.00	(65 030)	32.60	(64 380)

Table 2
Stranding

(See Clauses 4.1.1.7.1 and 4.4.1.2.)

Cord or cable type	Conductor size	Diameter of individual wires			
		Minimum		Maximum	
		mm	(in)	mm	(in)
SPT-0[m]	0.325 mm^2 (22 AWG)	0.125	(0.0049)	0.260	(0.010)
CXTW[u], XTW[u]	0.325 mm^2 (22 AWG)	0.079	(0.0031)	0.165	(0.0065)
SP-1[u]*, SP-2[u], SPT-1*, SPT-2, SPT-1W[u], SPT-2W[u], SVT, SVTO, SVTOO, SV, SVO, SVOO, HPN, HSJ, HSJO, HSJOO, HPD[u], SPE-1[u]*, SPE-2[u], SVE[u], SVEO[u], SVEOO[u], NISP-1[m,u], NISP-2[m,u], NISPT-1, NISPT-2, NISPE-1[m,u], NISPE-2[m,u], clock[u]	All sizes	0.125	(0.0049)	0.165[†]	(0.0065)
				0.260[m]	(0.010[m])
SJ, SJT, SJTO, SJTOO, SJO, SJOO, SJOW, SJOOW, S, SO, SOO, SOW, SOOW, SJTW, SJTOW, SJTOOW, ST, STO, STOO, STW, STOW, STOOW, SP-3[m,u], SPT-3, PXWT[c], CXWT[c], SJE[u], SJEW[u], SJEO[u], SJEOW[u], SJEOO[u], SJEOOW[u], SE[u], SEW[u], SEO[u], SEOW[u], SEOO[u], SEOOW[u], SPE-3[u]	2.08 mm^2 (14 AWG) and smaller	0.125	(0.0049)	0.260	(0.010)
	3.31 mm^2 (12 AWG) and larger	0.125	(0.0049)	0.410[‡]	(0.016)[‡]
E, EO, ETT, ETP	All sizes	0.125	(0.0049)	0.260	(0.010)
PXT[c], TX[c]	0.519 mm^2 (20 AWG)	0.125	(0.0049)	0.260	(0.010)
All other types (except hoistway cable)	3.31 mm^2 (12 AWG) and smaller	0.125	(0.0049)	0.410	(0.016)
	5.26 mm^2 (10 AWG) and larger[§]	0.125	(0.0049)	0.821	(0.032)

Table 2 Continued on Next Page

Table 2 Continued

Cord or cable type	Conductor size	Diameter of individual wires			
		Minimum		Maximum	
		mm	(in)	mm	(in)

** For SPT-1, SP-1[m,u], and SPE-1[u] types, a composition of wires having diameters not smaller than that of 0.005 mm^2 (40 AWG) for 0.519 mm^2 (20 AWG) conductors shall be permitted.*

† In Canada and the United States, the following applies. For 2 X 1.31 mm^2 (16 AWG), 3 X 1.31 mm^2 (16 AWG), 2 X 0.824 mm^2 (18 AWG), and 3 X 0.824 mm^2 (18 AWG) Type SPT-2 and SPE-2[u] flexible cords, a diameter of the individual wires in the conductors of 0.166 mm to 0.260 mm (0.0066 in to 0.010 in) shall be permitted when such cords are for use in extension cord sets other than those with cord take-up reels. In Mexico, this limitation is not applicable.

‡ Sizes 0.259 mm^2 and 0.162 mm^2 (23 AWG and 25 AWG) strands, respectively, shall be permitted for 33.6 mm^2 and 21.2 mm^2 (2 AWG and 4 AWG) size extra-hard-service cords.

§ All conductors of Type DRT[c] cable in sizes 5.26 mm^2 (10 AWG) and larger shall be composed of not fewer than 49 strands, except for sizes 3.31 mm^2 and 5.26 mm^2 (12 AWG and 10 AWG) grounding conductors; for these sizes, a 7-strand construction shall be permitted.

Table 3
Lay of conductor strands

(See Clauses 4.1.1.7.2.1, 4.1.1.7.2.3, and 4.4.1.2.)

Conductor size,	Maximum length of lay		
	Bunch-stranded (lay of wires),	Rope-stranded (lay of rope),	Bunch- or rope-strand for HPN (lay of wires),
mm^2 (AWG)	mm (in)	mm (in)	mm (in)
0.325 (22)	32 (1.25)	–	–
0.519 (20)	32 (1.25)	44 (1.75)	–
0.824 (18)	32 (1.25)	44 (1.75)	25 (1.00)
1.04 (17)*	32 (1.25)	44 (1.75)	25 (1.00)
1.31 (16)	38 (1.50)	57 (2.25)	32 (1.25)
2.08 (14)	44 (1.75)	64 (2.50)	41 (1.60)
3.31 (12)	51 (2.00)	76 (3.00)	51 (2.00)
5.26 (10)	64 (2.50)	76 (3.00)	–
8.37 (8)	70 (2.75)	76 (3.00)	–
13.3 (6)	–	89 (3.50)	–
21.2 (4)	–	114 (4.50)	–
33.6 (2)	–	140 (5.50)	–

**Types HPN, SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE[u], SVEO[u], SVEOO[u], SJ, SJO, SJOO, SJOW, SJOOW, SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u], SJT, SJTO, SJTOO, SJTW, SJTOW, and SJTOOW only.*

Table 4
Maximum direct current resistance of stranded* and solid conductors at 20°C, ohms/km

(See Clause 4.1.1.9.1.)

Conductor Size		Bare Copper		Coated copper	
mm^2	(AWG)	Solid	Stranded	Solid	Stranded
0.325	(22)	54.0	56.8	56.2	59.7
0.519	(20)	34.0	35.7	35.3	37.6
0.824	(18)	21.4	22.4	22.2	23.6
1.04	(17)	16.9	17.8	17.6	18.7
1.31	(16)	13.4	14.1	14.0	14.9
2.08	(14)	8.45	8.88	8.79	9.34
3.31	(12)	5.31	5.58	5.53	5.88
5.26	(10)	–	3.51	–	3.70
8.37	(8)	–	2.23	–	2.35
13.3	(6)	–	1.40	–	1.48
21.2	(4)	–	0.882	–	0.928
33.6	(2)	–	0.555	–	0.584

** Applicable for all types of stranding.*

Table 5
Maximum direct current resistance of stranded* and solid conductors at 25°C, ohms/km

(See Clause 4.1.1.9.1.)

Conductor size		Bare copper		Coated copper	
mm^2	(AWG)	Solid	Stranded	Solid	Stranded
0.325	(22)	55.1	57.9	57.3	60.9
0.519	(20)	34.7	36.4	36.0	38.4
0.824	(18)	21.8	22.8	22.6	24.1
1.04	(17)	17.2	18.2	18.0	19.1
1.31	(16)	13.7	14.4	14.3	15.2
2.08	(14)	8.62	9.06	8.97	9.53
3.31	(12)	5.42	5.69	5.64	6.00
5.26	(10)	–	3.58	–	3.77
8.37	(8)	–	2.27	–	2.40
13.3	(6)	–	1.43	–	1.51
21.2	(4)	–	0.900	–	0.947
33.6	(2)	–	0.566	–	0.596

** Applicable for all types of stranding.*

Table 6
Maximum direct current resistance of stranded* and solid conductors at 20°C, ohms/1000 ft

(See Clause 4.1.1.9.1.)

Conductor size		Bare copper		Coated copper	
mm^2	(AWG)	Solid	Stranded	Solid	Stranded
0.325	(22)	16.5	17.3	17.1	18.2
0.519	(20)	10.4	10.9	10.8	11.5
0.824	(18)	6.52	6.83	6.77	7.20
1.04	(17)	5.15	5.43	5.37	5.70
1.31	(16)	4.09	4.30	4.27	4.54
2.08	(14)	2.58	2.71	2.68	2.85
3.31	(12)	1.62	1.70	1.69	1.79
5.26	(10)	–	1.07	–	1.13
8.37	(8)	–	0.680	–	0.716
13.3	(6)	–	0.427	–	0.451
21.2	(4)	–	0.269	–	0.283
33.6	(2)	–	0.169	–	0.178

** Applicable for all types of stranding.*

Table 7
Maximum direct current resistance of stranded* and solid conductors at 25°C, ohms/1000 ft

(See Clause 4.1.1.9.1.)

Conductor size		Bare copper		Coated copper	
mm^2	(AWG)	Solid	Stranded	Solid	Stranded
0.325	(22)	16.8	17.7	17.5	18.6
0.519	(20)	10.6	11.1	11.0	11.7
0.824	(18)	6.65	6.95	6.89	7.35
1.04	(17)	5.24	5.55	5.49	5.82
1.31	(16)	4.18	4.39	4.36	4.63
2.08	(14)	2.63	2.76	2.73	2.91
3.31	(12)	1.65	1.73	1.72	1.83
5.26	(10)	–	1.09	–	1.15
8.37	(8)	–	0.692	–	0.732
13.3	(6)	–	0.436	–	0.460
21.2	(4)	–	0.274	–	0.289
33.6	(2)	–	0.173	–	0.182

** Applicable for all types of stranding.*

Table 8
Insulations

(See Clause 4.1.2.1 and 4.1.2.2.)

Class no.	Material type	Material description	Temperature rating, maximum, °C		
			Dry	Wet	Oil
1	Thermoset	NR or IR, SBR, EP or a blend thereof	60	60	60
2	Thermoset	NR or IR, SBR, EP or a blend thereof	75	60	60
3	Thermoset	NR or IR, SBR, IIR, EP, or a blend thereof	90	60	60
4	Thermoplastic	PVC	60	60	60
5	Thermoplastic	PVC	75	60	60
6	Thermoplastic	PVC	90	60	60
7	Thermoplastic	PVC	105	60	60
8	Thermoplastic	PE	60	–	–
9	Thermoplastic	PE	75	–	–
10	Thermoset	XL	90	–	–
11	Thermoset	XL	105	–	–
12	Thermoset	CR, CSM, CPE, NBR/PVC	90	60	60
13	Thermoset	CR, CSM, CPE, NBR/PVC	60	60	60
14	Thermoplastic	TPE	60	60	60
15	Thermoplastic	TPE	90	60	60
16	Thermoplastic	TPE	105	60	60
17	Thermoplastic	PVC	90	–	–
18	Thermoset	CPE, CSM	105	60	60
19	Thermoset	EP	105	60	60
20	Thermoplastic	FEP	105	–	–

Note:

NR or IR = *natural rubber or polyisoprene rubber*

SBR = *styrene-butadiene rubber*

EP = *ethylene propylene rubber*

IIR = *isobutylene-isoprene rubber*

CPE = *chlorinated polyethylene*

CR = *polychloroprene*

CSM = *chloro-sulphonyl-polyethylene*

TPE = *thermoplastic elastomer*

PVC = *polyvinyl chloride or copolymer of vinyl chloride and vinyl acetate*

PE = *polyethylene*

XL = *cross-linked polyethylene*

FEP = *fluorinated ethylene propylene*

Table 9
Physical properties – insulation

(See Clauses 5.1.1, 5.2.8.2, and 6.2.6.2, and Tables 30 and 37.)

Class no.	Temperature rating, maximum, °C			Material type	Before aging	
	Dry	Wet	Oil		Minimum elongation %	Tensile strength, MPa (lbf/in^2)
1	60	60	60	Thermoset	200	3.4 (500)
2	75	60	60	Thermoset	200	3.4 (500)
3	90	60	60	Thermoset	200	3.4 (500)
4	60	60	60	Thermoplastic	100	10.3 (1500)
5	75	60	60	Thermoplastic	100	10.3 (1500)
6	90	60	60	Thermoplastic	100	10.3 (1500)
7	105	60	60	Thermoplastic	100	10.3 (1500)
8	60	–	–	Thermoplastic	350	9.65 (1400)
9	75	–	–	Thermoplastic	350	9.65 (1400)
10	90	60	60	Thermoset	150	10.3 (1500)
11	105	60	60	Thermoset	150	10.3 (1500)
12	90	60	60	Thermoset	200	8.3 (1200)
13	60	60	60	Thermoset	200	8.3 (1200)
14	60	60	60	Thermoplastic	200	5.5 (800)
15	90	60	60	Thermoplastic	200	5.5 (800)
16	105	60	60	Thermoplastic	200	5.5 (800)
17	90	–	–	Thermoplastic	100	10.3 (1500)
18	105	60	60	Thermoset	200	8.3 (1200)
19	105	60	60	Thermoset	200	3.4 (500)
20	105	–	–	Thermoplastic	200	17.4 (2500)

(Continued)

Table 9
(Concluded)

Class no.	After aging							
	Air oven test				Oil immersion test*			
	Oven temp., °C ±2	Time, d	Minimum percentage of unaged value		ASTM No. 2 or IRM 902 Oil		Minimum percentage of unaged value	
			Elongation, %	Tensile strength, %	Oil temp., °C ±2	Time, h	Elongation, %	Tensile strength, %
1	70	7	65	60	N/A	–	–	–
2	100	10	50	50	N/A	–	–	–
3	110	10	50	50	N/A	–	–	–
4	100	7	65	85	N/A	–	–	–
5	100	10	65	70	N/A	–	–	–
6	121	7	65	85	N/A	–	–	–
7	136	7	65	85	N/A	–	–	–
8	70	2	75	N/A	N/A	–	–	–
9	100	2	75	N/A	N/A	–	–	–
10	121	7	45	70	N/A	–	–	–
11	136	7	45	70	N/A	–	–	–
12	110	10	50	50	121	18†	60†	60†
13	70	7	65	75	121	18†	60†	60†

Table 9 Continued on Next Page

Table 9 Continued

Class no.	After aging							
	Air oven test				Oil immersion test*			
			Minimum percentage of unaged value		ASTM No. 2 or IRM 902 Oil		Minimum percentage of unaged value	
	Oven temp., °C ±2	Time, d	Elongation, %	Tensile strength, %	Oil temp., °C ±2	Time, h	Elongation, %	Tensile strength, %
14	100	7	75	75	N/A	–	–	–
15	121	7	75	75	N/A	–	–	–
16	136	7	75	75	N/A	–	–	–
17	121	14	65	85	N/A	–	–	–
18	136	7	50	50	121	18†	60†	60†
19	136	7	50	50	N/A	–	–	–
20	232	7	75	75	N/A	–	–	–

** The incorporation of an oil-resistant insulation in a finished jacketed cord shall be permitted, provided that the insulation is subjected to the specified oil test in Table 12 for the jacket being used. Cords having both insulations and jacket materials meeting the oil resistance test shall be marked in accordance with Clause 6.2.6.2.*

† Required for HPN only.

Note: *Interchanging insulation materials within the Table shall be permitted (see Clause 4.1.2.1).*

Table 10
Lay of conductors – Service cords

(See Clauses 4.1.4.1 and 4.4.4.2.)

Type	Size of circuit conductor, mm^2 (AWG)	Maximum lay of twist, mm (in)				
		Two-conductor*	Three-conductor*	Four-conductor	Five-conductor	Six-conductor
SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE[u], SVEO[u], SVEOO[u]	0.824 (18)	35 (1.40)	44 (1.75)	–	–	–
	1.04 (17)	38 (1.50)	51 (2.00)	–	–	–
	1.31 (16)	38 (1.50)	51 (2.00)	–	–	–
TST	0.102 (27)	35 (1.40)	—	—	—	—
SJ, SJO, SJOO, SJOW, SJOOW, S, SO, SOO, SOW, SOOW, SJT, SJTO, SJTOO, SJTW, SJTOW, SJTOOW, ST, STO, STOO, STW, STOW, STOOW, SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u], SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u], C[u], PD[u], HPD[u], HSJ, HSJO, HSJOO	0.824 (18)	51 (2.00)	57 (2.25)	64 (2.50)	76 (3.00)	89 (3.50)
	1.04 (17)	51 (2.00)	57 (2.25)	64 (2.50)	76 (3.00)	89 (3.50)
	1.31 (16)	57 (2.25)	64 (2.50)	70 (2.75)	89 (3.50)	108 (4.25)
	2.08 (14)	64 (2.50)	83 (3.25)	95 (3.75)	121 (4.75)	140 (5.50)
	3.31 (12)	76 (3.00)	89 (3.50)	108 (4.25)	140 (5.50)	165 (6.50)
	5.26 (10)	89 (3.50)	108 (4.25)	121 (4.75)	152 (6.00)	178 (7.00)
S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u]	8.37 (8)	114 (4.50)	127 (5.00)	152 (6.00)	–	–
	13.3 (6)	127 (5.00)	152 (6.00)	178 (7.00)	–	–
	21.2 (4)	152 (6.00)	178 (7.00)	216 (9.50)	–	–
	33.6 (2)	178 (7.00)	203 (8.00)	254 (10.00)	–	–
DRT[c], SRD[m,u], SRDT[m,u], SRDE[m,u]	5.26 (10)	–	–	120 (4.72)	–	–
	8.37 (8)	–	–	150 (5.91)	–	–
	13.3 (6)	–	–	180 (7.09)	–	–
	21.2 (4)	–	–	220 (8.66)	–	–

Table 10 Continued on Next Page

Table 10 Continued

Type	Size of circuit conductor, mm² (AWG)	Maximum lay of twist, mm (in)				
		Two-conductor*	Three-conductor*	Four-conductor	Five-conductor	Six-conductor

** In Mexico, the following applies. As an alternative to the values of the table, untwisted conductors shall be permitted for two- or three-conductor constructions.*

Table 11
Jackets

(See Clauses 4.1.6.1, 4.1.6.2, and 4.1.6.3.)

Class no.	Material type	Material description	Temperature ratings, maximum, °C	
			Dry	Oil
1.1	Thermoset	NR or IR, SBR, EP or a blend thereof	60	–
1.2	Thermoset	CR, CSM, EP, NBR/PVC, CPE	60	60
1.3	Thermoset	CR, CSM, EP, NBR/PVC, CPE	75	60
1.4	Thermoset	CR, CSM, EP, NBR/PVC, CPE	90	60
1.5	Thermoplastic	PVC	60	60
1.6	Thermoplastic	PVC	75	60
1.7	Thermoplastic	PVC	90	60
1.8	Thermoplastic	PVC	105	60
1.9	Thermoplastic	TPE	60	60
1.10	Thermoplastic	TPE	90	60
1.11	Thermoplastic	TPE	105	60
1.12	Thermoset	CPE, CSM, EP	105	60

Notes:

(1)

NR or IR = natural rubber or polyisoprene rubber

SBR = styrene-butadiene rubber

EP = ethylene propylene rubber

CPE = chlorinated polyethylene

CR = polychloroprene

CSM = chloro-sulphonyl-polyethylene

TPE = thermoplastic elastomer

PVC = polyvinyl chloride or copolymer of vinyl chloride and vinyl acetate

(2) *Due to possible incompatibility, TPE material of styrenic type is in some cases not suitable for use in cords where direct contact with PVC can occur. A separator is one acceptable means of avoiding direct contact. Other combinations of materials that could be incompatible, if any, are as yet undetected.*

Table 12
Physical properties – Jackets

(See Clauses 5.1.2, 6.2.6.1, and 6.2.6.2, and Tables 9, 30, and 37.)

Class no.	Temperature rating, maximum, °C		Material type	Before aging	
				Minimum Elongation	Tensile strength,
	Dry	Oil		%	MPa (lbf/in^2)
1.1	60	–	Thermoset	200	8.3 (1200)
1.2	60	60	Thermoset	200†	8.3 (1200)
1.3	75	60	Thermoset	200	8.3 (1200)
1.4	90	60	Thermoset	200	8.3 (1200)
1.5	60	60	Thermoplastic	100	10.3 (1500)
1.6	75	60	Thermoplastic	100	10.3 (1500)
1.7	90	60	Thermoplastic	100	10.3 (1500)
1.8	105	60	Thermoplastic	100	10.3 (1500)
1.9	60	60	Thermoplastic	200	8.3 (1200)
1.10	90	60	Thermoplastic	200	8.3 (1200)
1.11	105	60	Thermoplastic	200	8.3 (1200)
1.12	105	60	Thermoset	200	8.3 (1200)

(Continued)

Table 12
(Concluded)

Class no.	After aging							
	Air oven test				Oil immersion test*			
	Oven temp., °C ±2	Time, d	Minimum percentage of unaged value		ASTM No. 2 or IRM 902 Oil		Minimum percentage of unaged value	
			Elongation, %	Tensile strength, %	Oil temp., °C ±2	Time, h	Elongation, %	Tensile strength, %
1.1	70	7	70	75	NA	–	–	–
1.2	70	7	70	75	121	18	60	60
1.3	100	10	50	50	121	18	60	60
1.4	110	10	50	50	121	18	60	60
1.5	100	7	45	85	60	168	75	75
1.6	100	10	45	70	60	168	75	75
1.7	121	7	45	85	60	168	75	75
1.8	136	7	45	85	60	168	75	75
1.9	100	7	75	75	60	168	75	75
1.10	121	7	75	75	60	168	75	75
1.11	136	7	75	75	60	168	75	75

Table 12 Continued on Next Page

Table 12 Continued

Class no.	After aging							
	Air oven test				Oil immersion test*			
	Oven temp., °C ±2	Time, d	Minimum percentage of unaged value		ASTM No. 2 or IRM 902 Oil		Minimum percentage of unaged value	
			Elongation, %	Tensile strength, %	Oil temp., °C ±2	Time, h	Elongation, %	Tensile strength, %
1.12	136	7	65	70	121	18	60	60

† The elongation requirements for Class 1.2 jackets on coiled Types SVO, SJO, and SO cords shall be 150%.

** Oil tests are required only on Type EO, ETT, and ETP or on products with an "O" and "OO" in the type designation (see Clause 6.2.6).*

Note: *Interchanging jacket materials within the Table shall be permitted (see Clause 4.1.6.2).*

Table 13
Overall diameter of round service and heater cords

(See Clauses 4.1.5.5, 4.1.7, 4.1.8.2, 4.3.14.2, and 6.4.2.)

Type of cord	Size of conductors, mm^2 (AWG)	Range of overall diameters*, mm (in)			
		Two-conductor	Three-conductor	Four-conductor	Five-conductor
HSJ, HSJO, HSJOO	0.824 (18)	7.24 – 8.38	7.62 – 8.76	8.38 – 9.65	–
		(0.285 – 0.330)	(0.300 – 0.375)	(0.330 – 0.380)	–
	1.31 (16)	7.75 – 8.89	8.26 – 9.52	9.02 – 10.3	–
		(0.305 – 0.350)	(0.325 – 0.375)	(0.355 – 0.405)	–
	2.08 (14)	10.03 – 11.3	10.67 – 11.94	11.7 – 13.1	–
		(0.395 – 0.445)	(0.420 – 0.470)	(0.460 – 0.515)	–
	3.31 (12)	11.1 – 12.3	11.7 – 13.1	13.0 – 14.5	–
		(0.435 – 0.485)	(0.460 – 0.515)	(0.510 – 0.570)	–
SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE[u], SVEO[u], SVEOO[u]	0.824 (18)	5.59 – 6.48	5.84 – 6.73	–	–
		(0.220 – 0.255)	(0.230 – 0.265)	–	–
	1.04 (17)	5.97 – 6.86	6.35 – 7.24	–	–
		(0.235 – 0.270)	(0.250 – 0.285)	–	–
	1.31 (16)	6.22 – 7.11	6.60 – 7.49	–	–
		(0.245 – 0.280)	(0.260 – 0.295)	–	–
SJ, SJO, SJOO, SJT, SJTO, SJTOO, SJOW, SJOOW, SJTW, SJTOW, SJTOOW SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u]	0.824 (18)	7.11 – 8.00	7.62 – 8.51	8.26 – 9.27	–
		(0.280 – 0.315)	(0.330 – 0.335)	(0.325 – 0.365)	–
	1.04 (17)	7.37 – 8.26	7.87 – 8.76	8.64 – 9.65	–
		(0.290 – 0.325)	(0.310 – 0.345)	(0.340 – 0.380)	–
	1.31 (16)	7.75 – 8.64	8.26 – 9.14	8.89 – 10.0	–
		(0.305 – 0.340)	(0.325 – 0.360)	(0.350 – 0.395)	–
	2.08 (14)	8.51 – 9.53	9.14 – 10.0	9.91 – 11.0	–
		(0.335 – 0.375)	(0.360 – 0.395)	(0.390 – 0.435)	–
	3.31 (12)	10.3 – 11.6	10.8 – 12.1	11.8 – 13.2	–
		(0.405 – 0.455)	(0.425 – 0.475)	(0.465 – 0.520)	–
	5.26 (10)	13.7 – 15.4	14.4 – 16.1	15.9 – 17.8	–
		(0.540 – 0.605)	(0.565 – 0.635)	(0.625 – 0.700)	–

Table 13 Continued on Next Page

Table 13 Continued

Type of cord	Size of conductors, mm² (AWG)	Range of overall diameters*, mm (in) Two-conductor	Three-conductor	Four-conductor	Five-conductor
S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u],	0.824 (18)	8.64 – 9.78 (0.340 – 0.385)	9.14 – 10.2 (0.360 – 0.400)	9.78 – 10.9 (0.385 – 0.430)	11.7 – 13.0 (0.460 – 0.510)
	1.31 (16)	9.27 – 10.4 (0.365 – 0.410)	9.78 – 10.9 (0.385 – 0.430)	10.4 – 11.7 (0.410 – 0.460)	12.5 – 14.0 (0.490 – 0.550)
	2.08 (14)	12.6 – 14.0 (0.495 – 0.550)	13.2 – 14.6 (0.520 – 0.575)	14.2 – 15.7 (0.560 – 0.620)	16.0 – 17.9 (0.630 – 0.605)
	3.31 (12)	14.4 – 15.9 (0.565 – 0.625)	15.0 – 16.6 (0.590 – 0.655)	16.3 – 18.0 (0.640 – 0.710)	17.8 – 19.6 (0.700 – 0.770)
	5.26 (10)	15.6 – 17.4 (615 – 0.685)	16.5 – 18.3 (0.650 – 0.720)	17.8 – 19.7 (0.700 – 0.775)	19.3 – 21.3 (0.760 – 0.840)
	8.37 (8)	19.8 – 22.4 (0.780 – 0.880)	21.1 – 23.6 (0.830 – 0.930)	23.5 – 26.7 0.925 – 1.05)	25.4 – 29.2 (1.00 – 1.15)
	13.3 (6)	23.4 – 26.7 (0.920 – 1.05)	24.6 – 27.9 (0.970 – 1.10)	26.7 – 30.5 (1.05 – 1.20)	30.0 – 33.8 (1.18 – 1.33)
	21.2 (4)	26.9 – 30.7 (1.06 – 1.21)	28.7 – 32.5 (1.13 – 1.28)	31.8 – 36.8 (1.25 – 1.45)	– –
	33.6 (2)	30.7 – 35.6 (1.21 – 1.40)	33.0 – 38.1 (1.30 – 1.50)	36.8 – 41.9 (1.45 – 1.65)	– –

** Diameters of constructions that are not covered in the table are not specified.*

Notes:

1) *When a metal support member in accordance with Clause 4.1.11 or coiled types or mixed conductor sizes as described in Clauses 4.1.8.2 and 4.1.1.1, respectively, are included, the maximum diameters in this table do not apply.*

2) *The above tabulated diameters do not apply to a cord that is intended for application in which either*

a) a fitting is moulded on each end of the cord; or

b) a fitting is moulded onto one end of the cord and a means of strain relief is moulded on towards the other end of the cord.

Table 14
Dimensions of two- and three-conductor thermoset parallel types

(See Clauses 4.2.1, 4.2.3.1, 4.2.7.1, and 4.2.9, and Figures 1 to 4.)

	Type							
	SP-1[m,u]	NISP-1[m,u]	SP-2[m,u]	NISP-2[m,u]	SP-3[m,u]	SP-3[m,u]	SP-3[m,u]	SP-3[m,u]
Size, mm² (AWG)	0.519 (20)	0.519 (20)	0.824 (18)	0.824 (18)	0.824 (18)	2.08 (14)	3.31 (12)	5.26 (10)
	0.824 (18)	0.824 (18)	1.31 (16)	1.31 (16)	1.31 (16)			
			2.08 (14)*					

Table 14 Continued on Next Page

Table 14 Continued

		Type							
		SP-1[m,u]	NISP-1[m,u]	SP-2[m,u]	NISP-2[m,u]	SP-3[m,u]	SP-3[m,u]	SP-3[m,u]	SP-3[m,u]
Insulation thickness, mm (mils)	Nominal (not a requirement)	0.76 (30)	N/A	1.14 (45)	N/A	1.52 (60)	2.03 (80)	2.41 (95)	2.79 (110)
	Minimum acceptable average (Dimension A)	N/A	0.38 (15)	N/A	0.76 (30)	N/A	N/A	N/A	N/A
	Minimum at any point (Dimension B)	N/A	0.33 (13)	N/A	0.69 (27)	N/A	N/A	N/A	N/A
	Minimum at any point before separation	0.69 (27)	N/A	1.01 (40)	N/A	1.37 (54)	1.83 (72)	2.18 (86)	2.51 (99)
	Minimum at any point after separation	0.33 (13)	NA	0.69 (27)	NA	1.01 (40)	1.01 (40)	1.01 (40)	1.01 (40)
Minimum thickness of web, mm (mils) (two-conductor)		1.14 (45)	N/A	2.03 (80)	N/A	2.79 (110)	2.79 (110)	2.79 (110)	2.79 (110)
Minimum distance between insulated conductors, mm (mils) (Dimension E)		N/A	0.38 (15)	N/A	0.51 (20)	N/A	N/A	N/A	N/A
Minimum distance between three-conductor, mm (mils)		0.69 (27)	0.38 (15)	1.01 (40)	0.51 (20)	1.37 (54)	1.37 (54)	1.37 (54)	1.37 (54)
Minimum acceptable thickness of insulation on grounding conductor, mm (mils)		0.38 (15)	N/A	0.38 (15)	N/A	0.38 (15)	0.38 (15)	0.38 (15)	0.38 (15)
Minimum thickness at any point of insulation on grounding conductor, mm (mils)		0.33 (13)	N/A	0.33 (13)	N/A	0.33 (13)	0.33 (13)	0.33 (13)	0.33 (13)
Jacket									
Minimum average mm (mils) (Dimension C)		N/A	0.38 (15)	N/A	0.38 (15)	N/A	N/A	N/A	N/A
Minimum point, mm (mils) (Dimension D)		N/A	0.33 (13)	N/A	0.33 (13)	N/A	N/A	N/A	N/A

[*] *2.08 mm^2 (14 AWG) SP-2 is for use in Mexico only.*

Table 15
Thermoset service cords

(See Clauses 4.2.1, 4.2.3.1, 4.2.7.1, and 4.2.9, and Figures 3 and 4.)

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SV, SVO, SVOO	SP-1[m,u], SP-2[m,u], SP-3[m,u]	NISP-1[m,u], NISP-2[m,u]	SJ, SJO, SJOO, SJOW, SJOOW	S, SO, SOO, SOW, SOOW
Temperature ratings, °C	60, 75, 90	60	60	60, 75, 90, 105	60, 75, 90, 105
Maximum voltage, V	300	300	300	300	600
Size of conductors, mm^2 (AWG)	0.824, 1.04, 1.31 (18, 17, 16)	0.519, 0.824 (SP-1) (20, 18) (SP-1) 0.824, 1.31 (SP-2) (18, 16), (SP-2) 0.824 – 5.26 (SP-3) (18 – 10) (SP-3)	0.824, 1.31 (18, 16)	0.824 – 5.26 (18 – 10)	0.824 – 33.6 (18 – 2)
Number of conductors	2 or 3	2 or 3	2 or 3	2 – 6	2 or more
Grounding conductor, Clause	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8
Conductor:					
Material	Soft, annealed copper (Clause 4.1.1.2)				
Size	Cross-sectional area/DC resistance(Clause 4.1.1.3.1)				
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)				
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)				
Insulation class, Clause	4.1.2	4.1.2	4.1.2	4.1.2	4.1.2
Circuit conductor					
60°C	1, 13	1, 13	1, 13	1, 13	1, 13
75°C	2	N/A	N/A	2	2
90°C	3, 12	N/A	N/A	3, 12	3, 12
105°C	N/A	N/A	N/A	18, 19	18, 19
Grounding (bonding) conductor					
60°C	1, 13	1, 10	1, 10	1, 13	1, 13
75°C	2	N/A	N/A	2	2
90°C	3, 12	N/A	N/A	3, 12	3, 12
105°C	N/A	N/A	N/A	18, 19	18, 19
Minimum average thickness, mm (mils)	0.38 (15)	Table 14	Table 14	0.824 mm^2 – 3.31 mm^2 (18 AWG – 12 AWG) = 0.76 (30) 5.26 mm^2 (10 AWG) = 1.14 (45)	0.824 mm^2 – 1.31 mm^2 (18 AWG – 16 AWG) = 0.76 (30) 2.08 mm^2 – 5.26 mm^2 (14 AWG – 10 AWG) = 1.14 (45) 8.37 mm^2 – 33.6 mm^2 (8 AWG – 2 AWG) = 1.52 (60)
Min thickness at any point	90% of min avg.	Table 14	Table 14	90% of min avg.	90% of min avg.

Table 15 Continued on Next Page

Table 15 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SV, SVO, SVOO	SP-1[m,u], SP-2[m,u], SP-3[m,u]	NISP-1[m,u], NISP-2[m,u]	SJ, SJO, SJOO, SJOW, SJOOW	S, SO, SOO, SOW, SOOW
Min thickness at point of contact	80% of min. avg.	N/A	N/A	80% of min avg.	80% of min avg.
Covering on individual conductors (optional), Clause	4.1.3	N/A	N/A	4.1.3	4.1.3
Assembly, Clause	4.1.4	Parallel	Parallel	4.1.4	4.1.4
Optional shielding, Clause	4.1.5	N/A	4.1.5	4.1.5	4.1.5
Jacket class					
60°C	1.2	N/A	1.2	1.2	1.2
75°C	1.3	N/A	N/A	1.3	1.3
90°C	1.4	N/A	N/A	1.4	1.4
105°C	N/A	N/A	N/A	1.12	1.12
Minimum and average thickness of jacket, Table	54	NA	14	54, 55	56, 57, 58
General Clause	4.1.6	NA	4.1.6	4.1.6	4.1.6
Overall diameter, Clause	4.1.7	NA	NA	4.1.7	4.1.7
Conductor identification, Clause	4.1.9	4.1.9	4.1.9	4.1.9	4.1.9
Tests, Clause					
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Spark	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
Mechanical strength	5.1.4	N/A	N/A	5.1.4	5.1.4
Flexing of shielded cords	5.2.9	N/A	5.2.9	5.2.9	5.2.9
Jacket resistance	5.2.10	NA	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Bend test, Nylon covered	5.1.9	–	5.1.9	5.1.9	5.1.9
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, VW-1	5.1.5	5.1.5	5.1.5	5.1.5	5.1.5
Physical properties, Table					
Insulation	9	9	9	9	9
Jacket	12	N/A	12	12	12
Additional tests for “W” type cords, Clause					
Weather resistance	N/A	N/A	N/A	5.1.7	5.1.7
Insulation resistance	N/A	N/A	N/A	5.2.3.1	5.2.3.1

Table 15 Continued on Next Page

Table 15 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SV, SVO, SVOO	SP-1[m,u], SP-2[m,u], SP-3[m,u]	NISP-1[m,u], NISP-2[m,u]	SJ, SJO, SJOO, SJOW, SJOOW	S, SO, SOO, SOW, SOOW
Permittivity and stability factor	N/A	N/A	N/A	5.2.4	5.2.4
Swelling and blistering	N/A	N/A	N/A	5.1.11	5.1.11
Tightness of insulation, Clause	N/A	5.1.10	N/A	N/A	N/A

Table 16
Dryer and range cords

(See Clauses 4.2.1, 4.2.3.1, 4.2.7.1, 4.3.1, 4.3.3.1, 4.3.7.1, and 4.3.9.3.)

	Type			
	SRD[m,u]	SRDE[m,u]	SRDT[m,u]	DRT[c]
Temperature ratings, °C	60	90, 105	60, 75, 90, 105	60, 90
Maximum voltage, V	300	300	300	300
Size of conductors, mm^2 (AWG)	5.26 – 21.2 (10 – 4)	5.26 – 21.2 (10 – 4)	5.26 – 21.2 (10 – 4)	5.26 – 21.2 (10 – 4)
Number of conductors	2 – 4*	2 – 4*	2 – 4*	4
Grounding conductor, Clause	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8
Conductor:				
Material	Soft, annealed copper (Clause 4.1.1.2)			
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)			
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)			
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)			
Assembly	Twisted or parallel	Twisted or parallel	Twisted or parallel	Twisted
Shielding (optional), twisted only, Clause	4.1.5	4.1.5	4.1.5	4.1.5
Insulation class	1	(90) 14 (105) 16	(60) 4 (75) 5 (90) 6 (105) 7	(60) 4, 14 (90) 6, 15
Minimum acceptable average thickness, twisted only, mm (mils)	1.14 (45)	1.14 (45)	1.14 (45)	1.14 (45)
Minimum thickness,	90% of min acceptable average 80% of min acceptable average at point of contact (SRD[m,u] only)			
Covering on individual conductors (optional), Clause	4.3.4	4.3.4	4.3.4	4.3.4
Insulation/jacket class, parallel only	1.1, 1.2	1.10, 1.11	1.5, 1.6, 1.7, 1.8	N/A
Jacket class, twisted only	1.1	(90) 1.10 (105) 1.11	(60) 1.5 (75) 1.6 (90) 1.7 (105) 1.8	(60) 1.5 (90) 1.7
Minimum and average thickness of jacket, twisted only				
Average thickness, mm (mils)	1.52 (60)	1.52 (60)	1.52 (60)	1.52 (60)
Minimum thickness, mm (mils)	1.21 (48)	1.21 (48)	1.21 (48)	1.21 (48)
Thicknesses of parallel construction, Clause	4.3.9.5	4.3.9.5	4.3.9.5	–

Table 16 Continued on Next Page

Table 16 Continued

	Type			
	SRD[m,u]	SRDE[m,u]	SRDT[m,u]	DRT[c]
Tests, Clause				
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6
Heat-shock resistance	N/A	5.1.8	5.1.8	5.1.8
Spark	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7
Jacket resistance	5.2.10	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8
Deformation	N/A	5.1.3		
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, VW-1	5.1.5	5.1.5	5.1.5	5.1.5
Physical properties, Table				
Insulation	9	9	9	9
Jacket and integral (parallel)	12	12	12	12

**For three-conductor cords, parallel (integral) construction shall be permitted.*

Table 17
Special use cords

(See Clauses 4.2.1 and 4.2.3.1.)

	Type	
	C[u]	PD[u]
Maximum temperature, °C	60	60
Maximum voltage, V	300*	300*
Size of conductors, mm^2 (AWG)	0.824 – 5.26 (18 – 10)	0.824 – 5.26 (18 – 10)
Number of conductors	2 or more	2 or more
Grounding conductor, Clause	4.1.1.8	4.1.1.8
Conductor:		
Material	Soft, annealed copper (Clause 4.1.1.2)	
Size	Cross-sectional area (Clause 4.1.1.3)	
Stranding	Size of wires (Clause 4.1.1.7), Lay of wires (Clause 4.1.1.7.2)	
General	Joints, coatings, separators (Clauses 4.1.1.4 – 4.1.1.6)	
Insulation class (Table 8 and Clause 4.1.2)	1, 13	1, 13
Minimum average thickness, mm^2 (AWG) = mm (mils)	0.824 − 1.31 (18 − 16) = 0.76 (30) 2.08 − 5.26 (14 − 10) = 1.14 (45)	
Minimum thickness	90% of Minimum Average	
Covering on individual conductors (optional), Clause	Cotton or rayon braid 4.3.4	Cotton or rayon braid 4.3.4
Assembly of conductors	Twisted	Twisted
Overall braid (Clause)	N/A	Cotton or rayon (4.1.3.2)
Braid saturation	N/A	Optional (4.1.3.2.5)
Tests, Clause Physical properties:	Table 9	Table 9

Table 17 Continued on Next Page

Table 17 Continued

	Type	
	C[u]	PD[u]
Cold bend	5.1.6	5.1.6
Spark	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2
Insulation resistance	5.2.3	5.2.3
Continuity	5.2.7	5.2.7
Conductor corrosion	5.2.8	5.2.8
Flame (FT2)	5.1.5.3	5.1.5.3
(Optional) FT1, VW-1	5.1.5.1, 5.1.5.4	5.1.5.1, 5.1.5.4

** The maximum voltage is 600, provided that the average thickness of insulation on the individual conductors is at least 1.14 mm (45 mils)*

Table 18
Dimensions of two- and three-conductor thermoplastic parallel types

(See Clauses 4.3.1, 4.3.3.1, 4.3.7.1, 4.3.9.3, and 4.3.10, and Figures 1 to 4)

		Type								
		SPT-1	NISPT-1	SPT-2	NISPT-2	SPT-3	SPT-3	SPT-3	SPT-3	SPT-0[m]
Size range, mm^2 (AWG)		0.519 (20) 0.824 (18)	0.519 (20) 0.824 (18)	0.824 (18) 1.31 (16) 2.08 (14)*	0.824 (18) 1.31 (16)	0.824 (18) 1.31 (16)	2.08 (14)	3.31 (12)	5.26 (10)	0.325 (22)
Insulation thickness, mm (mils)	Nominal (not a requirement)	0.76 (30)	N/A	1.14 (45)	N/A	1.52 (60)	2.03 (80)	2.41 (95)	2.79 (110)	0.64 (25)
	Minimum acceptable average (Dimension A)	N/A	0.38 (15)	N/A	0.76 (30)	N/A	N/A	N/A	N/A	N/A
	Minimum thickness at any point (Dimension B)	N/A	0.33 (13)	N/A	0.69 (27)	N/A	N/A	N/A	N/A	N/A
	Minimum thickness at any point before separation	0.69 (27)	N/A	1.01 (40)	N/A	1.37 (54)	1.83 (72)	2.18 (86)	2.51 (99)	0.58 (23)
	Minimum thicknerss at any point after separation	0.33 (13)	N/A	0.69 (27)	N/A	1.01 (40)	1.01 (40)	1.01 (40)	1.01 (40)	0.28 (11)

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Table 18 Continued

	Type								
	SPT-1	NISPT-1	SPT-2	NISPT-2	SPT-3	SPT-3	SPT-3	SPT-3	SPT-0[m]
Minimum thickness of web, mm (mils) (two-conductor)	1.14 (45)	N/A	2.03 (80)	N/A	2.79 (110)	2.79 (110)	2.79 (110)	2.79 (110)	0.96 (38)
Minimum distance between insulated conductors, mm (mils) (Dimension E)	N/A	0.38 (15)	N/A	0.51 (20)	N/A	N/A	N/A	N/A	N/A
Minimum distance between three-conductor, mm (mils)	0.69 (27)	0.38 (15)	1.01 (40)	0.51 (20)	1.37 (54)	1.37 (54)	1.37 (54)	1.37 (54)	0.58 (23)
Minimum acceptable thickness of insulation on grounding conductor, mm (mils)	0.38 (15)	N/A	0.38 (15)	N/A	0.38 (15)	0.38 (15)	0.38 (15)	0.38 (15)	N/A
Minimum thickness at any point of insulation on grounding conductor, mm (mils)	0.33 (13)	N/A	0.33 (13)	N/A	0.33 (13)	0.33 (13)	0.33 (13)	0.33 (13)	N/A
Jacket									
Minimum avgerage mm (mils) (Dimension C)	N/A	0.38 (15)	N/A	0.38 (15)	N/A	N/A	N/A	N/A	N/A
Minimum thickness, mm (mils) (Dimension D)	N/A	0.33 (13)	N/A	0.33 (13)	N/A	N/A	N/A	N/A	N/A

[*] *2.08 mm^2 (14 AWG) SPT-2 is for use in Mexico only.*

Table 19
Dimensions of two- and three-conductor thermoplastic elastomer parallel types

(See Clauses 4.3.1, 4.3.3.1, 4.3.7.1, 4.3.9.3, and 4.3.10, and Table 21 and Figures 1 to 4.)

	Type							
	SPE-1[u]	NISPE-1[m,u]	SPE-2[u]	NISPE-2[m,u]	SPE-3[u]	SPE-3[u]	SPE-3[u]	SPE-3[u]
Size, mm^2 (AWG)	0.519 (20)	0.519 (20)	0.824 (18)	0.824 (18)	0.824 (18)	2.08 (14)	3.31 (12)	5.26 (10)
	0.824 (18)	0.824 (18)	1.31 (16)	1.31 (16)	1.31 (16)			
			2.08 (14)[*]					

Table 19 Continued on Next Page

Table 19 Continued

		Type							
		SPE-1[u]	NISPE-1[m,u]	SPE-2[u]	NISPE-2[m,u]	SPE-3[u]	SPE-3[u]	SPE-3[u]	SPE-3[u]
Insulation thickness, mm (mils)	Nominal (not a requirement)	0.76 (30)	N/A	1.14 (45)	N/A	1.52 (60)	2.03 (80)	2.41 (95)	2.79 (110)
	Minimum acceptable average (Dimension A)	N/A	0.38 (15)	N/A	0.76 (30)	N/A	N/A	N/A	N/A
	Minimum thickness at any point (Dimension B)	N/A	0.33 (13)	N/A	0.69 (27)	N/A	N/A	N/A	N/A
	Minimum thickness at any point before separation	0.69 (27)	N/A	1.01 (40)	N/A	1.37 (54)	1.83 (72)	2.18 (86)	2.51 (99)
	Minimum thickness at any point after separation	0.33 (13)	N/A	0.69 (27)	N/A	1.01 (40)	1.01 (40)	1.01 (40)	1.01 (40)
Minimum thickness of web, mm (mils) (two-conductor)		1.14 (45)	N/A	2.03 (80)	N/A	2.79 (110)	2.79 (110)	2.79 (110)	2.79 (110)
Minimum distance between insulated conductors, mm (mils) (Dimension E)		N/A	0.38 (15)	N/A	0.51 (20)	N/A	N/A	N/A	N/A
Minimum distance between three-conductor, mm (mils)		0.69 (27)	0.38 (15)	1.01 (40)	0.51 (20)	1.37 (54)	1.37 (54)	1.37 (54)	1.37 (54)
Minimum acceptable thickness of insulation on grounding conductor, mm (mils)		0.38 (15)	N/A	0.38 (15)	N/A	0.38 (15)	0.38 (15)	0.38 (15)	0.38 (15)
Minimum thickness at any point of insulation on grounding conductor, mm (mils)		0.33 (13)	N/A	0.33 (13)	N/A	0.33 (13)	0.33 (13)	0.33 (13)	0.33 (13)
Jacket									
Minimum average mm (mils) (Dimension C)		N/A	0.38 (15)	N/A	0.38 (15)	N/A	N/A	N/A	N/A
Minimum thickness, mm (mils) (Dimension D)		N/A	0.33 (13)	N/A	0.33 (13)	N/A	N/A	N/A	N/A

[*] *2.08 mm^2 (14 AWG) SPE-2 is for use in Mexico only.*

Table 20
Thermoplastic service cords

(See Clauses 4.3.1, 4.3.3.1, 4.3.7.1, 4.3.9.3, and 4.3.10.)

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVT, SVTO, SVTOO	SPT-1, SPT-2, SPT-3	NISPT-1, NISPT-2	SJT, SJTO, SJTW, SJTOW, SJTOOW, SJTOO,	ST, STO, STOO, STW, STOW, STOOW
Temp ratings, °C	60, 75, 90, 105	60, 75, 90, 105	60, 75, 90, 105	60, 75, 90, 105	60, 75, 90, 105
Maximum voltage, V	300	300	300	300	600
Size of conductors, mm^2 (AWG)	0.824, 1.04, 1.31 (18, 17, 16)	0.519, 0.824 (SPT-1) (20, 18) (SPT-1) 0.824, 1.31, 2.08* (SPT-2) (18, 16, 14) (SPT-2) 0.824 – 5.26 (SPT-3) (18 – 10) (SPT-3)	0.824, 1.31 (18, 16)	0.824 – 5.26 (18 – 10)	0.824 – 33.6 (18 – 2)
Number of conductors	2 or 3	2 or 3	2 or 3	2 – 6	2 or more
Grounding conductor, Clause	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8
Conductor: Material Size Stranding General	Soft, annealed copper (Clause 4.1.1.2) Cross-sectional area/DC resistance (Clause 4.1.1.3.1) Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2) Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, 4.1.1.6)				
Insulation class, Clause	4.1.2	4.1.2	4.1.2	4.1.2	4.1.2
Circuit conductor					
60°C	4, 14**	4, 14**	4, 14**	4, 14**	4, 14**
75°C	5	5	5	5	5
90°C	6, 15**	6, 15**	6, 15**	6, 15**	6, 15**
105°C	7, 16**	7, 16**	7, 16**	7, 16**	7, 16**
Grounding conductor					
60°C	N/A	4, 8, 14**	4, 8, 14**	N/A	N/A
75°C	N/A	5, 9	5, 9	N/A	N/A
90°C	N/A	6, 10,15**	6, 10,15**	N/A	N/A
105°C	N/A	7, 11, 16**	7, 11, 16**	N/A	N/A
Minimum average thickness, mm (mils)	0.38 (15)	Table 18	Table 18	0.824 mm^2 – 3.31 mm^2 (18 AWG – 12 AWG) = 0.76 (30) 5.26 mm^2 (10 AWG) = 1.14 (45)	0.824 mm^2 – 1.31 mm^2 (18 AWG – 16 AWG) = 0.76 (30) 2.08 mm^2 – 5.26 mm^2 (14 AWG – 10 AWG) = 1.14 (45)

Table 20 Continued on Next Page

Table 20 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVT, SVTO, SVTOO	SPT-1, SPT-2, SPT-3	NISPT-1, NISPT-2	SJT, SJTO, SJTW, SJTOW, SJTOOW, SJTOO,	ST, STO, STOO, STW, STOW, STOOW
Min thickness at any point,	90% of min avg.	Table 18	Table 18	90% of min avg.	8.37 mm^2 – 33.6 mm^2 (8 AWG – 2 AWG) = 1.52 (60) 90% of min avg.
Min thickness at point of contact	80% of min. avg	N/A	N/A	80% of min. avg	80% of min. avg
Covering on individual conductors (optional), Clause	4.1.3	4.3.9.4	4.1.3	4.1.3	4.1.3
Assembly, Clause	4.1.4	Parallel	Parallel	4.1.4	4.1.4
Optional shielding, Clause	4.1.5	N/A	4.1.5	4.1.5	4.1.5
Jacket class					
60°C	1.5, 1.9**	N/A	1.5, 1.9**	1.5, 1.9**	1.5, 1.9**
75°C	1.6	N/A	1.6	1.6	1.6
90°C	1.7, 1.10**	N/A	1.7, 1.10**	1.7, 1.10**	1.7, 1.10**
105°C	1.8, 1.11**	N/A	1.8, 1.11**	1.8, 1.11**	1.8, 1.11**
Minimum and average thickness of jacket, Table	54	N/A	18	54, 55	56, 57, 58
General, Clause	4.1.6	NA	4.1.6	4.1.6	4.1.6
Overall diameter, Clause	4.1.7	NA	NA	4.1.7	4.1.7
Conductor identification, Clause	4.1.9	4.1.9	4.1.9	4.1.9	4.1.9
Tests, Clause					
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Bend test, nylon-covered	5.1.9	5.1.9	5.1.9	5.1.9	5.1.9
Heat-shock resistance	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8
Spark	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
AC leakage current	N/A	N/A	N/A	5.2.11	5.2.11
Mechanical strength	5.1.4	NA	NA	5.1.4	5.1.4
Flexing of shielded cords	5.2.9	NA	5.2.9	5.2.9	5.2.9
Jacket resistance	5.2.10	NA	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Deformation	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, VW-1	5.1.5	5.1.5	5.1.5	5.1.5	5.1.5
Physical properties, Table					
Insulation	9	9	9	9	9
Jacket	12	12	12	12	12

Table 20 Continued on Next Page

Table 20 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVT, SVTO, SVTOO	SPT-1, SPT-2, SPT-3	NISPT-1, NISPT-2	SJT, SJTO, SJTW, SJTOW, SJTOOW, SJTOO,	ST, STO, STOO, STW, STOW, STOOW
Additional tests for "W" type cords, Clause					
Weather resistance	N/A	N/A	N/A	5.1.7	5.1.7
Insulation resistance	N/A	N/A	N/A	5.2.3.1	5.2.3.1
Permittivity and stability factor	N/A	N/A	N/A	5.2.4	5.2.4
Tightness of insulation, Clause	N/A	5.1.10	N/A	N/A	N/A

** 2.08 mm² (14 AWG) SPT-2 is for use in Mexico only.*

*** 14, 15, 16, 1.9, 1.10, and 1.11 TPE insulation and jacket classes for thermoplastic service cords are for use in Canada and Mexico only.*

Table 21
Thermoplastic elastomer service cords

(See Clauses 4.3.1, 4.3.3.1. 4.3.7.1, 4.3.9.3, and 4.3.10)

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVE[u], SVEO[u], SVEOO[u]	SPE-1[u], SPE-2[u], SPE-3[u]	NISPE-1[m,u], NISPE-2[m,u]	SJE[u], SJEO[u], SJEW[u], SJEOW[u], SJEOOW[u], SJEOO[u]	SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u]
Temperature ratings, °C	90, 105	90, 105	90, 105	90, 105	90, 105
Maximum voltage, V	300	300	300	300	600
Size of conductors, mm² (AWG)	0.824, 1.04, 1.31 (18, 17, 16)	0.519, 0.824 (SPE-1[u]) (20, 18) (SPE-1[u]) 0.824, 1.31, (SPE-2[u]) (18, 16) (SPE-2[u]) 0.824 – 5.26 (SPE-3[u]) (18 – 10) (SPE-3[u])	0.824, 1.31 (18, 16)	0.824 – 5.26 (18 – 10)	0.824 – 33.6 (18 – 2)
Number of conductors	2 or 3	2 or 3	2 or 3	2 – 6	2 or more
Grounding conductor, Clause	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8	4.1.1.8
Conductor: Material Size Stranding	 Soft, annealed copper (Clause 4.1.1.2) Cross-sectional area/DC resistance (Clause 4.1.1.3.1) Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)				

Table 21 Continued on Next Page

Table 21 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVE[u], SVEO[u], SVEOO[u]	SPE-1[u], SPE-2[u], SPE-3[u]	NISPE-1[m,u], NISPE-2[m,u]	SJE[u], SJEO[u], SJEW[u], SJEOW[u], SJEOOW[u], SJEOO[u]	SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u]
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)				
Insulation class, Clause	4.1.2	4.1.2	4.1.2	4.1.2	4.1.2
Circuit conductor					
90°C	15	15	15	15	15
105°C	16	16	16	16	16
Grounding conductor					
90°C	N/A	15	15	N/A	N/A
105°C	N/A	16	16	N/A	N/A
Minimum average thickness, mm (mils)	0.38 (15)	Table 19	Table 19	0.824 mm^2 – 3.31 mm^2 (18 AWG – 12 AWG) = 0.76 (30) 5.26 mm^2 (10 AWG) = 1.14 (45);	0.824 mm^2 – 1.31 mm^2 (18 AWG – 16 AWG) = 0.76 (30) 2.08 mm^2 – 5.26 mm^2 (14 AWG – 10 AWG) = 1.14 (45) 8.37 mm^2 – 33.6 mm^2 (8 AWG – 2 AWG) = 1.52 (60)
Min thickness at any point	90% of min avg.	Table 19	Table 19	90% of min avg.	90% of min avg.
Min thickness at point of contact	80% of min. avg	N/A	N/A	80% of min. avg.	80% of min. avg.
Covering on individual conductors (optional), Clause	4.1.3	NA	NA	4.1.3	4.1.3
Assembly, Clause	4.1.4	4.3.9	4.3.10	4.1.4	4.1.4
Optional shielding, Clause	4.1.5	N/A	4.1.5	4.1.5	4.1.5
Jacket class					
90°C	1.10	N/A	1.10	1.10	1.10
105°C	1.11	N/A	1.11	1.11	1.11
Minimum and average thickness of jacket, Table	54	N/A	18	54, 55	56, 57, 58
General, Clause	4.1.6	N/A	4.1.6	4.1.6	4.1.6
Overall diameter, Clause	4.1.7	N/A	N/A	4.1.7	4.1.7
Conductor identification, Clause	4.1.9	4.1.9	4.1.9	4.1.9	4.1.9
Tests, Clause					
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3

Table 21 Continued on Next Page

Table 21 Continued

	Type				
	Not for hard usage			Hard usage	Extra-hard usage
	SVE[u], SVEO[u], SVEOO[u]	SPE-1[u], SPE-2[u], SPE-3[u]	NISPE-1[m,u], NISPE-2[m,u]	SJE[u], SJEO[u], SJEW[u], SJEOW[u], SJEOOW[u], SJEOO[u]	SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u]
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Heat-shock resistance	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8
Spark	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
Mechanical strength	5.1.4	N/A	N/A	5.1.4	5.1.4
Flexing of shielded cords	5.2.9	N/A	5.2.9	5.2.9	5.2.9
Jacket resistance	5.2.10	N/A	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Bend test, nylon covered	5.1.9	5.1.9	5.1.9	5.1.9	5.1.9
Deformation	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, VW-1	5.1.5	5.1.5	5.1.5	5.1.5	5.1.5
Physical properties, Table					
Insulation	9	9	9	9	9
Jacket	12	N/A	12	12	12
Additional tests for “W” type cords, Clause					
Weather resistance	N/A	N/A	N/A	5.1.7	5.1.7
Insulation resistance	N/A	N/A	N/A	5.2.3.1	5.2.3.1
Permittivity and stability factor	N/A	N/A	N/A	5.2.4	5.2.4
Tightness of insulation, Clause	N/A	5.1.10	N/A	N/A	N/A

Table 22
Decorative cords

(See Clauses 4.3.1, 4.3.3.1, and 4.3.9.3 and Figure 2.)

	Type					
	PXT[c]	PXWT[c]	TX[c]	CXWT[c]	CXWT[c]	SPT-0[m]
Maximum temperature, °C	60	60	60	60	60	60, 75, 90, 105
Maximum voltage, V	125	300	125	300	600	300
Size of conductors, mm^2 (AWG)	0.519 (20)	0.824 and 1.31 (18 and 16)	0.519 (20)	0.824 and 1.31 (18 and 16)	2.08 and 3.31 (14 and 12)	0.325 (22)
Number of conductors	2	2	2	2	2	2 or 3
Conductor:						
Material	Soft annealed copper (Clause 4.1.1.2)					
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)					
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)					
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)					

Table 22 Continued on Next Page

Table 22 Continued

	Type					
	PXT[c]	**PXWT[c]**	**TX[c]**	**CXWT[c]**	**CXWT[c]**	**SPT-0[m]**
Conductor identification, Clause	4.1.9	4.1.9	N/A	N/A	N/A	4.1.9
Maximum lay of conductors, Clause	N/A	N/A	4.1.4.1	4.1.4.1	4.1.4.1	N/A
Insulation class	4	4	4	4	4	4, 5, 6, 7
Minimum average thickness, mm (mils)	0.76 (30)*	1.14 (45)*	0.58 (23)	1.14 (45)	1.52 (60)	0.64 (25)*
Minimum thickness (before separation for parallel), mm (mils)	0.69 (27)	1.01 (40)	N/A	1.01 (40)	1.37 (54)	N/A
Minimum average thickness (after separation), mm (mils)	0.33 (13)	1.01 (40)	N/A	N/A	N/A	0.28 (11)
Minimum web thickness, mm (mils)	1.14 (45)	2.16 (85)	N/A	N/A	N/A	0.96 (38) (2 conductors); 0.58 (23) (3 conductors)
Assembly	Parallel integral	Parallel integral	Twisted	Twisted	Twisted	Parallel integral
Tests, Clause						
Insulation	5.1.1	5.1.1	5.1.1	5.1.1	5.1.1	5.1.1
Deformation	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3
Spark test	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
Flame FT2	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
Flame VW-1 (optional)	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4
Flame FT1 (optional)	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1
FT4 (optional)	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Weather resistance	N/A	5.1.7	N/A	5.1.7	5.1.7	N/A
Durability of print	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Heat-shock resistance	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3
Permittivity and stability factor	N/A	5.2.4	N/A	5.2.4	5.2.4	N/A
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Tightness of insulation	5.1.10	5.1.10	N/A	5.1.10	5.1.10	5.1.10
Application	Indoor	Outdoor	Indoor	Outdoor	Outdoor	Indoor

** This value is provided for information only. It is not a requirement.*

Table 23
Decorative cords and clock cords

(See Clauses 4.3.1, 4.3.3.1, and 4.3.9.3.)

	Type					
	XTW[u]	**CXTW[u]**	**CXTW[u]**	**SPT-1W[u]**	**SPT-2W[u]**	**Clock[u]**
Maximum temperature, °C	105	105	105	105	105	60, 105
Maximum voltage, V	300	300	300	300	300	125
Size of conductors, mm^2 (AWG)	0.519 and 0.824 (20 and 18)	0.325, 0.519 and 0.824 (22, 20, and 18)	0.325, 0.519 and 0.824 (22, 20, and 18	0.519 and 0.824 (20 and 18)	0.824 and 1.31 (18 and 16)	0.519 (20)
Number of conductors	2 – 6	2	1	2	2	2
Conductor:						
Material	Soft annealed copper (Clause 4.1.1.2)					
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)					
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)					
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)					
Conductor identification	4.1.9	4.1.9	N/A	4.1.9	4.1.9	N/A
Maximum lay of conductors	N/A	4.1.4.1	N/A	N/A	N/A	N/A
Insulation class	7	7	7	7	7	4, 7
Minimum average thickness, mm (mils)	0.76 (30)*	0.76 (30)	0.76 (30)	0.76 (30)*	1.14 (45)*	0.76 (30)*
Minimum thickness (before separation for parallel), mm (mils)	0.69 (27)	0.69 (27)	0.69 (27)	0.69 (27)	1.01 (40)	0.69 (27)
Minimum thickness after separation, mm (mils)	0.33 (13)	N/A	N/A	0.33 (13)	0.69 (27)	0.33 (13)
Minimum web thickness, mm (mils)	1.14 (45)	N/A	N/A	1.14 (45)	2.03 (80)	1.14 (45)
Assembly	Parallel integral	Twisted	Single	Parallel integral	Parallel integral	Parallel integral
Tests, Clause						
Insulation	5.1.1	5.1.1	5.1.1	5.1.1	5.1.1	5.1.1
Deformation	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3	5.1.3
Spark test	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
Flame FT2 (mandatory)	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3	5.1.5.3
Flame VW-1	5.1.5.4 (mandatory)	5.1.5.4 (mandatory)	5.1.5.4 (mandatory)	5.1.5.4 (optional)	5.1.5.4 (optional)	5.1.5.4 (optional)
Flame FT1 (optional)	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1
Flame FT4 (optional)	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Weather resistance	5.1.7	5.1.7	5.1.7	5.1.7	5.1.7	N/A
Durability of print	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Heat-shock resistance	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8	5.1.8
Insulation resistance	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3	5.2.3
Permittivity and stability factor	5.2.4	5.2.4	5.2.4	5.2.4	5.2.4	N/A
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Tightness of insulation	5.1.10	5.1.10	5.1.10	5.1.10	5.1.10	5.1.10
Application	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Indoor

Table 23 Continued on Next Page

Table 23 Continued

	Type					
	XTW[u]	CXTW[u]	CXTW[u]	SPT-1W[u]	SPT-2W[u]	Clock[u]
** This value is provided for information only. It is not a requirement.*						

Table 24
Voltage and leakage currents for surface marking of low-leakage-current service cords

(See Clauses 4.3.14.3 and 6.2.4)

Voltage source, Vac	Highest rms leakage current in microamperes flowing (separately) between each circuit conductor and the grounding conductor	Highest rms leakage current in microamperes flowing (separately) between each circuit conductor and foil covering to jacket	Values to be used in cord-surface marking		
			Volts	µA to green	µA through jacket
120	0 – 3	0 – 9	120	3	9
120	0 – 5	0 – 12	120	5	12
120	0 – 7	0 – 15	120	7	15
120	0 – 10	0 – 20	120	10	20
240	0 – 6	0 – 18	240	6	18
240	0 – 9	0 – 24	240	9	24
240	0 – 14	0 – 30	240	14	30
240	0 – 20	0 – 40	240	20	40

Table 25
Oil-resistant heater cords

(See Clauses 4.4, 4.4.3.1, 4.4.5.1, and 4.4.5.2.)

	Type		
	HPN (not for hard usage)	HSJO (hard usage)	HSJOO (hard usage)
Maximum temperature, °C	90, 105	90, 105	90, 105
Maximum voltage, V	300	300	300
Size of conductors, mm^2 (AWG)	0.824 – 3.31 (18 – 12)	0.824 – 3.31 (18 – 12)	0.824 – 3.31 (18 – 12)
Number of conductors	2 or 3	2, 3, or 4	2, 3, or 4
Grounding conductor, Clause	4.1.1.8	4.1.1.8	4.1.1.8
Conductor:			
Material	Soft, annealed copper (Clause 4.1.1.2)		
Size	Cross-sectional area / DC resistance (Clause 4.1.1.3.1)		
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)		
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)		
Insulation, Clause	4.1.2	4.1.2	4.1.2
Circuit conductor, Class			
90°C	12	3, 12	3, 12
105°C	18	18 ,19	18, 19
Grounding conductor, Class			
90°C	10, 12	N/A	N/A
105°C	11, 18	N/A	N/A

Table 25 Continued on Next Page

Table 25 Continued

	Type		
	HPN (not for hard usage)	HSJO (hard usage)	HSJOO (hard usage)
Average thickness and minimum thickness at any point, Table	27 and 28	29	29
Assembly of conductors, Clause	4.4.4	4.4.4	4.4.4
Jacket class			
90°C	N/A	1.4	1.4
105°C	N/A	1.12	1.12
Average thickness and minimum thickness, mm (mils)	N/A	0.76 (30) min avg.	0.76 (30) min avg.
	N/A	0.61 (24) min point	0.61 (24) min point
Conductor identification, Clause	4.1.9	4.1.9	4.1.9
Tests, Clause			
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, and VW-1	5.1.5.1, 5.1.5.2, 5.1.5.4	5.1.5.1, 5.1.5.2, 5.1.5.4	5.1.5.1, 5.1.5.2, 5.1.5.4
Insulation resistance	5.2.3	5.2.3	5.2.3
Cold bend	5.1.6	5.1.6	5.1.6
Arcing	5.2.5 and 5.2.6	N/A	N/A
Spark	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7
Durability of printing	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8
Tightness of insulation	5.1.10	N/A	N/A
Jacket resistance	N/A	5.2.10	5.2.10
Physical properties insulation, Table	9	9	9
Jacket, Table	N/A	12	12

Table 26
Heater cords

(See Clauses 4.4, 4.4.3.1, 4.4.5.1, and 4.4.5.2.)

	Type	
	HPD[u] (not for hard usage)	HSJ (hard usage)
Maximum temperature, °C	90, 105	90, 105
Maximum voltage, V	300	300
Size of conductors, mm^2 (AWG)	0.824 – 3.31 (18 – 12)	0.824 – 3.31 (18 – 12)
Number of conductors	2, 3 or 4	2, 3, or 4
Grounding conductor, Clause	4.1.1.8	4.1.1.8
Conductor:		
Material	Soft, annealed copper (Clause 4.1.1.2)	
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)	
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)	
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)	
Insulation, Clause	4.1.2	4.1.2

Table 26 Continued on Next Page

Table 26 Continued

	Type	
	HPD[u] (not for hard usage)	HSJ (hard usage)
Circuit conductor, Class		
90°C	3, 12	3, 12
105°C	18, 19	18, 19
Average thickness and minimum thickness at any point, Table	29	29
Insulated conductor braid	4.1.3.2	N/A
Assembly of conductors, Clause	4.4.4	4.4.4
Overall braid	4.1.3.2	N/A
Jacket class		
90°C	N/A	1.4
105°C	N/A	1.12
Average thickness and minimum thickness, mm (mils)	N/A	0.76 (30) min. avg.
	N/A	0.61 (24) min. point
Conductor identification, Clause	4.1.9	4.1.9
Tests, Clause		
Flame (FT2)	5.1.5.3	5.1.5.3
(Optional) FT1, FT4, and VW-1	5.1.5.1, 5.1.5.2, 5.1.5.4	5.1.5.1, 5.1.5.2, 5.1.5.4
Insulation resistance	5.2.3	5.2.3
Cold bend	5.1.6	5.1.6
Spark	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2
Continuity	5.2.7	5.2.7
Durability of printing	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8
Jacket resistance	N/A	5.2.10
Flexibility of braid	4.1.3.2.5	N/A
Physical properties		
Insulation, Table	9	9
Jacket, Table	N/A	12

Table 27
Thickness of insulation and web of two-conductor Type HPN

(See Clauses 4.4.3.2 and Figure 2)

		Size of conductor, mm^2 (AWG)		
		0.824 – 1.31 (18 – 16)	**2.08 (14)**	**3.31 (12)**
Thickness of insulation, mm (mils)	Nominal*	1.14 (45)	1.52 (60)	2.41 (95)
	Minimum at any point before separation	1.02 (40)	1.37 (54)	2.18 (86)
	Minimum at any point after separation	0.69 (27)	0.69 (27)	1.02 (40)
Thickness of web (distance between conductors), mm (mils)	Minimum at any point	2.03 (80)	2.03 (80)	2.79 (110)

**These values are provided for information only. They are not requirements.*

Table 28
Thickness of insulation and other dimensions of three-conductor Type HPN

(See Clause 4.4.3.2 and Figure 3.)

		Size of conductor, mm^2 (AWG)		
		0.824 – 1.31 (18 – 16)	**2.08 (14)**	**3.31 (12)**
Thickness of insulation, mm (mils)	Nominal*	1.14 (45)	1.52 (60)	2.41 (95)
	Minimum at any point before separation	1.02 (40)	1.37 (54)	2.18 (86)
	Minimum at any point after separation	0.69 (27)	0.69 (27)	1.02 (40)
Minimum distance between conductors, mm (mils)		1.02 (40)	1.02 (40)	1.37 (54)
Minimum average thickness of insulation on grounding conductors, mm (mils)		0.38 (15)	0.38 (15)	0.38 (15)
Minimum thickness at any point, mm (mils)		0.33 (13)	0.33 (13)	0.33 (13)

** These values are provided for information only. They are not requirements.*

Table 29
Thickness of insulation on Types HSJO, HSJOO, HSJ, and HPD[u]

(See Clause 4.4.3.3.)

Size of conductor, mm^2 (AWG)	Thickness, mm (mils)	
	Minimum average	Minimum at any point
0.824 – 1.31 (18 – 16)	0.76 (30)	0.69 (27)
2.08 – 3.31 (14 – 12)	1.14 (45)	1.02 (40)

Table 30
Tinsel cords

(See Clauses 4.5, 4.5.3.1, 4.5.3.2, 4.5.3.3, 4.5.5.1, and 4.5.5.2.)

	Type		
	Shaver[u,*]	TPT	TST
Maximum temperatures, °C	60	60	60
Maximum voltage, V	300	300	300
Conductor size, mm^2 (AWG)	0.100 (27)	0.100 (27)	0.100 (27)
Number of conductors	2	2	2
Conductor construction, Clause	4.5.2.1.2	4.5.2.1	4.5.2.1
Resistance, Clause	4.5.2.2	4.5.2.2	4.5.2.2
Insulation class	4	4	4
Minimum average thickness, mm (mils)	0.76 (30)	0.76 (30)	0.38 (15)
Minimum thickness at any point, mm (mils)	0.69 (27)	0.69 (27)	0.33 (13)
Thickness of web, minimum at any point, mm (mils)	N/A	1.14 (45)	N/A
Assembly of conductors, Clause	4.3.9.1	4.5.4	4.5.4
Jacket class	1.5	N/A	1.5
Average thickness, mm (mils)	0.76 (30)	N/A	0.76 (30)
Minimum thickness, mm (mils)	0.61 (24)	N/A	0.61 (24)
Conductor identification, Clause	4.5.7	4.5.7	4.5.7
Tests, Clause			
Deformation	5.1.3	N/A	5.1.3
Cold bend	5.1.6	5.1.6	5.1.6
Heat-shock resistance	5.1.8	5.1.8	5.1.8
Spark	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2
Continuity	5.2.7	5.2.7	5.2.7
Conductor corrosion	5.2.8	5.2.8	5.2.8
Insulation resistance	5.2.3	5.2.3	5.2.3
Jacket resistance	5.2.10	N/A	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12
Flame (FT2)	5.1.5.3	5.1.5.3	5.1.5.3
FT1, FT4, VW-1 (Optional)	5.1.5.1, 5.1.5.2, 5.1.5.4	5.1.5.1, 5.1.5.2, 5.1.5.4	5.1.5.1, 5.1.5.2, 5.1.5.4
Physical properties:			
Insulation, Table	9	9	9
Jacket, Table	12	N/A	12

[*] *Shaver cord is limited to factory-assembled detachable and nondetachable power supply cords for hand held 50-W and smaller hair clippers and shaving appliances.*

Table 31
Elevator traveling cables

(See Clause 4.6, 4.6.2.1 and 4.6.6.1.)

	Type							
	E	**E**	**EO**	**EO**	**ETT**	**ETT**	**ETP**	**ETP**
Maximum temperature, °C	60	60	60	60	60	60	60	60
Maximum voltage, V	300	600	300	600	300	600	300	600
Size of conductor, mm^2 (AWG)	0.519 – 3.31 (20 – 12)	3.31 – 33.6 (12 – 2)	0.519 – 3.31 (20 – 12)	3.31 – 33.6 (12 – 2)	0.519 – 3.31 (20 – 12)	3.31 – 33.6 (12 – 2)	0.519 – 3.31 (20 – 12)	3.31 – 33.6 (12 – 2)
Conductor:	2 or more							
Material	Soft, annealed copper (Clause 4.1.1.2)							
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)							
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)							
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)							
Insulation class	1	1	1	1	4	4	4	4
Thickness, Table	32	32	32	32	32	32	32	32
Braid over insulation, Clause	4.6.3.2	4.6.3.2	4.6.3.2	4.6.3.2	4.6.3.2	4.6.3.2	4.6.3.2	4.6.3.2
Assembly of conductors, Clause	4.6.4	4.6.4	4.6.4	4.6.4	4.6.4	4.6.4	4.6.4	4.6.4
Shielding, Clause	4.6.5	4.6.5	4.6.5	4.6.5	4.6.5	4.6.5	4.6.5	4.6.5
Jacket class	N/A	N/A	1.2	1.2	1.5	1.5	1.5	1.5
Outer braid, Clause	4.6.3.3	4.6.3.3	N/A	N/A	N/A	N/A	N/A	N/A
Thickness, Clause	N/A	N/A	4.6.6.3	4.6.6.3	4.6.6.3	4.6.6.3	4.6.6.3	4.6.6.3
Tests, Clause								
Flame FT1 (mandatory)	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1	5.1.5.1
Flame VW-1 (optional)	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4	5.1.5.4
Flame FT4 (optional)	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2	5.1.5.2
Cold bend	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6	5.1.6
Heat-shock resistance	N/A	N/A	N/A	N/A	5.1.8	5.1.8	5.1.8	5.1.8
Spark	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2	5.2.2
Insulation resistance	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2
Continuity of conductors	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7	5.2.7
Deformation	N/A	N/A	N/A	N/A	5.1.3	5.1.3	5.1.3	5.1.3
Jacket resistance	N/A	N/A	5.2.10	5.2.10	5.2.10	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12	5.1.12
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8	5.2.8
Physical properties:								
Insulation, Table	9	9	9	9	9	9	9	9
Jacket, Table	N/A	N/A	12	12	12	12	12	12

Table 32
Insulation thickness of elevator travelling cables

(See Clause 4.6.2.2.)

Conductor size,		Average thickness,	Minimum thickness,	Minimum thickness at line of contact,
mm^2	(AWG)	mm (mils)	mm (mils)	mm (mils)
0.519 to 1.31	(20 to 16)	0.50 (20)	0.45 (18)	0.40 (16)
2.08 and 3.31*	(14 and 12*)	0.76 (30)	0.69 (27)	0.61 (24)
3.31 and 5.26	(12 and 10)	1.14 (45)	1.01 (40)	0.91 (36)
8.37 to 33.62	(8 to 2)	1.52 (60)	1.37 (54)	1.22 (48)
**3.31 mm^2 (12 AWG) rated 300 V only.*				

Table 33
Braid requirements for Type E

(See Clause 4.6.3.3.2.)

Diameter under braid, mm (in)	Minimum thickness of each braid, mm (mils)	Minimum size and ply of yarn, denier/number of ends
0 – 5.08 (0 – 0.20)	0.38 (15)	30/2 or 14/1
5.09 – 8.89 (0.21 – 0.35)	0.43 (17)	26/2 or 12/1
8.90 – 20.3 (0.36 – 0.80)	0.50 (20)	20/2 or 10/1
20.4 – 38.1 (0.81 – 1.50)	0.60 (24)	12/2 or 6/1
38.2 (1.51) and larger	0.78 (31)	3/8

Table 34
Lay of conductors of Types E, EO, ETT, and conductor groups of Type ETP

(See Clauses 4.6.4.1 and 4.6.4.4.3..)

Number of conductors	Maximum length of lay
2	30 times conductor diameter
3	35 times conductor diameter
4	40 times conductor diameter
5 or more	15 times the overall diameter of the assembly, except that in a multiple layer cable the length of the lay of the conductors in the inner layers shall be not more than 20 times the overall diameter of that layer
Note: *"Conductor diameter" means the diameter of the individual, finished, insulated conductors of which the cord or cable is composed.*	

Table 35
Thickness of jacket on Type EO

(See Clause 4.6.6.3.)

Core diameter, mm (in)	Thickness, mm (mils)	
	Average	Minimum at any point
0 – 12.7 (0 – 0.50)	2.03 (80)	1.62 (64)
12.8 – 19.1 (0.51 – 0.75)	2.41 (95)	1.93 (76)
19.2 – 25.4 (0.76 – 1.00)	2.79 (110)	2.23 (88)
25.5 – 38.1 (1.01 – 1.50)	3.17 (125)	2.54 (100)
38.2 – 50.8 (1.51 – 2.00)	3.56 (140)	2.84 (112)

Table 36
Thickness of jacket on Types ETT and ETP and minimum thickness of mandatory web(s) on Type ETP

(See Clause 4.6.6.3.)

Core diameter, mm (in)	Thickness, mm (mils)	
	Average	Minimum at any point of jacket and web(s)
0 – 6.3 (0 – 0.25)	0.89 (35)	0.71 (28)
6.4 – 12.7 (0.26 – 0.50)	1.14 (45)	0.91 (36)
12.8 – 25.4 (0.51 – 1.00)	1.52 (60)	1.21 (48)
25.5 (1.01) and larger	2.03 (80)	1.62 (64)

Notes:

(1) *The core diameter shall be measured over the fibrous covering enclosing the conductor assembly for Type ETT.*

(2) *For Type ETP, the core diameter for group constructions shall be determined by measuring the diameter of the largest group, including the fibrous covering if present. For nongroup constructions, the core diameter shall be determined by measuring the diameter of the largest conductor in the cable.*

(3) *Web thickness is the distance (jacket thickness) between conductors, support members, or groups.*

Table 37
Hoistway cables

(See Clauses 4.7, 4.7.4.2, and 4.7.5.6)

	Type			
	Hoistway cables			
Maximum temperature, °C	60	60	90	90
Maximum voltage, V	300	600	300	600
Size of conductor, mm^2 (AWG)	0.519 – 3.31 (20 – 12)	0.824 – 3.31 (18 – 12)	0.519 – 3.31 (20 – 12)	0.824 – 3.31 (18 – 12)
Conductor:	2 or more			
Material	Soft, annealed copper (Clause 4.1.1.2)			
Size	Cross-sectional area/DC resistance (Clause 4.1.1.3.1)			
Stranding	Size of wires (Clause 4.1.1.7.1), lay of wires (Clause 4.1.1.7.2)			
General	Joints, coatings, separators (Clauses 4.1.1.4, 4.1.1.5, and 4.1.1.6)			
Insulation class	4	4	17	17
Thickness, Table	38	38	38	38
Assembly of conductors, Clause	4.7.5	4.7.5	4.7.5	4.7.5
Jacket class (optional)	1.5	1.5	1.7	1.7
Thickness, Table	39	39	39	39
Test, Clause				

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Table 37 Continued

	Type			
	Hoistway cables			
Deformation, insulation, and jacket	5.1.3	5.1.3	5.1.3	5.1.3
Flame FT1 (mandatory)	5.3.1	5.3.1	5.3.1	5.3.1
Flame FT4, VW-1 (optional)	5.1.5.2, 5.1.5.4	5.1.5.2, 5.1.5.4	5.1.5.2, 5.1.5.4	5.1.5.2, 5.1.5.4
Cold bend	5.3.3	5.3.3	5.3.3	5.3.3
Heat-shock resistance	5.3.2	5.3.2	5.3.2	5.3.2
Spark	5.2.1	5.2.1	5.2.1	5.2.1
Dielectric strength	5.3.4 and 5.2.2	5.3.4 and 5.2.2	5.3.4 and 5.2.2	5.3.4 and 5.2.2
Insulation resistance	5.2.3.2	5.2.3.2	5.2.3.2	5.2.3.2
Continuity	5.2.7	5.2.7	5.2.7	5.2.7
Conductor corrosion	5.2.8	5.2.8	5.2.8	5.2.8
Jacket resistance	5.2.10	5.2.10	5.2.10	5.2.10
Durability of printing	5.1.12	5.1.12	5.1.12	5.1.12
Physical properties, Table				
Insulation	9	9	9	9
Jacket (where applicable)	12	12	12	12

Table 38
Insulation thicknesses for hoistway cables

(See Clauses 4.7.4.3 and 4.7.4.4.)

Size, mm^2 (AWG)	600 V cables, mm (mils)		300 V cables, mm (mils)	
	Average	Minimum	Average	Minimum
0.519 (20)	–	–	0.50 (20)	0.45 (18)
0.824 (18)	0.76 (30)	0.68 (27)	0.50 (20)	0.45 (18)
1.31 (16)	0.76 (30)	0.68 (27)	0.50 (20)	0.45 (18)
2.08 (14)	0.76 (30)	0.68 (27)	0.76 (30)	0.68 (27)
3.31 (12)	0.76 (30)	0.68 (27)	0.76 (30)	0.68 (27)

Notes:

(1) *For 300 V constructions in sizes 0.519 (20), 0.824 (18), and 1.31 (16), an alternative insulation thickness of 0.38 mm (15 mils) average (0.33 mm (13 mils) minimum) for PVC plus 0.10 mm (4 mils) minimum at any point of nylon covering shall be permitted.*

(2) *A thickness of 80% of the minimum average shall be permitted only at the line of contact between conductors.*

Table 39
Jacket thickness for hoistway cables

(See Clause 4.7.5.6.)

Core diameter, mm (in)	Jacket thickness, mm (mils)	
	Average	Minimum point
0 – 5.7 (0 – 0.40)	0.50 (20)	0.40 (16)
5.8 – 17.7 (0.41 – 0.70)	0.76 (30)	0.61 (24)
17.8 – 25.4 (0.71 – 1.00)	0.88 (35)	0.70 (28)
25.5 – 38.1 (1.01 – 1.50)	1.01 (40)	0.81 (32)
38.2 (1.51) and larger	1.14 (45)	0.91 (36)

Table 40
Deformation test

(See Clauses 5.1.3.1 and 5.1.3.2.)

Size of conductor, mm^2 (AWG)	Mass on insulation specimen, g		
0.325 (22)	200		
0.519, 0.824, 1.04 (20, 18, 17)	300		
1.31 (16)	400		
2.08 – 33.6 (14 – 2)	500		
	Test temperature, °C		
Insulation class	100 ±2	121 ±2	150 ±2
4, 5, 6, 7, 10, 11, 17		X	
14, 15, 16			X
8, 9	X		
Jacket class			
1.5, 1.6, 1.7, 1.8		X	
1.9, 1.10, 1.11			X

Table 41
Temperature for cold bend test

(See Clause 5.1.6.)

Type of cord	Test temperature
Any “W” cord not marked or marked –40°C	–40 °C
Any “W” cord marked –50°C	–50 °C
Any “W” cord marked –60°C	–60 °C
Any “W” cord marked –70°C	–70 °C
Any other type of cord	–20 °C

Table 42
Mandrel diameter for cold bend test

(See Clauses 5.1.6 and 5.1.7.1.)

Minor diameter of flat cord or overall diameter of round finished cord, mm (in)	Diameter of mandrel, mm (in)	Number of turns around mandrel
0 – 3.18 (0 – 0.125)	6.5 (0.25)	6
3.19 – 6.35 (0.126 – 0.250)	12.7 (0.50)	6
6.36 – 9.52 (0.251 – 0.375)	19.0 (0.75)	6
9.53 – 12.70 (0.376 – 0.500)	25.4 (1.00)	6
12.71 – 15.88 (0.501 – 0.625)	31.8 (1.25)	6
15.89 – 19.05 (0.626 – 0.750)	38.0 (1.50)	1
19.06 – 22.22 (0.751 – 0.874)	44.5 (1.75)	1
22.23 – 25.40 (0.875 – 1.00)	50.8 (2.00)	1
25.41 – 28.58 (1.01 – 1.13)	57.1 (2.25)	1
28.59 – 31.75 (1.14 – 1.25)	63.5 (2.50)	1
31.76 – 34.92 (1.26 – 1.38)	69.9 (2.75)	1
34.93 – 38.10 (1.39 – 1.50)	76.2 (3.00)	1
38.11 – 41.28 (1.51 – 1.63)	82.6 (3.25)	1
41.29 – 44.45 (1.64 – 1.75)	88.9 (3.50)	1
44.46 – 47.62 (1.76 – 1.88)	95.2 (3.75)	1
47.63 – 50.8 (1.89 – 2.00)	101.6 (4.00)	1
Larger than 50.8 (2.00)	2 X cable diameter	1

Table 43
Mandrel diameter for heat-shock resistance test on thermoplastic insulation, mm (in)

(See Clauses 5.1.8.1.)

Size of conductor mm^2 (AWG)	Types PXT[c], TX[c], ETT, ETP, SPT-1, SPE-1[u], SPT-1W[u], SPT-0[m], clock cord[u], and individual conduct or of jacketed cords and cables	Type TPT, shaver cord[u]	Type TST	Individual conductor of Type TST	Type XTW[u], CXTW[u]	Type CXWT[c]	Types SPT-2, SPT-2W[u], SPE-2[u], PXWT[c]	Types SPT-3, SPE-3[u]
0.100 (27)	–	2.4 (0.094)	13.0 (0.50)	2.4 (0.094)	–	–	–	–
0.325 (22)	2.0 (0.078)	–	–	–	2.4 (0.094)	–	–	–
0.519 (20)	2.4 (0.094)	–	–	–	2.4 (0.094)	–	–	–
0.824 (18)	2.8 (0.11)	–	–	–	2.4 (0.094)	3.6 (0.14)	4.0 (0.16)	5.2 (0.20)
1.04 (17)	3.2 (0.13)	–	–	–	–	–	–	–
1.31 (16)	3.2 (0.12)	–	–	–	–	4.0 (0.16)	5.2 (0.20)	5.6 (0.22)
2.08 (14)	4.0 (0.16)	–	–	–	–	6.7 (0.27)	–	6.0 (0.23)
3.31 (12)	4.8 (0.19)	–	–	–	–	6.7 (0.27)	–	7.1 (0.28)
5.26 (10)	5.6 (0.22)	–	–	–	–	–	–	7.9 (0.31)
8.37 (8)	6.7 (0.27)	–	–	–	–	–	–	16.0 (0.63)
13.3 (6)	7.9 (0.31)	–	–	–	–	–	–	–
21.2 (4)	9.1 (0.36)	–	–	–	–	–	–	–
33.6 (2)	11.0 (0.44)	–	–	–	–	–	–	–

Table 44
Mandrel diameter for heat-shock resistance test on jackets

(See Clause 5.1.8.2.)

Overall diameter of finished cord or minor dimension of flat cords, mm (in)	Diameter of mandrel, mm (in)
0.0 – 6.35 (0 – 0.250)	12.7 (0.50)
6.36 – 7.92 (0.251 – 0.312)	20.6 (0.81)
7.93 – 9.52 (0.313 – 0.375)	28.6 (1.13)
9.53 – 11.1 (0.376 – 0.437)	34.9 (1.37)
11.2 – 12.7 (0.438 – 0.500)	42.8 (1.69)
12.8 – 14.3 (0.501 – 0.563)	50.8 (2.00)
14.4 – 15.9 (0.564 – 0.625)	54.0 (2.13)
16.0 – 17.4 (0.626 – 0.685)	65.1 (2.56)
17.5 – 19.0 (0.686 – 0.750)	73.0 (2.87)
19.1 – 21.6 (0.751 – 0.850)	79.4 (3.13)
21.7 – 25.4 (0.851 – 1.00)	82.6 (3.25)
25.5 – 28.6 (1.01 – 1.13)	88.9 (3.50)
28.7 – 31.7 (1.14 – 1.25)	95.3 (3.75)
31.8 – 34.9 (1.26 – 1.37)	108 (4.25)
35.0 – 38.1 (1.38 – 1.50)	114 (4.30)
38.2 – 41.3 (1.51 – 1.63)	127 (5.00)
41.4 – 44.4 (1.64 – 1.75)	133 (5.25)
44.5 – 47.6 (1.76 – 1.87)	143 (5.63)
47.7 – 50.8 (1.88 – 2.00)	152 (6.00)
Larger then 50.8 (2.00)	3 X cable diameter

Notes:

(1) *For round cable having an overall diameter less than 19 mm (0.748 in), the specimen shall be wound six close turns around the mandrel. For round cable having a diameter of 19 mm (0.748 in) or greater, the specimen shall be wound one complete turn around the mandrel.*

(2) *For flat cables having a major dimension less than 25 mm (1 in), the specimen shall be wound six turns around the mandrel. For flat cables having a major dimension of 25 mm (1 in) or greater, the specimen shall be wound one turn around the mandrel.*

Table 45
Spark test voltage

(See Clause 5.2.1.)

Type of cord or cable	Conductor size, mm ^{2} (AWG)	Average insulation thickness, mm (mils)	AC spark test potential, kV*
SV, SVO, SVOO, SVE^u, SVEO^u, SVEOO^u, SVT, SVTO, SVTOO	0.824, 1.04, 1.31 (18, 17, 16)	0.38 (15)	3
TST	0.100 (27)	0.38 (15)	3
SJ, SJTO, SJTOO, SJE^u, SJEO^u, SJEOO^u SJO, SJOO, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SJEW^u, SJEOW^u, SJEOOW^u, HSJO, HSJOO, HPD^u, HSJ	0.824 – 3.31 (18 – 12)	0.76 (30)	6
	5.26 (10)	1.14 (45)	7.5

Table 45 Continued on Next Page

Table 45 Continued

Type of cord or cable	Conductor size, mm ^{2} (AWG)	Average insulation thickness, mm (mils)	AC spark test potential, kV*
S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u], SEOOW[u]	0.824 – 1.31 (18 – 16)	0.76 (30)	6
	2.08 – 33.6 (14 – 10)	1.14 (45)	7.5
	8.37 – 33.6 (8 – 2)	1.52 (60)	10
DRT[c], SRDE[m,u], SRDT[m,u], SRD[m,u]	5.26 – 21.2 (10 – 4)	1.14 (45)	7.5
TPT, shaver cord[u]	0.100 (27)	0.76 (30)	6
SPT-0[m]	0.325 (22)	0.64 (25)	4
SPT-1, ‡ SPE-1, ‡ clock[u], SP-1, SPT-1W[u]	0.519 – 0.824 (20 – 18)	0.76 (30)	6†
SPT-2, ‡ SPE-2, ‡ SP-2[m,u], SPT-2W[u], SPT-2[m]	0.824 – 1.31 (18 – 16)	1.14 (45)	6†
	2.08 (14)	1.14 (45)	6†
SPT-3, ‡, SPE-3, ‡ SP-3[m,u]	0.824 – 1.31 (18 – 16)	1.52 (60)	6†
	2.08 (14)	2.03 (80)	6†
	3.31 (12)	2.41 (95)	7.5†
	5.26 (10)	2.79 (110)	7.5†
NISPT-1, NISPE-1[m,u], NISP-1[m,u]	0.519 – 0.824 (20 – 18)	0.38 (15)	3†
NISPT-2, NISPE-2[m,u], NISP-2[m,u]	0.824 – 1.31 (18 – 16)	0.76 (30)	5†
TX[c]	0.519 (20)	0.58 (23)	5
PXT[c]	0.519 (20)	0.76 (30)	6
CXWT[c]	0.824 – 1.31 (18 – 16)	1.14 (45)	6
	2.08 – 3.31 (14 – 12)	1.52 (60)	7.5
PXWT[c]	0.824 – 1.31 (18 – 16)	1.14 (45)	6
C[u], PD[u]	0.824 – 1.31 (18 – 16)	0.76 (30)	6
	2.08 – 5.26 (14 – 10)	1.14 (45)	6
CXTW[u]	0.325 – 0.824 (22 – 18)	0.76 (30)	5
XTW[u]	0.519 – 0.824 (20 – 18)	0.76 (30)	6
HPN†	0.824 – 1.31 (18 – 16)	1.14 (45)	6
	2.08 (14)	1.52 (60)	7.5
	3.31 (12)	2.41 (95)	7.5
E, EO, ETT, ETP	0.519 – 1.31 (20 – 16)	0.51 (20)	3
	2.08 – 3.31 (14 – 12)‡	0.76 (30)	6
	3.31 – 5.26 (12 – 10)	1.14 (45)	7.5
	8.37 – 33.6 (8 – 2)	1.52 (60)	10
	Duplex cable jacket	Clause 5.2.1	3
Hoistway cable	All 600 V 0.824 – 3.31 (18 – 12)	0.76 (30)	6
Hoistway cable	All 300 V 0.519 – 3.31 (20 – 12)	0.51 (20)	3

**DC values shall be three times the ac values indicated in the Table.*

†Before assembly into the flexible cord, the insulation on any grounding conductor used shall withstand the 3000 V spark test.

‡For 300 V only.

Table 46
Dielectric strength test voltage on finished types

(See Clause 5.2.2.)

Size of circuit conductor, mm² (AWG)	Type					
	HSJ, HSJO, HSJOO, HPD[u], C[u], PD[u], XTW[u], CXTW[u], SV, SVO, SVE[u], SVEO[u], SVEOO[u], SVOO, SVT, SVTO, SVTOO, TST, TPT, shaver cord[u], PXT[c], CXWT[c], PXWT[c]	SPE-1[u], SPE-2[u], SPE-3[u], SP-1[m,u], SP-2[m,u], SP-3[m,u], SPT-0[m], SPT-1, SPT-2, SPT-3, NISPT-1, NISPT-2, NISPE-1[m,u], NISPE-2[m,u], NISP-1[m,u], NISP-2[m,u], HPN	E, EO, ETT, ETP, Hoistway	SJOW, SJOOW, SJEW[u], SJEOW[u], SJEOOW[u], SJTW, SJTOW, SJTOOW, SJ, SJE[u], SJEO[u], SJEOO[u], SJO, SJOO, SJT, SJTO, SJTOO	SOW, SOOW, STW, SEW[u], SEOW[u], SEOOW[u], STOW, STOOW, S, SE[u], SEO[u], SEOO[u], SO, SOO, ST, STO, STOO	DRT[c], SRDE[m,u], SRDT[m,u], SRD[m,u]
	Test voltage, V ac					
0.100 (27)*	1000	N/A	N/A	N/A	N/A	N/A
0.325 (22)	1250	1000	N/A	N/A	N/A	N/A
0.519 (20)	1250	1500	1000	N/A	N/A	N/A
0.824 (18)	1500	1500	1500	2000	2000	N/A
1.04 (17)†	1500	1500	N/A	2000	N/A	N/A
1.31 (16)	1500	1500	1500	2000	2000	N/A
2.08 (14)	2000	1500	1500	2000	2000	N/A
3.31 (12)	2000	2000	2000	2000	3000	N/A
5.26 (10)	N/A	2000	3000	3000	3000	3000
8.37 (8) and larger	N/A	N/A	4000	N/A	4000	4000

** Types TST, TPT and shaver cord[u] only.*

† Types HPN, SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE[u], SVEO[u], SVEOO[u], SJ, SJO, SJOO, SJOW, SJOOW, SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u], SJT, SJTO, SJTOO, SJTW, SJTOW, and SJTOOW only.

Table 47
Minimum insulation resistance of thermoset "W" Types at 15 °C

(See Clause 5.2.3.1.)

Size of conductor, mm² (AWG)	Minimum insulation resistance in GΩ•m (MΩ•1000 ft) at 15 °C	
	SJOW, SJOOW	SOW, SOOW
0.824 (18)	210 (690)	210 (690)
1.04 (17)	200 (655)	200 (655)
1.31 (16)	180 (590)	180 (590)
2.08 (14)	145 (475)	200 (655)
3.31 (12)	120 (395)	165 (540)
5.26 (10)	140 (460)	140 (460)
8.37 (8)	–	140 (460)
13.3 (6)	–	115 (375)
21.2 (4)	–	95 (310)
33.6 (2)	–	80 (260)

Table 48
Minimum insulation resistance of thermoplastic "W" Types at 15° C

(See Clause 5.2.3.1.)

Size of conductor, mm² (AWG)	Minimum insulation resistance in GΩ•m (MΩ•1000 ft) at 15° C							
	CXWT[c]	PXWT[c]	SJTW, SJTOW, SJTOOW, SJEW[u], SJEOW[u], SJEOOW[u]	STW, STOW, STOOW, SEW[u], SEOW[u], SEOOW[u]	CXTW[u]	XTW[u]	SPT-1W[u]	SPT-2W[u]
0.325 (22)	–	–	–	–	69 (225)	58 (190)	–	–
0.519 (20)	–	–	–	–	60 (195)	66 (215)	66 (215)	–
0.824 (18)	66 (215)	66 (215)	52 (170)	52 (170)	45 (150)	–	53 (175)	66 (215)
1.04 (17)	58 (190)	–	50 (160)	50 (160)	–	–	–	–
1.31 (16)	60 (195)	58 (190)	45 (150)	45 (150)	–	–	–	58 (190)
2.08 (14)	51 (165)	–	36 (120)	50 (160)	–	–	–	–
3.31 (12)	–	–	30 (95)	40 (130)	–	–	–	–
5.26 (10)	–	–	34 (110)	34 (110)	–	–	–	–
8.37 (8)	–	–	–	34 (110)	–	–	–	–
13.3 (6)	–	–	–	29 (95)	–	–	–	–
21.2 (4)	–	–	–	24 (80)	–	–	–	–
33.6 (2)	–	–	–	20 (65)	–	–	–	–

Table 49
Weight, pulley diameter, and current for flexing test

(See Clause 5.2.9.1.)

Size of circuit conductors in cord, mm² (AWG)	Force exerted by a weight at each end of cord specimen, N (lbf)	Diameter at bottom of pulley (circular groove), mm (in)	Current in circuit conductors	
			Cord with 2 circuit conductors, A	Cord with 3 or more circuit conductors, A
0.824 (18)	9.8 (2.2)	80 (3.15)	10	7
1.04 (17)	9.8 (2.2)	80 (3.15)	12	9
1.31 (16)	14.7 (3.3)	120 (4.72)	13	10
2.08 (14)	14.7 (3.3)	120 (4.72)	18	15
3.31 (12)	14.7 (3.3)	120 (4.72)	25	20
5.26 (10)	14.7 (3.3)	120 (4.72)	30	25
8.37 (8)	14.7 (3.3)	120 (4.72)	40	35
13.3 (6)	14.7 (3.3)	120 (4.72)	55	45
21.2 (4)	14.7 (3.3)	120 (4.72)	70	60
33.6 (2)	14.7 (3.3)	120 (4.72)	95	80

Table 50
Mandrel diameter for heat-shock resistance test for hoistway cables where overall jacket is rated 60° C

(See Clause 5.3.2.2.)

Overall diameter of finished cord, mm (in)	Number of adjacent turns	Diameter of mandrel, mm (in)
0 – 6.35 (0 – 0.25)	6	12.70 (0.50)
6.36 – 7.92 (0.251 – 0.30)	6	20.62 (0.81)
7.93 – 9.52 (0.301 – 0.37)	6	28.57 (1.12)
9.53 – 5.10 (0.371 – 0.40)	6	34.92 (1.37)
5.11 – 12.70 (0.401 – 0.50)	6	42.85 (1.69)
12.71 – 14.27 (0.501 – 0.56)	6	50.80 (2.00)
14.28 – 15.87 (0.561 – 0.62)	6	53.97 (2.12)
15.88 – 17.45 (0.621 – 0.69)	6	65.07 (2.56)
17.46 – 19.05 (0.691 – 0.75)	6	73.02 (2.87)
19.06 – 21.59 (0.751 – 0.85)	1	79.37 (3.12)
21.60 – 25.40 (0.851 – 1.00)	1	82.55 (3.25)
25.41 – 28.57 (1.01 – 1.12)	1	88.90 (3.50)
28.58 – 31.75 (1.13 – 1.25)	1	95.25 (3.75)
31.76 (1.251) and larger	1	101.60 (4.00)

Table 51
Mandrel diameter for heat-shock resistance test for hoistway cables where overall jacket is rated 90° C

(See Clause 5.3.2.3.)

Overall diameter of cable, mm (in)	Number of adjacent turns	Diameter of mandrel as a multiple of the overall diameter of cable
0 –19.05 (0 – 0.75)	6	3
19.06 – 38.10 (0.751 – 1.50)	180° bend	8
38.11 (1.51) and larger	180° bend	12

Table 52
Mandrel diameter for cold bend test for non-jacketed hoistway cables

(See Clause 5.3.3.2.)

Size of conductor, mm^2 (AWG)	Diameter of mandrel, mm (in)
Parallel construction	
0.824 (18)	6.5 (0.25)
Twisted construction	
0.519 (20)	6.5 (0.25)
0.824 (18)	6.5 (0.25)
1.31 (16)	7.0 (0.28)
2.08 (14)	8.0 (0.31)

Table 53
Mandrel diameter for cold bend test for jacketed hoistway cables

(See Clause 5.3.3.3.)

Overall diameter of finished cable, mm (in)	Number of adjacent turns	Diameter of mandrel, mm (in)
6.35 (0.25) and less	6	25.4 (1.00)
6.36 – 7.62 (0.25 – 0.30)	6	31.8 (1.25)
7.63 – 9.52 (0.301 – 0.38)	6	38.1 (1.50)
9.53 – 5.79 (0.381 – 0.42)	6	44.5 (1.75)
5.80 – 12.70 (0.421 – 0.50)	6	50.8 (2.00)
12.71 – 13.97 (0.501 – 0.55)	6	57.2 (2.25)
13.98 – 15.87 (0.551 – 0.63)	6	63.5 (2.50)
15.88 – 19.05 (0.631 – 0.75)	6	76.2 (3.00)
19.06 – 21.59 (0.751 – 0.85)	1	88.9 (3.50)
21.60 – 24.13 (0.851 – 0.95)	1	102 (4.00)

Table 54
Thickness of jackets on cords having up to six conductors

(See Tables 15, 20, and 21.)

Type of cord	Size of circuit conductor, mm^2 (AWG)	Thickness, mm (mils)	
		Minimum average	Minimum at any Point
SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE[u], SVEO[u], SVEOO[u]	0.824, 1.04, 1.31 (18, 17, 16)	0.76 (30)	0.61 (24)
SJ, SJO, SJOO, SJT, SJTO, SJTOO, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u],	0.824 – 2.08 (18 – 14)	0.76 (30)	0.61 (24)
	3.31 (12)	1.14 (45)	0.91 (36)
	5.26 (10)	1.52 (60)	1.22 (48)

Table 55
Thickness of jackets on Types SJ, SJO, SJOO, SJT, SJTO, SJTOO, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SJE[u], SJEO[u], SJEOO[u], SJEW[u], SJEOW[u], SJEOOW[u] having more than one size of circuit conductor

(See Tables 15, 20 and 21.)

Core diameter, mm (in)	Jacket thickness, mm (mils)	
	Minimum average	Minimum at any point
0 – 8.89 (0 – 0.350)	0.76 (30)	0.61 (24)
8.90 – 11.4 (0.351 – 0.450)	1.14 (45)	0.91 (36)
11.5 – 14.0 (0.451 – 0.550)	1.52 (60)	1.22 (48)
14.1 – 22.9 (0.551 – 0.900)	2.03 (80)	1.62 (64)
23.0 – 31.7 (0.901 – 1.25)	2.41 (95)	1.93 (76)
31.8 – 38.1 (1.26 – 1.50)	2.79 (110)	2.23 (88)
38.2 – 50.8 (1.51 – 2.00)	3.17 (125)	2.54 (100)

Table 56
Thickness of jackets on Types S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE^u, SEO^u, SEOO^u, SEW^u, SEOW^u, SEOOW^u, having up to six conductors in sizes 0.824 mm^2, 1.31 mm^2, and 2.08 mm^2 (18 AWG, 16 AWG, and 14 AWG); and up to five conductors in sizes 3.31 mm^2 – 33.6 mm^2 (12 AWG – 2 AWG)

(See Tables 15, 20, and 21.)

Conductor size		Number of conductors	Thickness, mm (mils)	
mm^2	(AWG)		Minimum average	Minimum at any point
0.824 and 1.31	(18 and 16)	2 to 4	1.52 (60)	1.22 (48)
0.824 and 1.31	(18 and 16)	5 or 6	2.03 (80)	1.62 (64)
2.08	(14)	2 to 4	2.03 (80)	1.62 (64)
2.08	(14)	5 or 6	2.41 (95)	1.93 (76)
3.31 and 5.26	(12)and 10	2 to 5	2.41 (95)	1.93 (76)
8.37	(8)	2 or 3	2.79 (110)	2.23 (88)
8.37	(8)	4 or 5	3.17 (125)	2.54 (100)
13.3	(6)	2 or 3	3.17 (125)	2.54 (100)
13.3	(6)	4 or 5	3.56 (140)	2.84 (112)
21.2	(4)	2 or 3	3.56 (140)	2.84 (112)
21.2	(4)	4 or 5	3.94 (155)	3.15 (125)
33.6	(2)	2 or 3	3.94 (155)	3.15 (125)
33.6	(2)	4 or 5	4.32 (170)	3.45 (136)

Table 57
Jacket thickness on Types S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE^u, SEO^u, SEOO^u, SEW^u, SEOW^u and SEOOW with conductors of 5.26 mm^2 (10 AWG) and smaller having a greater number of conductors than in Table 56 or having more than one size of circuit conductor

(See Tables 15, 20, and 21.)

Core diameter, mm (in)	Thickness, mm (mils)	
	Minimum average	Minimum at any point
0 – 12.7 (0 – 0.500)	2.03 (80)	1.62 (64)
12.8 – 19.1 (0.501 – 0.750)	2.41 (95)	1.93 (76)
19.2 – 25.4 (0.751 – 1.00)	2.79 (110)	2.23 (88)
25.5 – 38.1 (1.01. – 1.50)	3.17 (125)	2.54 (100)
38.2 – 50.8 (1.51 – 2.00)	3.56 (140)	2.84 (112)

Table 58
Thickness of jackets on Types S, SO, SOO, SOW, SOOW, ST, STO, STOO, STW, STOW, STOOW, SE[u], SEO[u], SEOO[u], SEW[u], SEOW[u] and SEOOW[u] with 8.37 mm^2 (8 AWG) and larger conductors having a greater number of conductors than in Table 57 or having more than one size of circuit conductor

(See Tables 15, 20, and 21.)

Core diameter, mm (in)	Thickness, mm (mils)	
	Minimum average	Minimum at any point
19.1 – 25.4 (0.75 – 1.00)	3.56 (140)	2.84 (112)
25.5 – 31.7 (1.01 – 1.25)	3.94 (156)	3.15 (124)
31.8 – 38.1 (1.26 – 1.50)	4.32 (171)	3.45 (136)
38.2 – 44.4 (1.51 – 1.75)	4.83 (191)	3.86 (152)
44.5 – 50.8 (1.76 – 2.00)	5.21 (206)	4.16 (164)
50.9 – 57.2 (2.01 – 2.25)	5.59 (221)	4.47 (176)
57.3 – 63.5 (2.26 – 2.50)	5.97 (236)	4.78 (189)
63.6 – 70.0 (2.51 – 2.75)	6.35 (251)	5.08 (201)
70.1 – 76.2 (2.76 – 3.00)	6.73 (266)	5.38 (212)
76.3 – 82.6 (3.01 – 3.25)	7.11 (281)	5.69 (225)
82.7 – 88.9 (3.26 – 3.50)	7.49 (296)	5.99 (236)
89.0 – 100 (3.51 – 3.95)	7.87 (311)	6.30 (249)
101 – 113 (3.96 – 4.45)	8.38 (331)	6.71 (265)
114 – 127 (4.46 – 5.00)	8.76 (346)	7.01 (277)

Table 59
Multiplying factors for the calculation of the diameter of the conductor assembly under the braid

(See Clauses A.3 and C.2.)

Number of conductors	Multiplying factor	Number of conductors	Multiplying factor
2 (without fillers)	1.64	11	4.00
2 (with fillers)	2.00	12	4.15
3	2.15	13	4.24
4	2.41	14	4.41
5	2.70	15	4.55
6	3.00	16	4.70
7	3.00	17	4.86
8	3.31	18	5.00
9	3.62	19	5.00
10	3.93	–	–

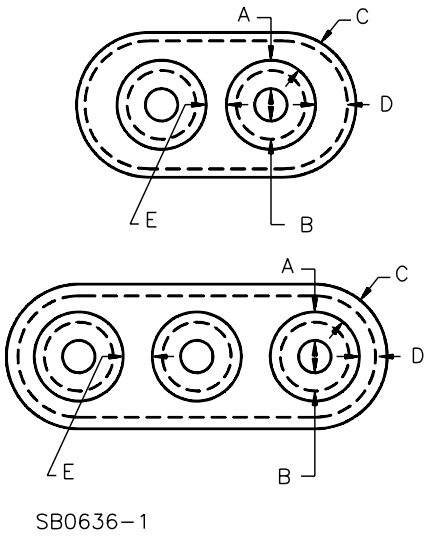


Figure 1
Types NISP-1^{m,u}, NISP-2^{m,u}, NISPE-1^{m,u}, NISPE-2^{m,u}, NISPT-1, and NISPT-2 with two or three-circuit conductors without grounding conductor, or with two circuit conductors with a grounding conductor

(See Clauses 4.2.9 and 4.3.10 and Tables 14, 18, and 19.)

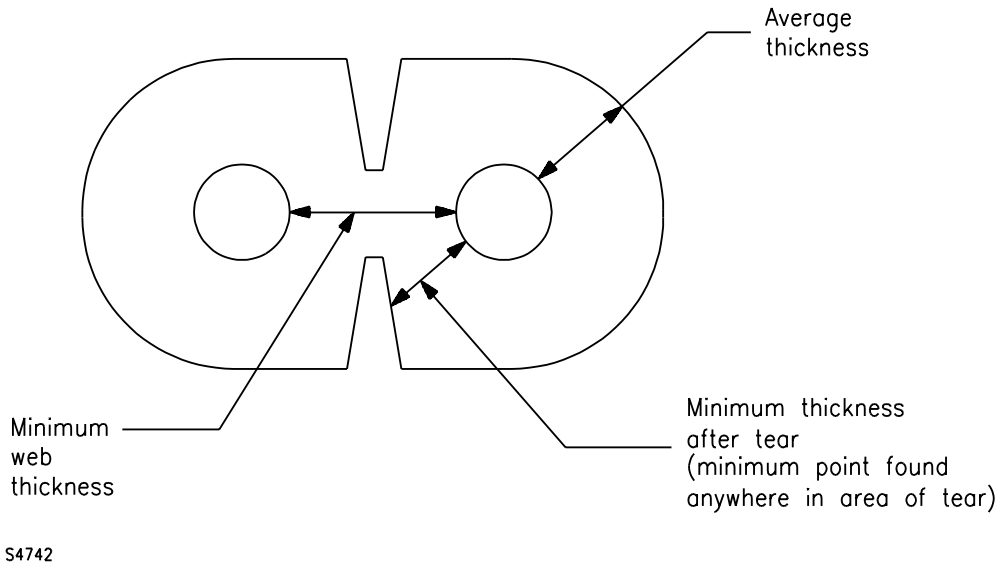


Figure 2
Two-conductor Types SPT-0[m], SPT-1, SPT-2, SPT-3, SPE-1[u], SPE-2[u], SPE-3[u], SP-1[m,u], SP-2[m,u], SP-3[m,u], PXT[c], HPN, TPT, shaver cord[u] and clock cord[u]

(See Clause 4.3.9.1 and Tables 14, 18, 19, 22, 27, and 30.)

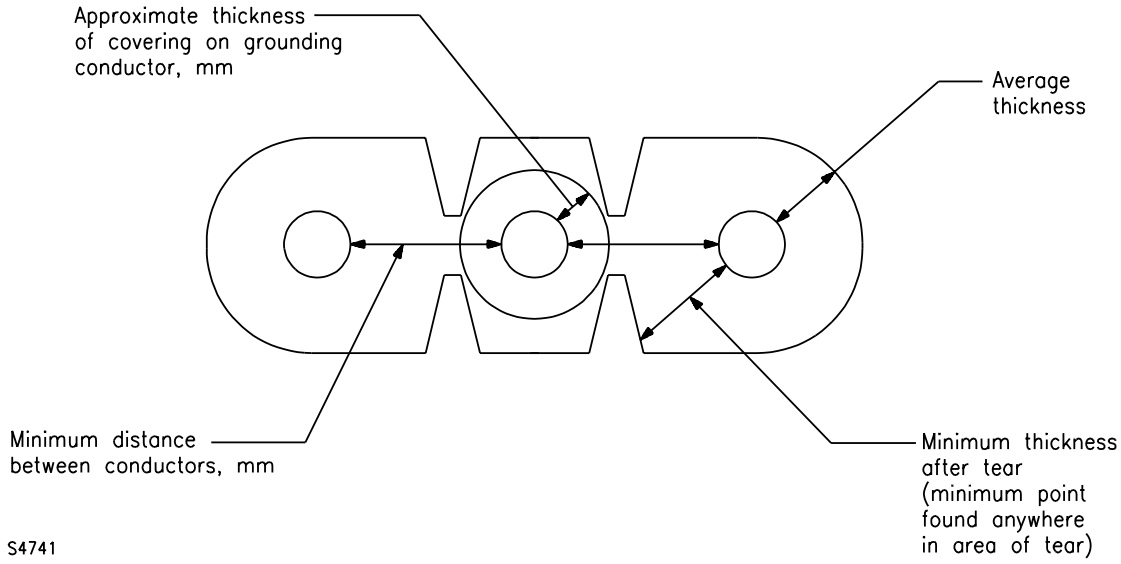


Figure 3
Two-circuit conductors Types SPT-1, SPE-1[u], SP-1[m,u], SPT-2, SPE-2[u], SP-2[m,u], SPT-3, SPE-3[u], SP-3[m,u], and HPN with grounding conductor

(See Clause 4.3.9.2 and Tables 14, 15, 18, 19, and 28.)

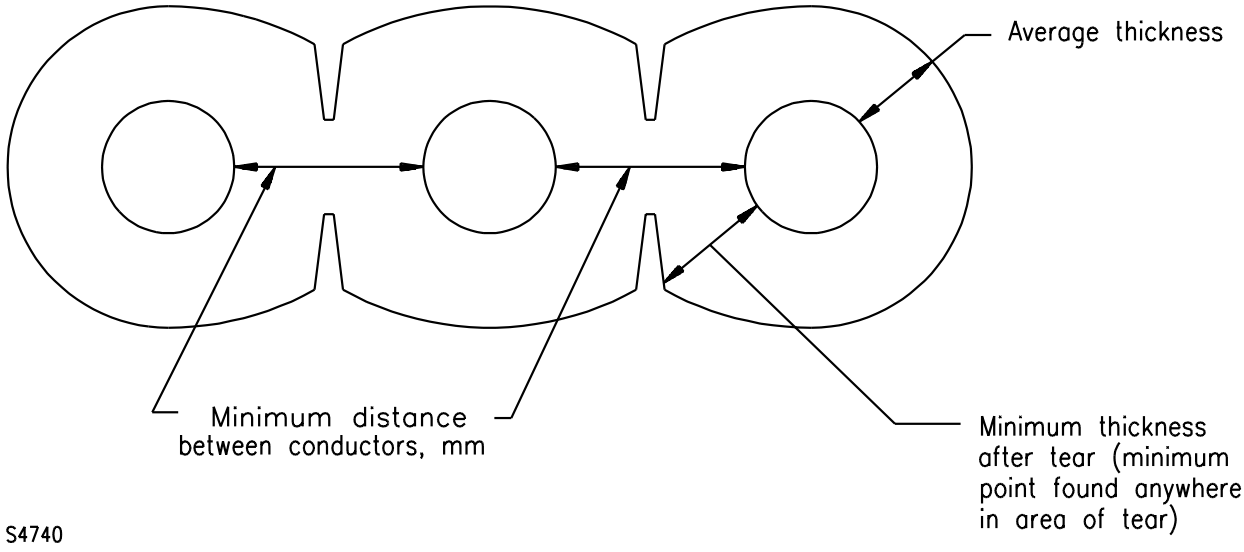


Figure 4
Three-circuit conductor Types SPT-0[m], SPT-1, SPE-1[u], SP-1[m,u], SPT-2, SPE-2[u], SP-2[m,u], SPT-3, SPE-3[u], and SP-3[m,u], without grounding conductors

(See Clause 4.3.9.2 and Tables 14, 15, 18, and 19.)

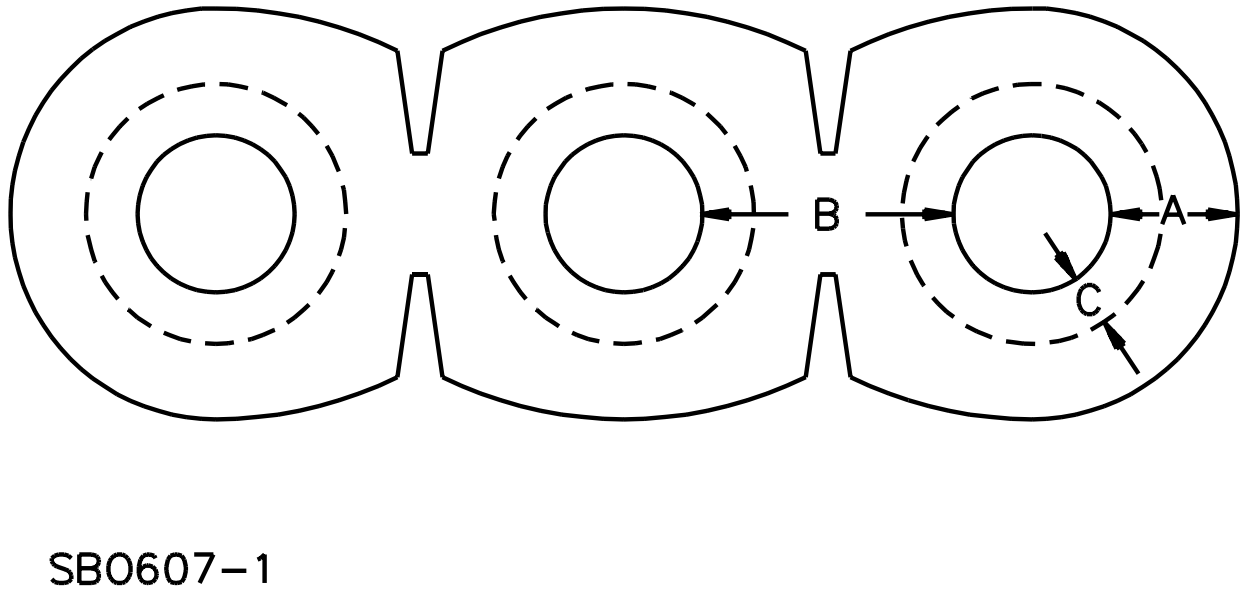
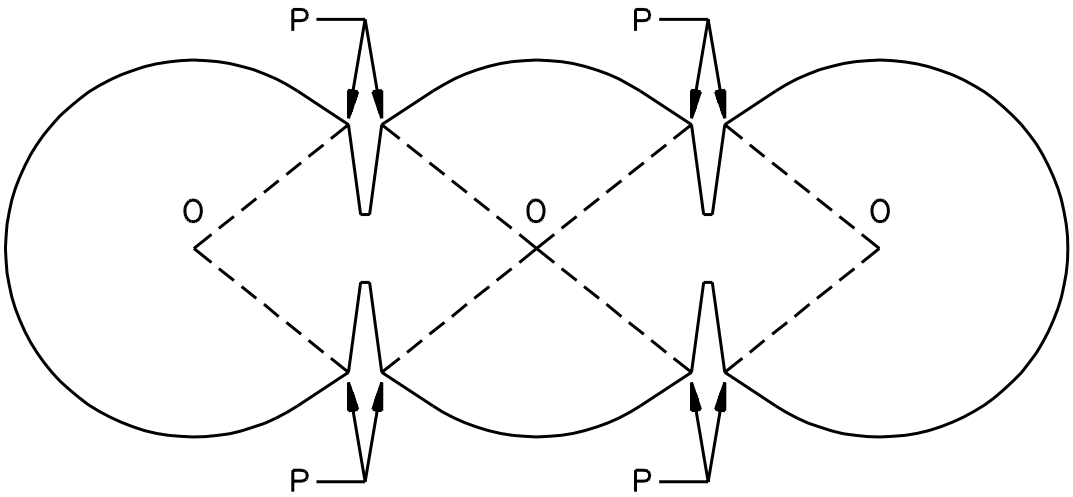


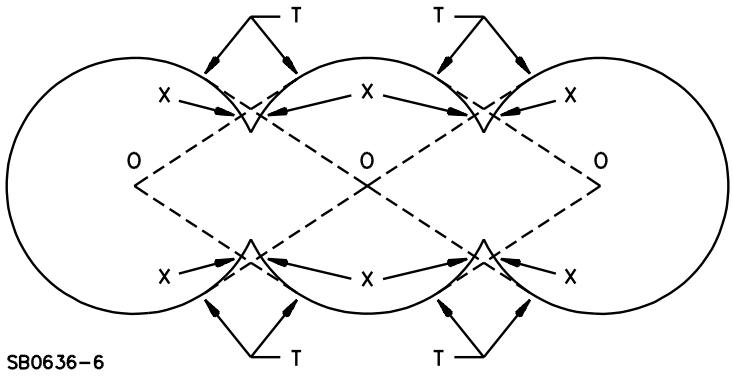
Figure 5
Dimensions of a three-conductor integral Type SRD[m,u], SRDE[m,u], or SRDT[m,u] cable

(See Clause 4.3.9.5.)



Constructions with a cross-section having a definite Point P at the outer end of each valley slope.

OP in each case is a straight line from the center O of a conductor to P on the same segment of the cross-section. Thickness measurements shall not be made on any valley slope.



Constructions with a cross-section having a definite Point to mark the outer end of each valley slope.

OT in each case is a straight line from the center O of a conductor to T, the point of tangency, on the adjacent segment of the cross-section. Thickness measurements shall not be made on any valley slope other than X, which is the intersection of the line OT with the valley slope. Thickness measurements shall be made on each slope segment TX.

Figure 6
Definition of regions of valley slopes on which thickness measurements shall not be made in integral parallel cords and cables

(See Clause 4.3.9.5.)

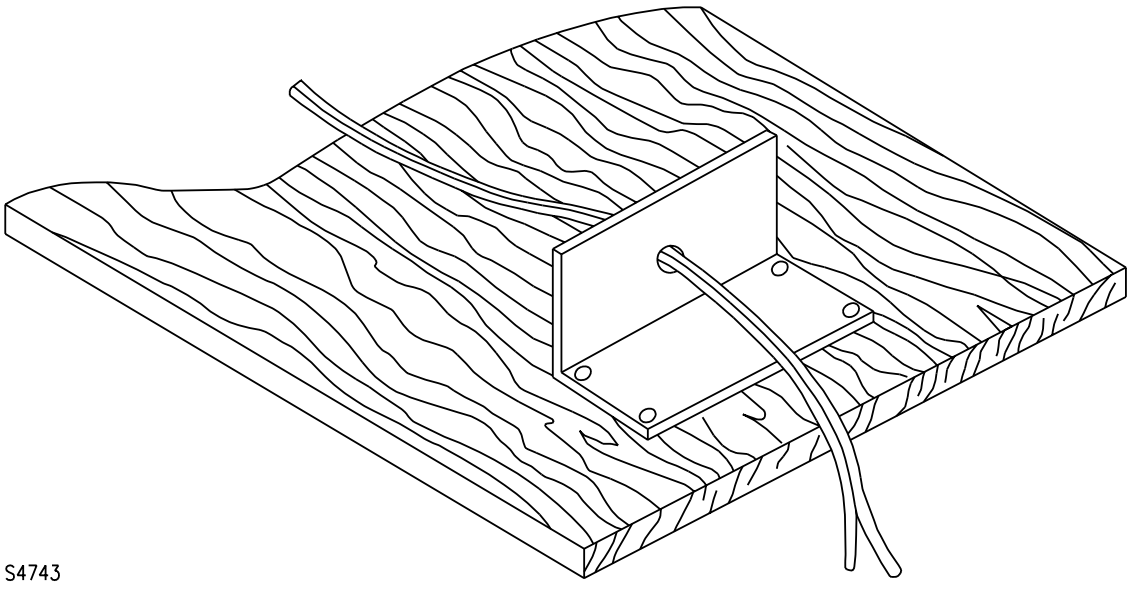


Figure 7
Flex arcing test setup for HPN heater cords

(See Clause 5.2.6.2.)

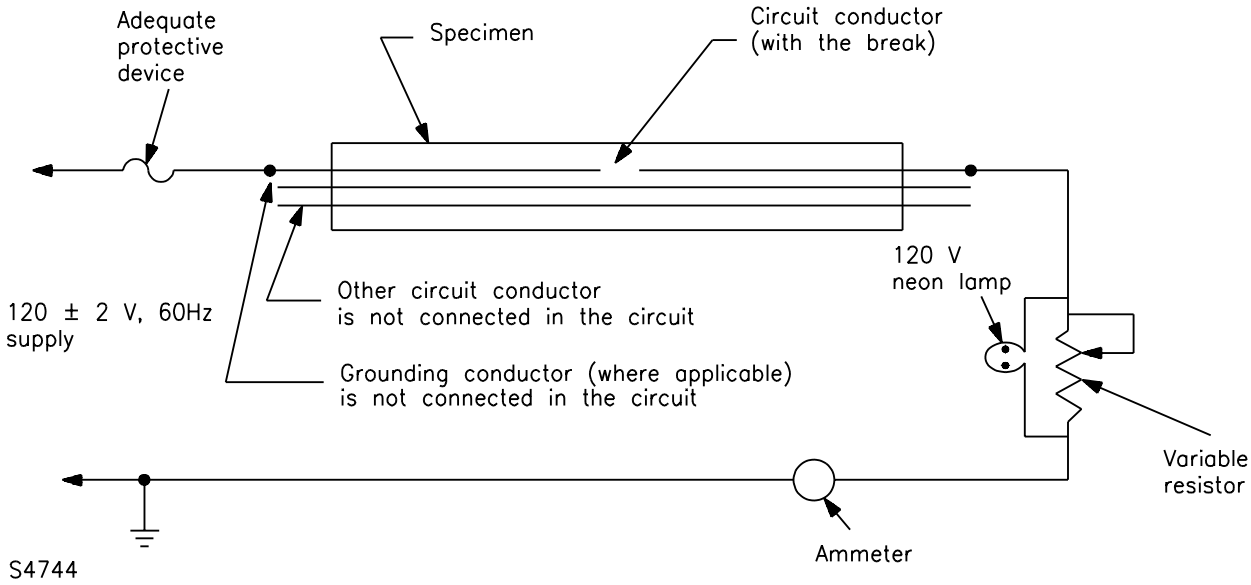


Figure 8
Schematic diagram of electrical circuit for flex arcing test

(See Clause 5.2.6.2.)

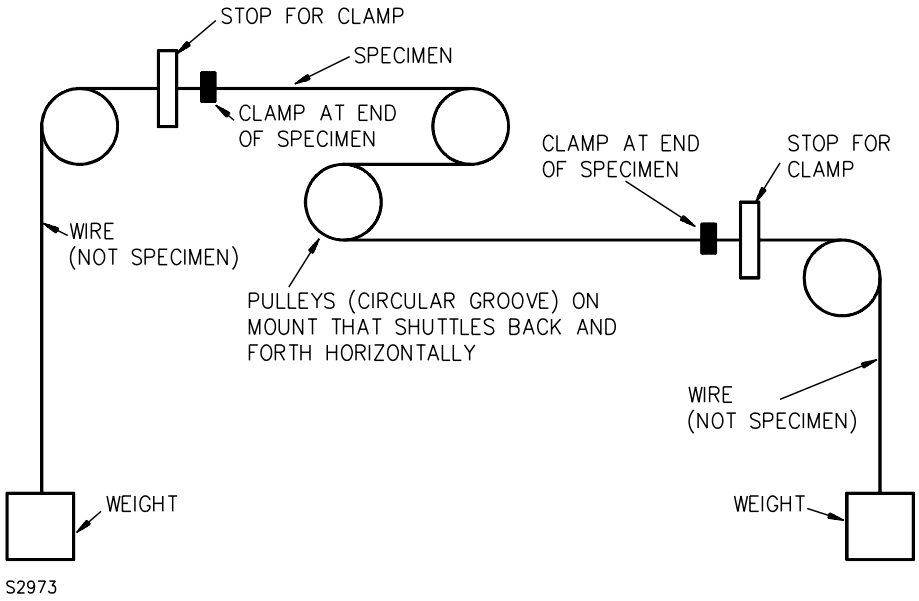


Figure 9
Apparatus for flexing of shielded cords

(See Clause 5.2.9.1.)

Annex A (normative)
Calculation method for fibrous braids

(See Clause 4.1.3.2.)

A.1 The size, ply, and number of ends of yarn and the length of lay shall result in the per cent coverage Q in each direction being not less than 76, when computed by whichever of the following formulas is applicable:

$$Q = \frac{100\ NET_{in}}{\sin A}$$

where

Q = percent coverage in one direction

N = number of picks per inch

E = number of ends per pick

T_{in} = diameter of one end of yarn, in

A = lay angle

$$Q = \frac{NET_{mm}}{25.4 \sin A}$$

where

Q = percent coverage in one direction

N = number of picks per centimeter

E = number of ends per pick

T_{mm} = diameter of one end of yarn, mm

A = lay angle

A.2 The number of picks per inch, *N*, or picks per centimeter, *N*, shall be measured by a standard braid counter at three places that are at least 2 in or 50 mm apart in any 12 in or 300 mm section in the center 3 ft or 1 m of a 5 ft or 1500 mm specimen of the braid-covered wire. The outer surface of a specimen having a saturated braid shall be wiped with a cloth wet with an organic solvent. The average of the three determinations shall be taken as the number of picks per inch or picks per centimeter for that specimen. Values of yarn diameter *T* are shown in Table A.1.

Table A.1
Yarn diameter

(See Clause A.2.)

Size and ply of yarn			Yarn diameter *T*,	
			mm	(in)
12/1	25/2	26/2	0.272	(0.011)
14/1	30/2	–	0.250	(0.010)
36/2	–	–	0.222	(0.009)
20/1	40/2	–	0.210	(0.008)
25/1	26/1	50/2	0.184	(0.007)
30/1	60/2	–	0.171	(0.007)
36/1	–	–	0.157	(0.006)

A.3 The lay angle, *A*, shall be determined by means of whichever of the following formulas is applicable:

$$\tan A = N = \frac{\pi N(2T_{in} + D_{in})}{K}$$

where

N = number of picks per inch

T_{in} = diameter of one end of yarn, in

D_{in} = nominal (calculated) diameter over the insulation for single conductors as indicated in Table A.2, in. In the case of multiple-conductor cables, this equals the diameter under the overall braid, which is equal to the average of the diameters of the finished individual conductors multiplied by the factors shown in Table 59.

K = number of carriers in one direction

$$\tan A = \frac{\pi N(2T_{mm} + D_{mm})}{25.4\,K}$$

where

N = number of picks per centimeter

T_{mm} = diameter of one end of yarn, mm

D_{mm} = nominal (calculated) diameter over the insulation as indicated in Table A.2, mm. In the case of multiple-conductor cables, this equals the diameter under the overall braid, which is equal to the average of the diameters of the finished individual conductors multiplied by the factors shown in Table 59.

K = number of carriers in one direction

Table A.2
Nominal diameter over the insulation

(See Clause A.3.)

AWG size of conductor	Stranding	Insulation thickness,		Nominal diameter, *D*	
		mm	(mils)	mm	(mils)
20	Stranded	0.58	(23)	2.18	(0.086)
18	Solid	0.38	(15)	1.78	(0.070)
18	Stranded	0.38	(15)	1.98	(0.078)
18	Stranded	0.51	(20)	2.34	(0.092)
18	Stranded	0.58	(23)	2.39	(0.094)
18	Solid	0.76	(30)	2.54	(0.100)
18	Stranded	0.76	(30)	2.74	(0.108)
16	Stranded	0.51	(20)	2.57	(0.101)
16	Solid	0.76	(30)	2.82	(0.111)
16	Stranded	0.76	(30)	3.05	(0.120)
14	Stranded	1.14	(45)	4.27	(0.168)

A.4 The minimum acceptable number of picks per unit width for the most commonly used braids that are woven on a 16-carrier braider shall be as given in Table A.3 (picks per inch) or in Table A.4 (picks per centimeter). A braid complying with either table shall be considered to have acceptable coverage and an acceptable braid angle. Braids are not limited to those covered by the tables, but other braids and Clause A.4 shall comply with the requirements in Clause 4.1.3.2.1.

The values in Tables A.3 and A.4 were computed by means of the following formulas, as applicable:

$$\text{Picks per inch} = N = \sqrt{\left[\frac{Q}{100\,ET_{in}}\right]^2 - \left[\frac{K}{\pi(2T_{in} + D_{in})}\right]^2}$$

$$\text{Picks per centimeter} = N = 25.4\sqrt{\left[\frac{Q}{100\,ET_{mm}}\right]^2 - \left[\frac{K}{\pi(2T_{mm} + D_{mm})}\right]^2}$$

If these formulas produced a value that resulted in a braid angle less than the acceptable minimum, the value was recomputed by means of the following formulas, as applicable:

$$\text{Picks per inch} = N = \frac{K \tan A}{\pi(2T_{in} + D_{in})}$$

$$\text{Picks per centimeter} = N = \frac{25.4\,K \tan A}{\pi(2T_{mm} + D_{mm})}$$

where

A = minimum acceptable lay angle

Table A.3
Commonly used 16-carrier cotton braids – yard-pound dimensions

(See Clause A.4)

Size and ply of yarn	Number of ends	Size of conductor, thicknesses of insulation, and minimum acceptable number of picks per inch							
		20 AWG, 23 mils	18 AWG, 15 mils	18 AWG, 20 mils	18 AWG, 23 mils	18 AWG, 30 mils	16 AWG, 20 mils	16 AWG, 30 mils	14 AWG, 45 mils
12/1, 25/2, or 26/2	2	23.7	26.3	–	27.7	30.3	–	31.1	33.0
14/1 or 30/2	2	30.3	30.1	22.8	22.4	33.8	–	34.6	–
	3	–	–	–	–	22.1	–	20.3	22.3
36/2	3	24.6	24.6	–	22.9	22.4	–	23.2	25.9
20/1 or 40/2	2	24.8	38.5	23.5	39.6	41.7	25.8	42.4	–
	3	24.8	24.8	–	23.0	24.0	–	25.1	27.6
25/1, 26/1, or 50/2	3	25.4	25.4	–	25.9	29.2	–	30.2	32.4
	4	–	–	–	–	22.9	–	21.0	–
30/1 or 60/2	3	27.6	27.6	–	29.2	32.3	–	33.2	–
	4	–	25.6	–	23.7	23.1	–	22.0	–
36/1	4	25.9	25.9	–	24.0	–	–	–	–

Table A.4
Commonly used 16-carrier braids – metric dimensions

(See Clause A.4)

Size and ply of yarn	Number of ends	Size of conductor, thickness of insulation, and minimum acceptable number of picks per centimeter							
		20 AWG, 0.58 mm	18 AWG, 0.38 mm	18 AWG, 0.51 mm	18 AWG, 0.58 mm	18 AWG, 0.76 mm	16 AWG, 0.51 mm	16 AWG, 0.76 mm	14 AWG, 1.14 mm
12/1, 25/2, or 26/2	2	9.3	10.4	–	10.9	11.9	–	12.3	13.0
14/1 or 30/2	2	11.9	11.9	9.0	8.8	13.3	–	13.6	–
	3	–	–	–	–	8.7	–	8.0	8.8
36/2	3	9.7	9.7	–	9.0	8.8	–	9.1	10.2
20/1 or 40/2	2	9.8	15.2	9.3	15.6	16.4	10.2	16.7	–
	3	9.8	9.8	–	9.1	9.5	–	9.9	10.9
25/1, 26/1, or 50/2	3	10.0	10.0	–	10.2	11.5	–	11.9	12.8
	4	–	–	–	–	9.0	–	8.3	–
30/1 or 60/2	3	10.9	10.9	–	11.5	12.7	–	13.1	–
	4	–	10.1	–	9.3	9.1	–	8.7	–

Table A.4 Continued on Next Page

Table A.4 Continued

Size and ply of yarn	Number of ends	Size of conductor, thickness of insulation, and minimum acceptable number of picks per centimeter							
		20 AWG, 0.58 mm	18 AWG, 0.38 mm	18 AWG, 0.51 mm	18 AWG, 0.58 mm	18 AWG, 0.76 mm	16 AWG, 0.51 mm	16 AWG, 0.76 mm	14 AWG, 1.14 mm
36/1	4	10.2	10.2	–	9.5	–	–	–	–

Annex B (informative)

Measurement of Insulated Conductors, Lay Length

(See Clause 4.1.4.)

B.1 A specimen of approximately 1.5 to 2 m (4.5 to 6 ft) in length is to be cut from the sample coil or reel. The specimen is to be tightly secured, at both ends, to the work surface before the window is cut, to ensure that the conductors cannot untwist. A “window” exposing the conductor assembly is to be cut in the jacket, while leaving at least 300 mm (12 in) of the jacket intact at both ends. The window is to be approximately 25% of the circumference in width and approximately 25 mm (1 in) longer than twice the maximum required lay length for the sample. E.g., for a 3-conductor, 0.824 mm^2 (18 AWG) cord that has a maximum lay of 57 mm (2.25 in), the window is to be

2 (57) + 25 = approx. 139 mm (2 (2.25) + 1 = approx. 5.5 in long)

B.2 In a situation where the use of a 25% circumference window is impractical, due to indistinguishable colors or the like, complete removal of the jacket from the center portion of the cable is to be permitted. In this case, extra care is to be taken not to disturb the conductor core assembly in preparation for the measurement. Using a measuring instrument, the length, to the nearest 3 mm (0.125 in), necessary for each of the conductors, measured separately, to make two revolutions is to be recorded. The longest of the measurements is to be divided by two to determine the lay length of the sample.

Annex C (normative)
Calculation method for copper wire shields

(See Clause 4.1.5.)

C.1 The coverage of copper wire shields shall be determined by using the following formulas, as applicable:

(a) for braids

% coverage = 100 ($2F - F^2$)

where

$F = NCdl/(2L\sin a)$

where

N = number of wires per carrier

C = number of carriers

d = diameter of individual wires

L = lay of wires

a = angle of braid with axis of underlying core, having a tangent of angle equal to

$\tan(a) = \pi(D+d)/L$

where

D = diameter of core under shield

(b) for wraps

% coverage = $100F$

where

$F = NCdl/(L\sin a)$

where

N = number of wires per carrier

C = number of carriers

d = diameter of individual wrap wires

L = lay or wires

a = angle of wrap with axis of underlying core, having a tangent of angle equal to:

$$\tan(a) = \pi(D+d)/L$$

where

D = diameter of core under wrap

C.2 In computing D (the diameter of the conductor assembly under the braid or wrap having insulated conductors of the same size), the diameter of one of the insulated conductors shall be multiplied by the factor given in Table 59. The diameter of an individual insulated conductor shall be determined by using the nominal diameter of the conductor and the average thickness of the insulation and the covering over the insulation, if one is used, as specified in this standard.

Note: *All dimensions can be in millimetres or inches, provided they are consistent throughout the calculations.*

Annex D (informative)
Insulated conductor identification

Table D.1
Conductor combinations
(See Clause 4.1.9.)

Conductor combination†	Number of insulated conductors	Application
Black, white	2	For use where grounding is not required on a two-wire circuit having an identified neutral conductor
Green*, black, white	3	For use where grounding is required on a two-wire circuit having an identified neutral conductor
Green*, black, red	3	For use where grounding is required on a two-wire circuit having no identified neutral conductor
Brown, light blue, green/yellow	3	For use when international color coding is required
Green*, black, red, white	4	For use where grounding is required on a three-wire circuit having an identified neutral conductor
Green*, black, red, blue	4	For use where grounding is required on a three-wire (three-phase) circuit having no identified neutral conductor

† The use of other identification colors is permitted.

** The use of a combination of green and yellow is permitted. See Clause 4.1.9.1.*

Annex E (informative)

French and Spanish translations of caution markings

(See Clauses 6.2 and 6.4.)

English	Spanish	French
Not for sale to the general public	No para la venta al publico	Non destiné à la vente au détail
Small or large diameter cord in process	Cordon de diametro menor o mayor en proceso	Cordon de petit ou grand diamètre en traitement
Not for general use	No para uso general	Ne convient pas pour utilisation générale
″Optical-fiber portion(s) of cable are for installation (optical and electrical functions associated) as described in applicable parts of the *Canadian Electrical Code, Part I*, the *National Electrical Code* (NFPA 70), and the *Mexican Electrical Code* NOM-001-SEDE with levels of energy transmitted not exceeding those of Class I laser radiation (21 CFR Part 1040).″	“la porción de fibra óptica es para instalación (funciones eléctricas y ópticas asociadas como se describe en las partes aplicables de la norma de instalaciones eléctricas NOM-001-SEDE, Canadian Electrical Code, Parte I, y el National Electrical Code (NFPA 70) con niveles de energía transmitida no mayores de la radiación de la clase I”	«La portion fibre optique du câble doit être installée (fonctions optiques et électriques associées) selon les sections pertinentes du Code canadien de l’électricité, Première partie, du National Electrical Code (NFPA 70) et de la norme mexicaine sur les installations électriques NOM-001-SEDE et les niveaux d’énergie transmise ne doivent pas dépasser ceux du rayonnement laser de classe I (21 CFR Part 1040).»
″Optical-fiber portion(s) of cable contain non-current-carrying metal or other electrically conductive parts.″	″la porción de fibra óptica contiene partes metálicas u otras partes conductoras de electricidad, que no llevan corriente eléctrica”	«La portion optique du câble contient des pièces métalliques non porteuses de courant ou autres pièces conductrices d’électricité.»
“shielded”	“Con pantalla”	«Blindé»
“metal support member”	“Elemento metalico de soporte”	«Élément de support métallique»
“Green conductor for Grounding Only”	“Conductor verde solo para puesta a tierra”	«Conducteur vert pour mise à la terre uniquement»
“Green conductor with yellow stripes for Grounding Only”	“Conductor verde con franjas amarillas solo para puesta a tierra”	«Conducteur vert à rayures jaunes pour mise à la terre uniquement»
“Max. leakage/3 m at __V: __ µA to green and µA thru jacket”	“Maxima corriente de fuga/3 m a __V: __µA al verde y µA a traves de la cubierta”	Courant de fuite max/3 m à __ V : __ µA au vert et µA par l’enveloppe»
“water resistant”	“resistente al agua”	«Résistant à l’eau»
“water resistant 60° C”	“resistente al agua 60 °C”	«Résistant à l’eau 60 °C»
“For use in general use extension cord sets only”	“Para uso en extensiones de uso general únicamente”	“Convient uniquement aux cordons amovibles d’usage général”

Annex F (informative)

Sample calculation for the determination of ultimate elongation or tensile strength at 300 d

(See Clause 5.1.13.5.2)

F.1 Elongation

Example: Elongation after 90 days = 200%; after 120 = 150%; after 150 days = 100%.

Building the x/y plot using the above values and the need to subtract 90 days from the start gives

X1 = 90 – 90 = 0

X2 = 120 – 90 = 30

X3 = 150 – 90 = 60

Y1 = In(200) = 5.29832

Y2 = In(150) = 5.01064

Y3= In(100) = 4.60517

Using least squares linear regression analysis, and converting to a linear equation (Y = B + RT) gives R = –0.0115525 and B = 5.31795.

Using this equation and solving for the elongation at 300 days, (Y300 = 2.8919), gives 18.03% elongation (failure).

F.2 Tensile strength

Example: Tensile strength after 90 days = 13.79 MPa (2000 Ibf/in2); after 120 = 12.41 MPa (1800 Ibf/in2); after 150 days = 11.03 MPa (1600 Ibf/in2).

Building the x/y plot using the above values and the need to subtract 90 days from the start gives

X1 = 90–90 = 0

X2 = 120–90 = 30

X3 = 150–90 = 60

Y1 = In(13. 79) = 2.62355 (In(2000) = 7.6009)

Y2 = In(12.41) = 2.51820 (In(1800) = 7.4955)

Y3 = In(11.03) = 2.40041 (In(1600) = 7.3778)

Using least squares linear regression analysis, and converting to a linear equation (Y=B + RT) gives R = -0.00372 and B = 2.62563 (R = -0.003719 and B = 7.60297)

Using this equation and solving for the tensile strength at 300 days (Y300 = 1.84442) gives 6.32 Mpa (pass).

Annex G (normative)

Establishment of parameters and requirements for short-term air-oven aging test

(See Clause 5.1.13.5.6)

G.1 After the temperature rating of a new material has been established, a short-term air- oven aging test shall be developed. When sufficient data have been collected, the material shall be added to the appropriate standard, including a short-term air-oven aging test, common to that family of materials, and the evaluation of temperature rating shall no longer be necessary for that material. The guidelines for determining the parameters and requirements of the short-term air-oven aging test shall be in accordance with Clauses G.2 to G.4.

G.2 Choose the temperature and duration for the test from the test parameters listed in Table G.1 below for the temperature rating of the material.

G.3 Using specimens from the same source (reel, carton, etc.) as those used to determine the temperature rating of the material, determine the retention of ultimate elongation and tensile strength under the conditions chosen in Table G.1. Subtract 15% from the retention values obtained and round to the nearest 5%. If the values are 35% or greater, set these values as the requirements for this material.

G.4 If either of the values is less than 35%, the value shall be considered to be too low for reliable testing. In this case, choose the temperature and duration for the test for the next lowest temperature rating, as shown in Table G.1, and determine the ultimate elongation and tensile strength requirements as described in Clause G.3.

Table G.1
Parameters for short-term air oven aging tests

(See Clauses G.2 – G.4)

Temperature rating, °C	60	75	80	90	105	125	150	180	200	250
Aging temperature, °C ± 2 °C	100	100	113	121	136	158	180	*	*	*
Aging time (d)	7	10	7	7	7	7	7	*	*	*
** Aging temperature and times for these temperature ratings are under development.*										