



UL 817

STANDARD FOR SAFETY

Cord Sets and Power-Supply Cords

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UL Standard for Safety for Cord Sets and Power-Supply Cords, UL 817

Twelfth Edition, Dated March 11, 2015

SUMMARY OF TOPICS

This new edition of ANSI/UL 817 is being issued to incorporate several substantive changes.

The new requirements are substantially in accordance with Proposal(s) on this subject dated March 29, 2013, April 25, 2014, May 16, 2014, July 25, 2014 and October 3, 2014.

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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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

Future Effective Date	Reference
March 11, 2018	Section 6.3 Paragraph 6.7.1 Section 14.2 and 14.3 Paragraph 20.1 Paragraph 21.2.1

MARCH 11, 2015



ANSI/UL 817-2015

1

UL 817

Standard for Cord Sets and Power-Supply Cords

The First edition was titled Standard for Cord Sets.

First Edition – October, 1937
Second Edition – February, 1948
Third Edition – May, 1952
Fourth Edition – December, 1955
Fifth Edition – June, 1962
Sixth Edition – February, 1972
Seventh Edition – December, 1977
Eighth Edition – May, 1980
Ninth Edition – December, 1986
Tenth Edition – January, 1994
Eleventh Edition – March, 2001

Twelfth Edition

March 11, 2015

This ANSI/UL Standard for Safety consists of the Twelfth Edition.

The most recent designation of ANSI/UL 817 as an American National Standard (ANSI) occurred on March 11, 2015. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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

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INTRODUCTION

1 Scope

1.1 This standard specifies the requirements for cord sets and power-supply cords employing molded-on or assembled-on fittings, rated 600 V maximum, and intended for use in non-hazardous locations in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 This Standard also specifies the requirements for molded-on general-use attachment plugs and cord connectors.

1.3 This Standard also specifies the requirements for hospital grade attachment plugs and cord connectors.

1.4 This Standard also specifies the requirements for cord restraint devices.

1.5 These requirements do not cover cord sets intended for temporary outdoor use – not to exceed 90 days – with outdoor equipment, Christmas-tree, and other seasonal decorative-lighting outfits. Such devices are covered by the Standard for Outdoor Seasonal-Use Cord-Connected Wiring Devices, UL 2438.

1.6 These requirements cover devices with remote control features that comply with the Standard for Solid-State Controls for Appliances, UL 244A. See also 9.9. Devices Employing Remote Control Features. Compliance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 The values given in SI (metric) units shall be normative, except for AWG/kcmil conductor sizes. Any other values are for information only.

4 Undated References

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

5 Definitions

5.1 The following terms and definitions apply in this standard.

5.2 ADAPTER CORD SET – A cord set, without a switch, intended to provide power from a single NEMA plug to a maximum of 6 NEMA outlets, convert from one contact configuration to another, or both.

Adapter cord sets are intended for use at construction sites and similar locations.

5.3 ALLOWABLE AMPACITY – The maximum continuous current-carrying capacity of electrical cord sets or power-supply cords, as determined by the lowest ampere rating of any individual component.

5.4 APPLIANCE CONNECTOR – A type of cord connector which mates with an inlet.

5.5 APPLIANCE/FLAT-IRON PLUG – A type of appliance coupler with a cord guard and a slot configuration specified for use with heating or cooking appliance.

5.6 ATTACHMENT PLUG – A male contact device which mates with an outlet

5.7 CORD CONDUCTORS – The total number of conductors in a cord.

5.8 CORD CONNECTOR – A female contact device which mates with an attachment plug.

5.9 CORD RESTRAINT DEVICE – A device provided with retention means intended to reduce the likelihood of an attachment plug becoming unintentionally detached from a mating cord connector of a cord set or any outlet device. This device is not an integral or permanently attached component of a cord set or outlet device, but rather is a separate add-on device.

5.10 CORD SET – A length of flexible cord having an attachment plug at one end and a cord connector at the other end. See Appendix B for pictorial representation of examples.

5.11 CURRENT-CARRYING CONDUCTOR – A cord conductor excluding both the grounding conductor and the neutral conductor that carries only the unbalanced current from the other conductors.

5.12 CURRENT TAP – An attachment plug with an integral outlet device.

5.13 DIMMER – A device intended to change lighting to various intensities.

5.14 EXTENSION CORD SET – A cord set having NEMA fittings on both ends with an attachment plug and a cord connector of the same mating configuration.

5.15 FITTING – Any device that can be molded or assembled on flexible cord

5.16 GROUNDED CONDUCTOR – The circuit conductor that is intentionally grounded.

5.17 GROUNDING CONDUCTOR – A conductor in a flexible cord or cable intended to connect the non-current-carrying parts of electrical equipment, raceways, or enclosures to the service equipment or system grounding conductor, and which has:

- a) A green covering;
- b) A green covering with one or more yellow stripes; or
- c) No covering in certain specific flexible cord and cable constructions.

5.18 HOSPITAL GRADE – Intended for use in hospitals and health care facilities.

5.19 HOSPITAL GRADE ATTACHMENT PLUG – A molded-on or assembled-on attachment plug of configuration 5-15P, 5-20P, 6-15P or 6-20P, either of straight or right angle type, intended for use in hospital and health care facilities in other than hazardous locations.

5.20 HOSPITAL GRADE CONNECTOR – A molded-on or assembled-on cord connector of configuration 5-15R, 5-20R, 6-15R or 6-20R, either of straight or right angle type, intended for use in hospital and health care facilities in other than hazardous locations.

5.21 HOSPITAL GRADE EXTENSION CORD SET – A cord set having a hospital grade attachment plug and a hospital grade cord connector of the same mating configuration.

5.22 IDENTIFIED CONDUCTOR – A conductor in a flexible cord or cable which is identified to be a grounded conductor or a neutral conductor, and which has:

- a) A white or grey covering;
- b) One or more raised longitudinal ridges on the surface of the extruded covering on certain flexible cords; or
- c) A light blue covering when the flexible cord or cable is made in accordance with the International System of colors.

5.23 INDOOR USE – Power-supply cords and cord sets in which materials and constructions have been found suitable to withstand the elements of indoor exposure.

5.24 JOINT – Branching of a flexible cord into two or more cords.

5.25 LINE CONDUCTOR – Any conductor in a flexible cord or cable which is not the identified conductor or the grounding conductor.

5.26 OUTDOOR USE – Power-supply cords and cord sets in which the materials and construction have been found suitable to withstand the elements of outdoor exposure.

5.27 OVERCURRENT – Any current in excess of the rated current (ampacity) that can result from an overload or a short circuit condition.

5.28 OVERCURRENT PROTECTIVE DEVICE – Any replaceable or manually-resettable type device capable of automatically opening an electric circuit, under both predetermined overload and short-circuit conditions.

5.29 OVERLOAD – Operation of conductors or fittings in excess of normal, full-load ampacity rating that, when it persists for a sufficient length of time, would cause damage or dangerous overheating.

5.30 PENDANT SWITCH – A switch intended to be installed at the end of a flexible cord.

5.31 POLARIZATION – A means to identify and to provide continuity of a neutral (the identified) conductor and the grounding conductor when an attachment plug is mated with a cord connector or outlet.

5.32 POWER-SUPPLY CORD – A length of flexible cord with an attachment plug at one end and individual cord conductors not terminated in a cord connector at the opposite end. It may have additional components such as an integral strain relief bushing or individual terminals.

5.33 SPECIAL-USE – A cord set or power supply cord employing a non- NEMA plug or cord connector.

5.34 STRAIN RELIEF – A device molded on or assembled to flexible cord to inhibit any pull stress from being transmitted to the terminal attachments.

5.35 SWITCH – A device for making, breaking, or changing the connection in an electric circuit.

CONSTRUCTION

6 Fittings – General

6.1 Configurations and dimensions

6.1.1 Configurations, terminal identification, and required dimensions and spacings of various attachment plugs, cord connectors, and receptacle combinations are found in the Standard for Appliance Couplers for Household and Similar General Purposes – Part 1: General Requirements, UL 60320-1, Appliance couplers for household and similar general purposes – Part 1: General requirements, IEC 60320-1, Appliance Couplers for Household and Similar General Purposes – Part 2-2: Interconnection Couplers for Household and Similar Equipment, IEC 60320-2-2, Wiring Devices – Dimensional Specifications, ANSI/NEMA WD 6, and the Standard for Wiring Device Configurations, UL 1681. Dimensional compliance to a standard configuration shall be verified by measurement. Other configurations shall be evaluated as required.

6.1.2 A fitting shall be investigated for use with the rating, type, and size of flexible cord used in the assembly.

6.2 Flammability

6.2.1 A polymeric material used in the fittings of a cord set or power-supply cord shall have a minimum flammability rating of HB in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, or comply with the 12 mm flame test in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

6.3 Accessibility of live parts

6.3.1 The electrical parts of a cord set or a power-supply cord that do not require use of a tool for access shall be located or enclosed so that persons are protected against inadvertent contact with uninsulated live parts and film-coated magnet wire.

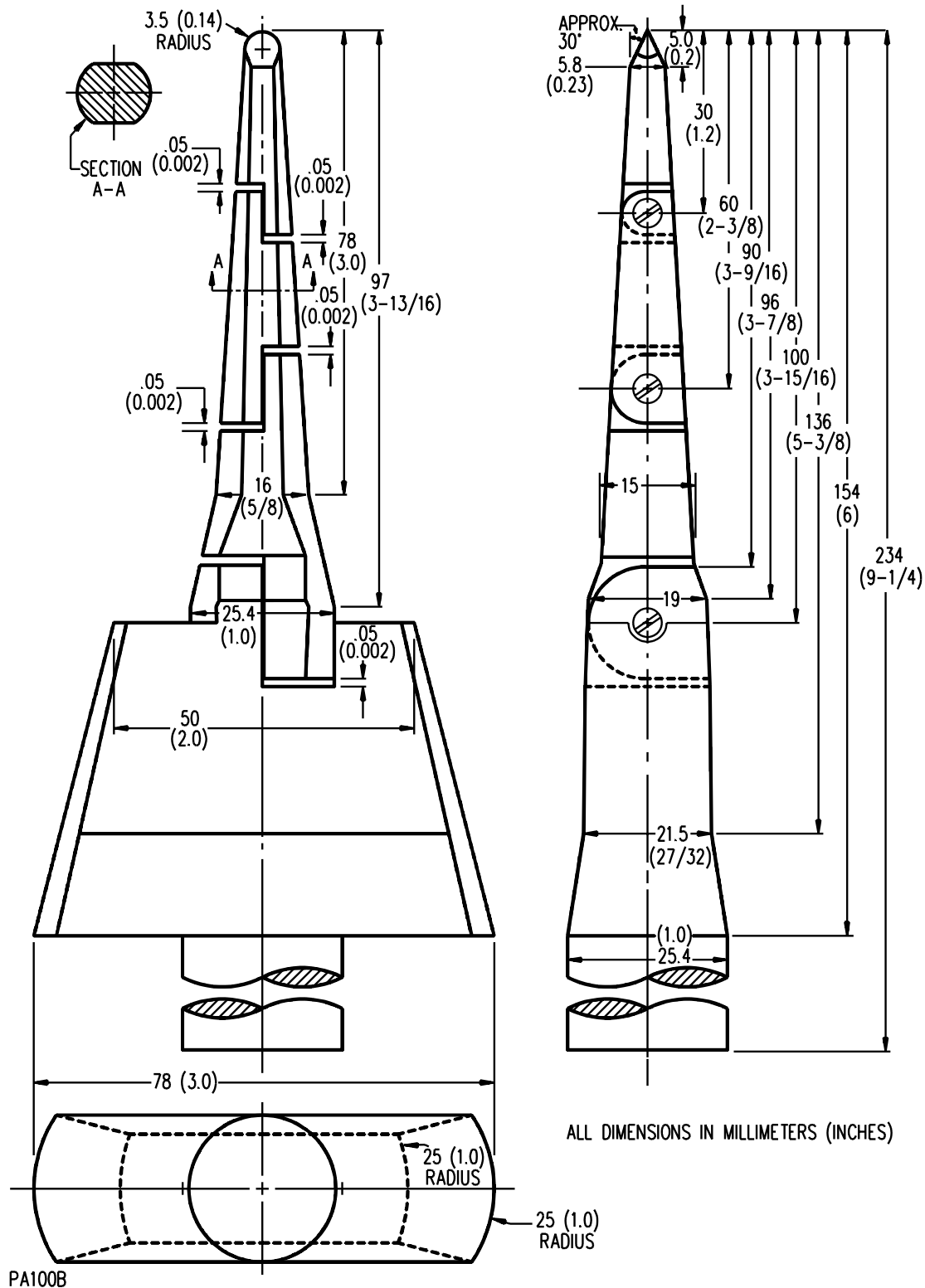
Added 6.3.1 effective March 11, 2018

6.3.2 The probe shown in Figure 6.1 shall not be able to contact uninsulated live parts of the connector. The probe shall be applied to any depth that the opening permits, and shall be rotated or angled before, during, and after insertion through the opening to any position that is required to examine the enclosure. The probe shall be applied in any possible configuration; and, when required, the configuration may be changed after insertion through the opening.

Added 6.3.2 effective March 11, 2018

Figure 6.1
Articulate probe with web stop

Added Figure 6.1 effective March 11, 2018



ALL DIMENSIONS IN MILLIMETERS (INCHES)

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6.3.3 The probe shall be used as a measuring instrument to evaluate the accessibility provided by an opening and not as an instrument to evaluate the strength of a material; it shall be applied with the minimum force required to determine accessibility.

Added 6.3.3 effective March 11, 2018

6.4 Connection to fittings

6.4.1 Each conductor shall be attached to the terminals of fittings in a manner that:

- a) Keeps strands of any conductor from contacting either uninsulated live parts of opposite polarity or dead metal parts,
- b) Provides mechanical security in accordance with 11.1,
- c) Provides adequate ampacity in accordance with 12.2; and
- d) Keeps strands from surfacing in a molded-on fitting.

6.4.2 Other forms of attachment of a conductor to the terminal of a fitting include the following:

- a) Soldering and welding, when found to comply with the Conductor secureness test in 11.1 (see 6.4.3); and
- b) Crimping, when found to comply with the Conductor secureness test in 11.1 and provide adequate ampacity in accordance with the Temperature test in 12.2.

6.4.3 When soldering is used as the means of connection, the construction shall ensure that there will be at least one right-angle bend or an offset in the conductor to prevent stress on the conductor from being transmitted directly to the connection.

6.5 Identification and wiring

6.5.1 A terminal on a fitting that is identified for the connection of either a grounded (the identified) conductor or the grounding conductor shall be correctly connected to the corresponding conductor of the cord.

6.5.2 A flexible cord assembled to a fitting that has any of the configuration contacts as illustrated in the Standard for Wiring Device Configurations, UL 1681(C3.1 – C3.8), the Standard for Appliance Couplers for Household and Similar General Purposes – Part 1: General Requirements, UL 60320-1, Appliances couplers for household and similar general purposes – Part 1: General requirements, IEC 60320-1 and Appliance Couplers for Household and Similar General Purposes - Part 2-2: Interconnection Couplers for Household and Similar Equipment, IEC 60320-2-2, or Wiring Devices – Dimensional Specifications, ANSI/NEMA WD 6, shall comply with 6.5.3 and 6.5.4.

6.5.3 The conductor in the cord identified as follows shall be connected to the contact designated by the letter "W" or an equivalent means to designate the identified conductor:

- a) Finished to show a white or gray color,
- b) Covered by a white or gray braid,
- c) Equivalently identified by:

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- 1) A white or gray separator,
 - 2) A stripe, ridge, or groove on the outside surface of the insulation; or
 - 3) A tin or other white metallic coating on each strand.
- d) Has light blue colored or light blue coated insulation; and:
- 1) The cord has a jacket not integral with the circuit conductor insulation,
 - 2) The power-supply cord or cord set is factory installed in, or packaged with, an appliance, and
 - 3) The shipping package is marked in accordance with 20.6.

6.5.4 The conductor in the cord identified as follows shall be connected to the contact designated by the letter "G" or an equivalent means to designate the grounding conductor:

- a) Green with or without one or more yellow stripes, or
- b) Covered by a green braid with or without one or more yellow tracers.

6.5.5 Terminals for devices with IEC 60320 configurations shall comply with the following:

a) Terminals for an IEC 60320-1 connector, when looking at the face of the connector, shall be as follows:

- 1) Earthing contact: upper central position;
- 2) Line contact: lower right-hand position; and
- 3) Neutral contact: lower left-hand position.

b) Terminals for an IEC 60320-2-2 plug, when looking at the face of the plug, shall be as follows:

- 1) Earthing contact: upper central position;
- 2) Line contact: lower left-hand position; and
- 3) Neutral contact: lower right-hand position.

c) Cord conductors shall be connected to the IEC connector and plug terminals in the following manner:

- 1) Green/yellow or green core to the earthing contact;
- 2) Brown or black core to the line contact; and
- 3) Light blue or white core to the neutral contact.

6.5.6 A flexible cord containing a grounding conductor shall not be assembled to a non-grounding plug or a non-grounding connector.

6.6 Treatment of cord-conductor coverings

6.6.1 The insulation, braid, or sheath on the flexible cord shall not be removed more than that necessary to make the proper connections within a fitting.

6.6.2 Suitable means shall be provided to inhibit fraying or slipping of the braid or insulation of the cord that would cause conductors external to a fitting to become exposed.

6.7 Outdoor-use fittings

6.7.1 Except as noted in 6.7.2, materials used for outdoor fittings when molded of polymeric material shall be subjected to:

a) The Weather (sunlight) resistance test in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C for 720 h for carbon arc or 1000 h for Xenon-arc; and

b) The Crushing and Impact Resistance tests as indicated in 11.7 and 11.8, respectively.

Added 6.7.1 effective March 11, 2018

6.7.2 Fittings molded of solid butyl rubber, neoprene, thermoplastic elastomer, or polyvinyl chloride shall not be required to comply with 6.7.1.

6.7.3 A molded fitting attachment plug of butyl rubber, neoprene, or polyvinyl chloride is acceptable if in compliance with the Adhesion test, 11.11. Molded-on cord connectors of other materials are acceptable if determined so by the results of special investigation.

Note: Special forms of construction not specified in this standard shall be subject to special investigation.

7 Plugs

7.1 Plugs

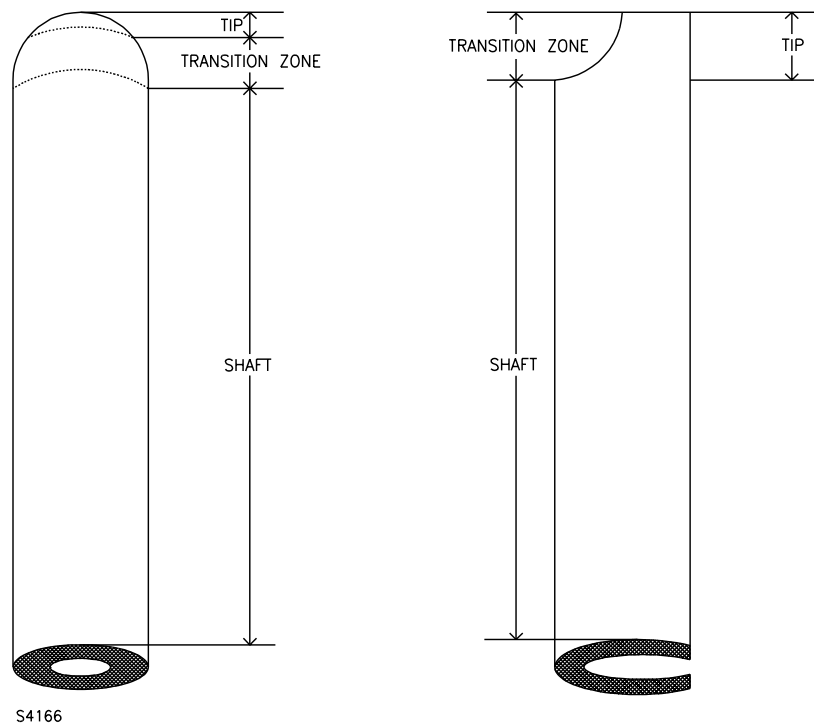
7.1.1 A blade used in a 15- or 20-A NEMA attachment plug cap shall comply with the Standard for Attachment Plug Blades for Use in Cord Sets and Power-Supply Cords, UL 1659. Where a blade is crimped and soldered, or welded, and/or where a blade is made mechanically secure and soldered directly to the conductor, connections need not comply with the performance requirements of UL 1659.

7.1.2 The grounding blade or pin of a 15- or 20-A non-locking type attachment plug shall not contain surface discontinuities that would tend to interfere with insertion into, or withdrawal from, a grounding contact of an outlet device. Abrupt surface transitions such as gaps, steps, offsets, detents, holes or sharp chamfers shall be specifically prohibited in the following areas shown in Figure 7.1:

a) The shaft; and

b) The transition zone between the tip and the shaft which is likely to engage the grounding contact during insertion or withdrawal.

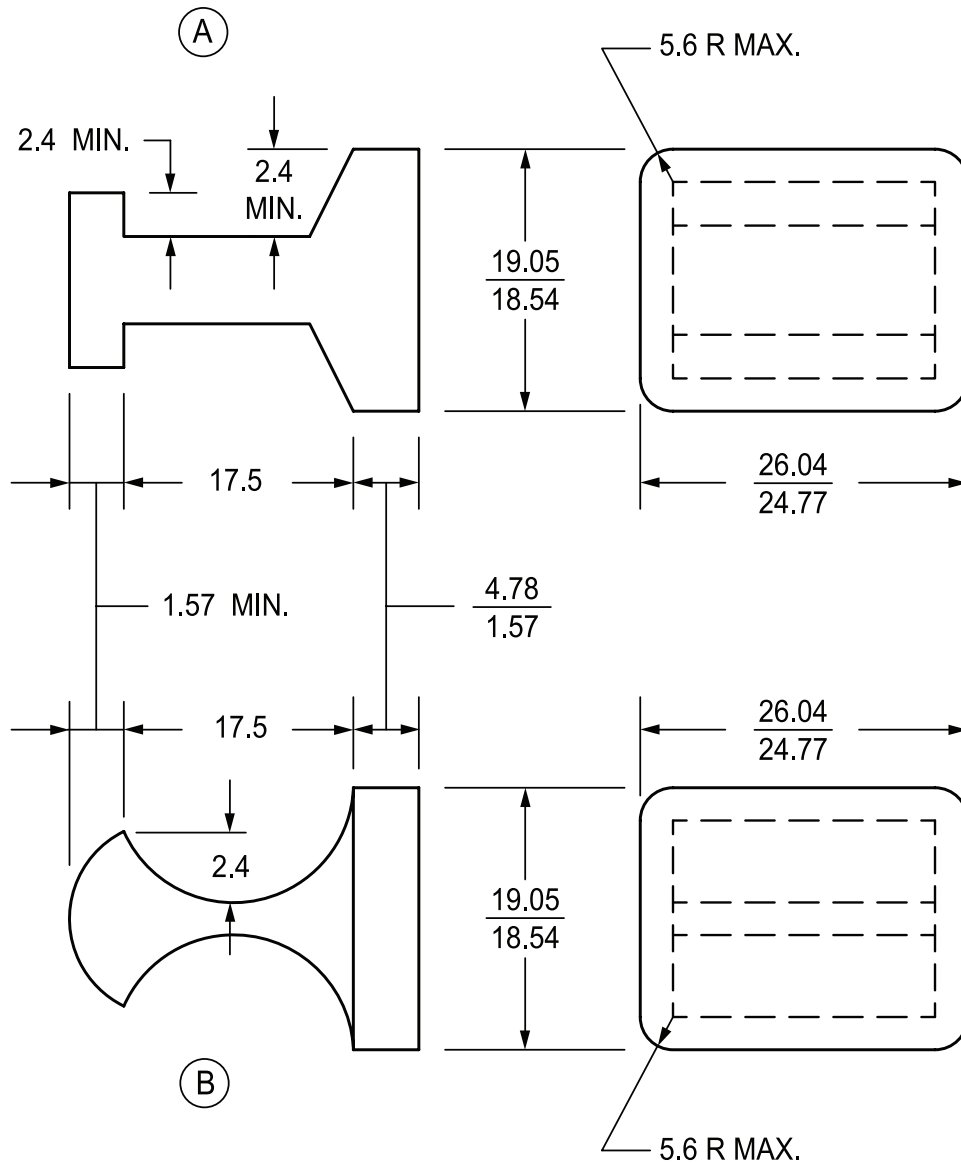
Figure 7.1
Grounding pin profiles



7.2 Attachment plug grip

7.2.1 The body of a molded-on NEMA attachment plug of the configuration 1-15P shall be shaped such that it is not likely to be grasped at the face periphery, but rather invites gripping at a section formed for such a purpose. The gripping area shall extend over a distance of at least 17.5 mm (0.688 in) located between two higher sections. The section at the rear shall provide a sharply defined projection at least 2.4 mm (0.094 in) high with a base of at least 1.57 mm (0.062 in), and an overall width of at least 6.4 mm (0.25 in), in accordance with Figure 7.2. In place of the gripping area, a finger grip in the form of a substantial closed loop capable of accommodating one or more fingers shall be permitted. Other gripping surfaces shall be permitted provided that they comply with 12.3. A grip or gripping surface might need to be additionally investigated for the ability to withstand the conditions of normal use such as flexing, mechanical strength, and similar conditions.

Figure 7.2
Attachment plug finger grip and blade guards



2.4 MIN-MATERIAL OVER LIVE PARTS

su1073

Note – All dimensions in mm.

mm	1.57	2.4	4.78	5.6	17.5	19.05	26.04
			1.57			18.54	24.77
(inch)	(0.062)	(3/32)	(0.188)	(7/32)	(11/16)	(0.750)	(1.025)
			(0.062)			(0.730)	(0.975)

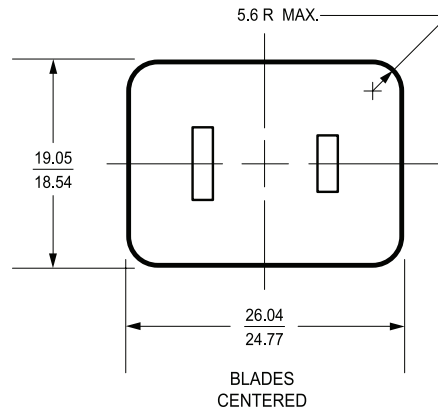
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7.2.2 Two-wire attachment plugs shall have a face size equal to or larger than that indicated in Figure 7.3.

Figure 7.3
Male fitting face dimensions



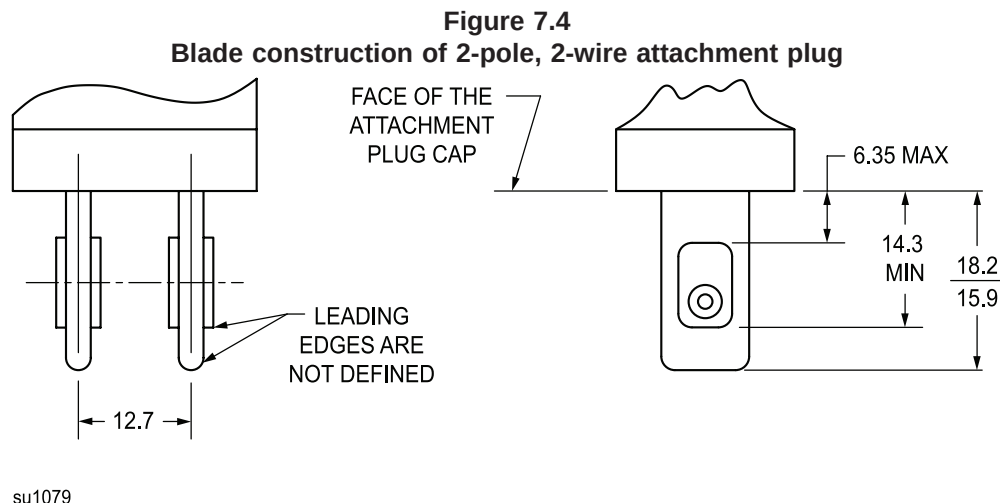
su1071

Note – All dimensions in mm.

mm	5.6	19.05	26.04
		18.54	24.77
(inch)	(7/32)	(0.750)	(1.025)
		(0.730)	(0.975)

7.2.3 A shallow-bodied right-angle plug may exceed the maximum face size.

7.2.4 The blades shall be located as shown in Figure 7.4 and parallel to one another. Compliance shall be determined by full insertion, as described in 14.2, into a 1-15R.



Note – All dimensions in mm.

mm	6.35	12.7	14.3	18.2
(inch)	(0.250)	(0.500)	(0.562)	(0.718)
				15.9
				(0.625)

7.3 Hospital grade attachment plugs

7.3.1 A hospital grade molded-on attachment plug shall comply with the requirements in 7.3 and Section 18, Hospital Grade Molded-On Plugs and Connectors, and with all other applicable requirements in this standard. These requirements are applicable only to configurations 5-15P, 5-20P, 6-15P, and 6-20P in accordance with ANSI/NEMA WD 6. Attachment plugs shall be of the straight type (longitudinal axis of flexible cord parallel to that of the line blades), or right-angle type (longitudinal axis of flexible cord at right angle to that of the line blades), molded onto flexible cord.

7.3.2 Blades shall be formed of solid brass material in conformance with ANSI/NEMA WD 6. The grounding pin shall not be capable of being easily bent or removed without the use of tools.

7.3.3 The size of the attachment plug shall allow the full insertion of two attachment plugs into a duplex receptacle.

7.3.4 The strain relief system shall comply with the requirements of 18.2, and shall not permit any forces applied to the cord to be transmitted to the point of electrical termination of the cord conductors inside the fitting.

7.3.5 A hospital grade plug shall be marked in accordance with Section 27, Hospital Grade Attachment Plugs, Connectors and Hospital Grade Extension Cords.

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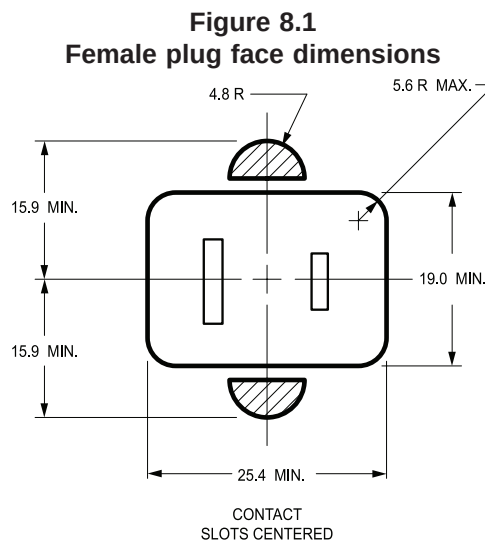


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8 Cord Connectors

8.1 General

8.1.1 The perimeter of the outlet face of a 1-15R configuration shall meet the requirements of Figure 8.1. Two-wire molded-on cord connectors shall have a face size equal to or larger than that indicated in Figure 8.1.



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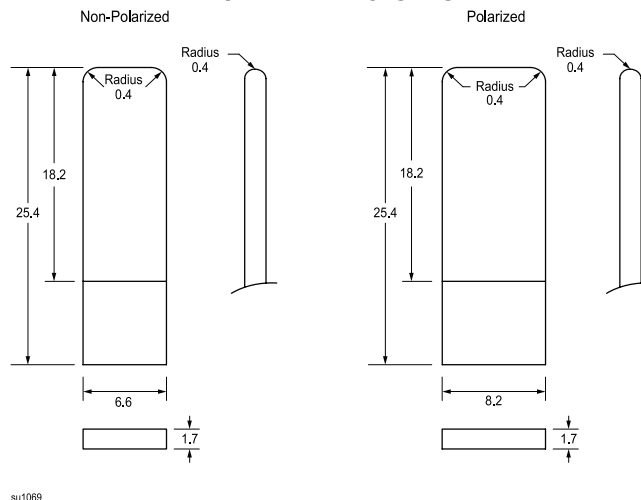
Note – All dimensions in mm.

mm	4.8	5.6	15.9	19.0	25.4
(inch)	(3/16)	(7/32)	(5/8)	(3/4)	(1)

8.1.2 The female contacts of a 1-15R cord connector shall be recessed at least 6.4 mm (1/4 in) from the face of the fitting.

8.1.3 A 1-15R cord connector shall accommodate a 1-15 plug without any blade exposure between the faces of the fittings as determined by the Depth of cavity test in 14.1. The depth gauge shall be as shown in Figure 8.2.

Figure 8.2
Depth of cavity gauge



Note – All dimensions in mm.

mm	0.4	1.7	6.6	8.2	18.2	25.4
(inch)	(1/64)	(0.065)	(0.260)	(0.322)	(0.718)	(1.0)

8.1.4 When two or more 1-15R outlets are on the same surface of a cord connector, they shall be spaced apart so as to allow adjacent plugs with the dimensions in Figure 7.3 to be fully inserted with no exposed blades.

8.1.5 The contact openings of all, or all but one, of the outlets of a cord connector shall be effectively and reliably closed by means that comply with the Closure of openings test, 14.11. The closure shall:

- a) Be formed of insulating material having physical properties that can withstand the rigors of use and reasonably foreseeable abuse;
- b) In no case, be removable from the cord set. A closure that is removable from the outlet shall remain within 150 mm (6 in) of the cord connector while not in use after being tested in accordance with 14.11.2;
- c) When positioned as intended, be capable of obstructing a straight steel wire that is 0.25 mm (0.010 in) from touching any female contact;
- d) Be capable of insertion into and withdrawal from the outlet in the intended manner without breakage or damage both before and after the cord connector and closure have been tested in accordance with 14.11.1.1;
- e) Not impair the performance of the cord connector after three simulated insertions and withdrawals of the closure in the intended manner, after testing in accordance with 14.11.1.4; and

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f) Not serve as a tab or handle used to open another closing means on the cord connector.

8.1.6 If the closing means consists of an insulating closure, it shall not be provided with handles, loops, knobs, or similar means that possibly facilitate removal. Such means shall not have been removed from an outlet after being subjected to a straight pull of 4.4 N (1 lbf) perpendicular to the face of the outlet.

Note: Special forms of construction not specified in this standard shall be subject to special investigation.

8.1.7 Contact material shall be either copper or copper alloy.

8.2 Holes, indentations, and projections

8.2.1 A connector of a cord set may be provided with a means, such as a hole, hook, indentation, or similar means, molded to the cord connector body, to facilitate temporary positioning during use. A hole shall have a minimum inside diameter of 9.5 mm (3/8 in). A projection shall not be used. A hole, hook, or indentation that could be used for permanent hang-up mounting of the connector shall not be used.

8.3 Improper insertion

8.3.1 Molded-on cord connectors of the 1-15R configuration, 5-15R configuration, or the non-polarized 1-15R configuration shall prevent the improper insertion of the mating attachment plug and/or the insertion of a ground pin into any contact opening so that it might contact live parts. Compliance is determined in accordance with 14.8.

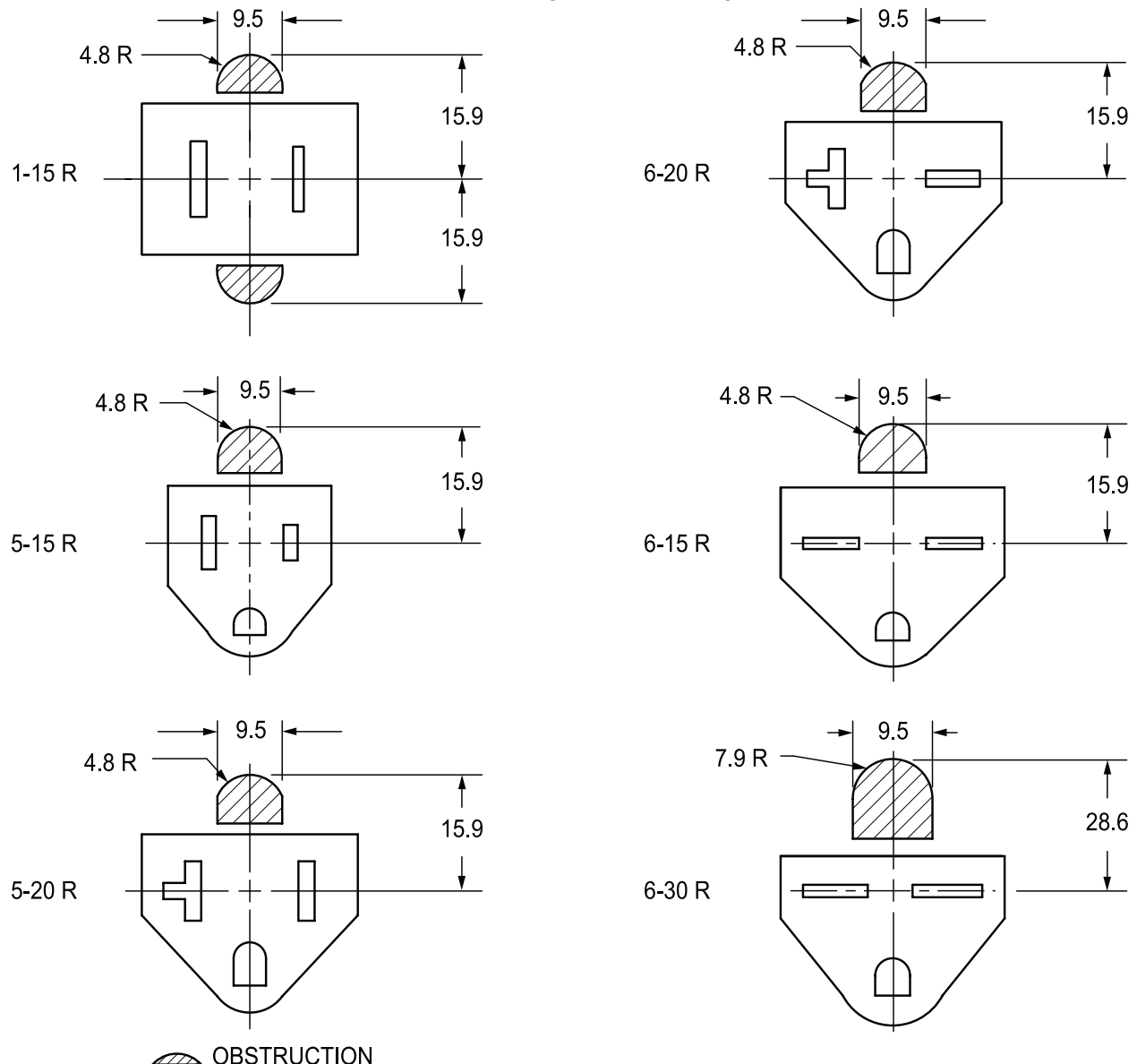
8.4 Mismatching

8.4.1 Except as noted in 8.4.2, the face of a 1-15R cord connector shall be in compliance with Figure 8.1 and shall obstruct the insertion of an attachment plug of the 5-15P configuration.

8.4.2 The face of a cord connector of the 5-15R, 6-15R, 5-20R, 6-20R, or 6-30R configuration shall be in compliance with Figure 8.3 and obstruct the insertion of either its respective mating plug in the reverse direction in an attempt to deflect the ground pin to the outside of the face when inserting the line blades, or a dissimilarly rated grounding attachment plug.

Figure 8.3

Faces of outlet devices showing smallest acceptable obstructions



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Note – All dimensions in mm.

mm	4.8	9.5	15.9
(inch)	(3/16)	(3/8)	(5/8)

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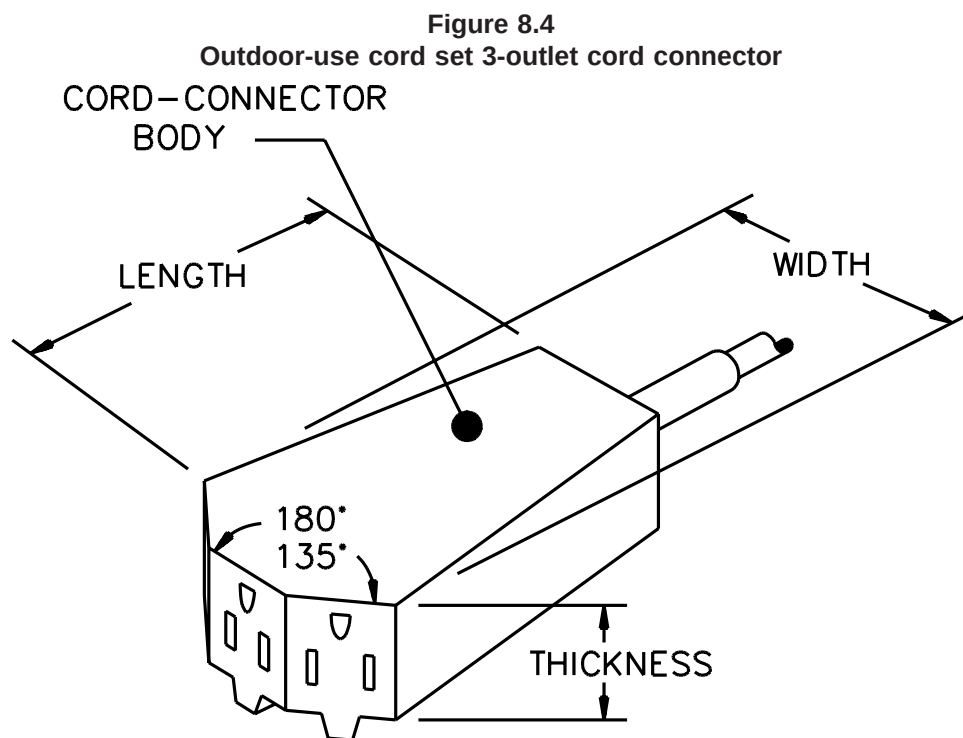
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8.5 Cord connector – outdoor

8.5.1 A cord connector shall be resistant to sunlight and mechanical abuse, and shall exclude moisture by tightly adhering to the jacket of the cord at the point that the cord enters the body, in accordance with the Adhesion test, 11.11.

8.5.2 A cord connector shall have a maximum of three outlets. The configuration of the cord connector shall be the same as the attachment plug.

8.5.3 Each multi-outlet of a cord connector intended for outdoor-use shall have the outlets positioned in a vertical plane (the outlet faces not positioned face up or face down) as shown in Figure 8.4 in accordance with the Random drop test, 14.10.



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8.5.4 A 5-15R outlet face of a 3-outlet cord connector need not comply with 8.5.3 when:

- a) The length and width dimensions are at least three times the maximum thickness dimensions, excluding the grounding pin obstruction(s),
- b) There is no outlet in the surfaces formed by the length and width dimensions, and
- c) The angle between the adjacent faces containing outlets is not less than 135 degrees. See Figure 8.4.

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8.5.5 When two or more 1-15R or 5-15R outlets are on the same surface of a cord connector, they shall be spaced apart so as to enable adjacent plugs having the minimum face size shown in Figure 7.3 to be fully inserted with no exposed blades.

8.5.6 Each outlet of a cord connector for an outdoor-use cord set shall be tested as described in the Low-temperature insertion test, 14.9, to determine that connector(s) are capable of low-temperature connection.

8.6 Hospital grade connectors

8.6.1 A hospital grade molded-on connector shall comply with the requirements in Section 18 and with all other applicable requirements in this standard. These requirements are applicable only to configurations 5-15R, 5-20R, 6-15R, and 6-20R in accordance with ANSI/NEMA WD 6. Connectors shall be of the straight type (longitudinal axis of flexible cord parallel to that of the contacts), or right-angle type (longitudinal axis of flexible cord at right angle to that of the contacts), molded onto flexible cord.

8.6.2 A hospital grade connector shall be marked in accordance with Section 27.

9 Other Components

9.1 General

9.1.1 The construction requirements in this Section cover components other than plugs and cord connectors, such as strain relief clamps, switches, and overcurrent devices used in power-supply cords and cord sets.

9.2 Metal strain relief clamps

9.2.1 A strain relief clamp shall not affect the performance of round jacketed cable.

9.2.2 A strain relief that is part of a wiring device applied on Types SP-1, SPT-1, NISP-1, NISPT-1, SP-2, SPT-2, and NISP-2 and NISPT-2 cords or on tinsel cords shall be acceptable only after previous investigation, and used with supplementary insulation tested in accordance with 11.3.3.

9.2.3 A strain relief clamp for Type SPT-3 shall comply with the test in 11.3.3 if the design of the clamp appears to cause damage to the cord.

9.2.4 A strain relief for flexible cords other than Type HSJ or Type C and heavier general-use cords shall have between the strain relief clamp and the cable of at least one layer of supplementary insulation, unless the construction of the clamp is such that the cord jacket will not be adversely affected.

9.3 Switches

9.3.1 A through-cord or pendant switch shall comply with the performance requirements of the Standard for General-Use Snap Switches, UL 20. An AC/DC rated through-cord or pendant switch shall be rated not less than "6 A, 120 V - 3 A, 250 V". An AC-only rated through-cord or pendant switch shall be rated not less than "10 A, 120 V AC". These requirements apply to all switches, including supplementary protectors being used as a switch actuator, and having a reset button or containing symbols, words, or letters, meaning "ON/OFF".

9.3.2 A supplementary protector located within the plug body, having a reset button that is similar in shape to a switch actuator and marked "Not to be used as a switch" or equivalent, shall comply with either:

- a) Supplementary Protectors for Use in Electrical Equipment, UL 1077 and the Standard for Special-Use Switches, UL 1054; or
- b) The Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1.

The marking shall be located as identified in 21.1.10.

9.3.3 A switch in a cord set or power-supply cord that is not polarized shall simultaneously open all of the supply conductors.

9.3.4 A switch in a polarized cord set or power-supply cord shall simultaneously open all current carrying conductors.

9.3.5 A switch shall not open the grounding conductor of a cord set.

9.3.6 A dimmer switch for use only with an incandescent lamp load, having a rating of at least 300 W and marked in accordance with 21.1.7, shall be used as the pendant switching device on the cord set described in 10.7.4.2.2.

9.3.7 A pendant switch used in an extension cord set shall not be of a dimmer type.

9.4 Switches – outdoor

9.4.1 A switch provided on an outdoor-use cord set shall comply with the requirements for switches described in 9.3.1 – 9.3.7 in addition to the requirements in this Section.

9.4.2 Each switch provided on an outdoor-use cord set shall have an enclosure to reduce the likelihood of persons unintentionally contacting uninsulated live parts of the switch.

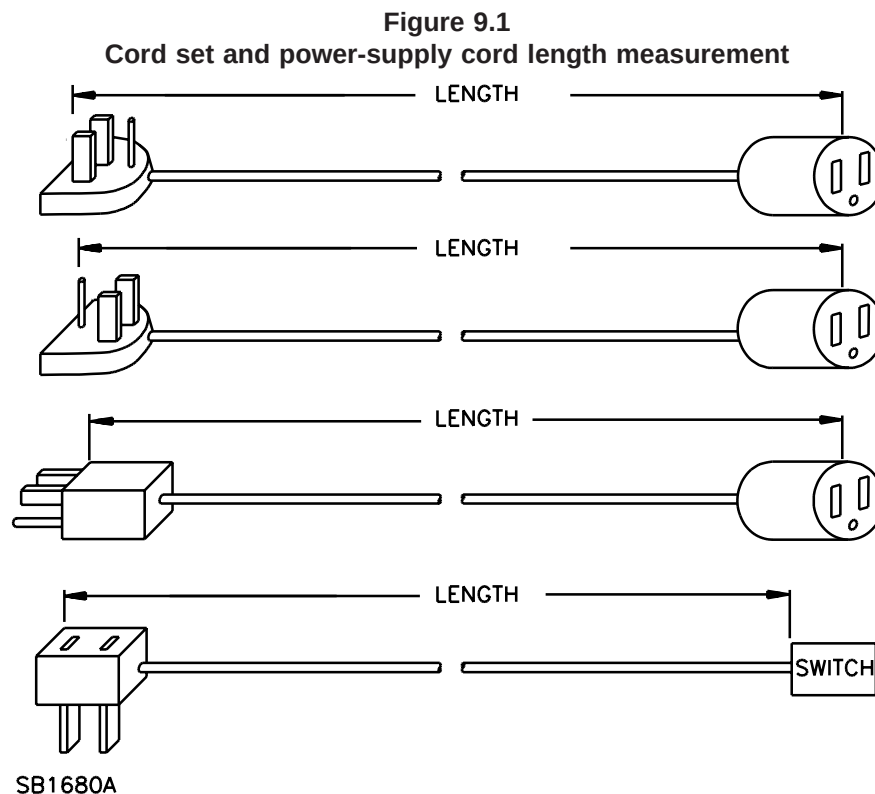
9.4.3 The enclosure of a switch provided on an outdoor-use cord set shall be comprised of material that has a minimum flammability rating of HB, in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

9.4.4 A switch enclosure shall be of a material having moisture absorptive properties in accordance with the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A. Molded phenolic and similar thermosetting polymeric materials are considered to have moisture-absorptive properties for use as the enclosure of a switch. Fiber and similar absorptive materials are not considered to have moisture-absorptive properties for use as the enclosure of a switch.

9.4.5 The enclosure of a switch intended for use on an outdoor-use cord set shall not permit water to enter that portion of an attachment plug or current tap that serves as the enclosure of the switch so as to contact live parts as determined by the Water exclusion test, 17.6.

9.5 Current taps and pendant switches

9.5.1 A single or multiple series-connected current tap may be provided on a general-use cord set if the series-connected flexible cord terminates in a pendant switch or a dimmer device and the flexible cord is not less than 1.8 m (6 ft) long when measured as described in Figure 9.1.



9.5.2 The outlets of a cord connector on a polarized cord set may be controlled by a single-pole pendant switch located on a flexible cord. The unidentified (switched) conductor of the flexible cord shall be continuous from the attachment plug, through the switch, to the cord connector.

9.6 Through-cord heating-pad switch

9.6.1 Each through-cord heating-pad switch shall be assembled with a means to provide strain relief unless all connections in the switch (except for a soldered joint in a slack portion of the through conductor) are riveted or welded, or unless such connections are made by means of eyelets, pressure wire connectors with closed-loop tangs, soldered loops in the conductors, or soldered joints where mechanical security is provided without depending upon the joint. Terminal binding screws shall not unthread completely when the switch is assembled. The through-cord heating-pad switch shall comply with the requirements of 11.3.6.

9.7 Fittings intended to accommodate overcurrent protective devices

9.7.1 An enclosure shall be provided for each overcurrent protective device provided on a cord set or power-supply cord.

9.7.2 The material of molded-on bodies of attachment plugs or current taps that serve as the enclosure for an overcurrent protective device shall operate within its recognized temperature limits when tested in accordance with the temperature test in 12.2. The test shall be performed with a rated fuse installed. The material shall not flame or melt to the extent that live parts are exposed or a replaceable fuse cannot be replaced. The material of any other type of enclosure shall be comprised of material in compliance with this standard, and shall have a minimum flammability rating of V-2.

9.7.3 An overcurrent protective device enclosure shall:

- a) Be of a material having moisture absorptive, flammability, and mechanical strength properties acceptable for the purpose and shall retain these properties when exposed to the maximum temperatures and other conditions of normal use,
- b) Prevent unintentional contact with uninsulated live parts of the fuse and fuseholder, and
- c) Confine the effects of a fuse rupture to the interior of the enclosure.

9.7.4 Fiber and similar absorptive materials shall not be considered to have moisture-absorptive properties acceptable for use as the enclosure of a fuse.

9.7.5 Molded phenolic and similar thermosetting polymeric materials are considered to be acceptable for use as a fuse enclosure.

9.7.6 The construction of a fusible plug that has male pins or blades, such as an attachment plug or current tap, shall be such that the fuse or fuses are not removable when the pins or blades are energized.

9.7.7 A fuseholder, attachment plug, or current tap intended to accommodate replaceable fuses shall be plainly and permanently marked in accordance with 21.1.2.

9.7.8 The enclosure of an overcurrent protective device intended for use on an outdoor-use cord set or power-supply cord shall be constructed so that water does not enter a through-cord fuseholder or that portion of an attachment plug or current tap which serves as the enclosure of the protective device (fuse or supplementary protector) so as to contact live parts when tested in accordance with 17.6.

9.8 Supplementary circuit

9.8.1 A supplementary charging circuit provided in a general-use cord set or power-supply cord shall comply with the requirements of the Standard for Class 2 Power Units, UL 1310.

9.8.2 A supplementary charging circuit provided in a special-use power-supply cord intended for ITE equipment shall comply with the requirements of the Standard for Class 2 Power Units, UL 1310, or the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1.

9.9 Devices employing remote control features

9.9.1 In addition to the requirements of this standard, general-use cord sets and special-use nondetachable power-supply cords employing remote control features shall comply with the Standard for Solid-State Controls for Appliances, UL 244A. Compliance with the Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, UL 60730-1, and/or the applicable Part 2 standard from the UL 60730 series fulfills these requirements.

9.9.2 The electrical tungsten rating of the switching device shall be greater than or equal to the rating of the cord set or power-supply cord.

9.9.3 The switching device shall be capable of controlling up to and including a $\frac{1}{2}$ HP motor. If the cord set or special-use power-supply cord is not intended for use with a motor load, the unit shall be marked as noted in 21.4.1 or 10.9.6.4, respectively.

9.9.4 The output shall not only be controlled by the remote controller. A separate individual switch/interface shall be provided on the unit to disconnect the main power of the device.

9.9.5 A switch used to directly control a load fitting, shall comply with the performance requirements contained in the Standard for General-Use Snap Switches, UL 20, for an AC only through cord switch or a special-use switch that complies with the Standard for Special-Use Switches, UL 1054, or the Standard for Switches for Appliances – Part 1: General Requirements, UL 61058-1. The switch shall be AC tungsten rated and have an electrical rating equal to or greater than the rating of the cord set or power-supply cord. These requirements apply to all switching mechanisms such as relays, supplementary protectors, and switches which contain symbols, words, or letters meaning ON/OFF.

9.9.6 A general-use cord set employing a remote control feature shall be marked in accordance with 21.1.12 and 21.1.13.

9.9.7 A special-use nondetachable power supply cord employing a remote control feature shall be marked in accordance with 10.9.5.2 and 10.9.6.3.

9.10 Overcurrent protection

9.10.1 Cord sets and power-supply cords that comply with 10.1 – 10.16 may be provided with overcurrent protection (short circuit and overload protection) rated to equal to or less than the ampacity of the flexible cord. Supplementary overcurrent protection found in compliance with the Standard for Supplementary Protectors for Use in Electrical Equipment, UL 1077, and with the requirements for overcurrent protective devices in Section 17, Tests for Overcurrent Protective Devices, of this standard, meets the intent of this requirement.

9.10.2 Supplementary overcurrent protection is an acceptable method of providing the protection required in 9.10.1; however, thermal cutouts, thermal relays, and other devices not intended to open short circuits shall not be used.

9.10.3 The overcurrent protective device may be of the replaceable or manually resettable, but not of the automatic resetting type, and shall have a minimum short circuit rating of 1000 A.

9.10.4 The overcurrent protective device shall be located in the attachment plug or current tap, or be of a through-cord design located not more than 150 mm (6 in) from the face of the plug to the rear of the fuseholder.

9.10.5 The overcurrent protective device shall provide protection for each unidentified circuit conductor, but not for any identified (grounded) circuit conductor or grounding conductor unless all branch circuit conductors are simultaneously open. The overcurrent protective device shall not open the grounding conductor.

9.11 Cord restraint devices

9.11.1 In addition to the applicable general requirements, a cord restraint device shall comply with the requirements in 9.11.2 – 9.11.4.

9.11.2 A cord restraint device is intended to reduce the likelihood of an attachment plug becoming unintentionally detached from a mating cord connector of a cord set or any outlet device.

9.11.3 Cord restraint devices shall not be integral or permanently attached to a cord set or outlet device.

9.11.4 If the cord restraint device encapsulates or confines the air space within the enclosure, it shall comply with the Temperature test for cord restraint devices as described in 19.1.

10 Assembly

10.1 Power-supply cords

10.1.1 General

10.1.1.1 A power-supply cord shall be constructed with a flexible cord as defined in Table 10.1, a male plug at one end and non-terminated leads on the opposite end.

Table 10.1
Types of flexible cord, cable, and wire for power-supply cords and cord sets

Tinsel cords	Heater cords	General-use cords				Specific-purpose cords, cables, and wires
TPT	HPD	C	SP-1	SV	SJ	XTW
TST	HPN	PD	SPT-1	SVO	SJO	CXTW
	HSJ	S	SPE-1	SVOO	SJOO	Clock
	HSJO	SO	SP-2	SVT	SJT	SRD
	HSJOO	SOO	SPT-2	SVTO	SJTO	SRDT
	HSJOOW	ST	SPE-2	SVTOO	SJTOO	SRDE
	HSJOW	STO	SP-3	SVE	SJE	Shaver
		STOO	SPT-3	SVEO	SJEO	
		SE	SPE-3	SVEOO	SJEOO	
		SEO	NISP-1	NISPE-1	NISPT-2	
		SEOO	NISPT-1	NISP-2	NISPE-2	
			STW	SJEW	SW	
			STOW	SJEOW	SOW	
			STOOW	SJEOWW	SOOW	
			SEW	SJTW		
			SEOW	SJTOW	SJOW	
			SEOWW	SJTOOW	SJOOW	

NOTES:

- 1 – It is intended that this table be used in conjunction with applicable end-use product Standards to ensure selection of the proper size and type.
- 2 – Tinsel cords are limited to use in power-supply cords not larger than 2.4 m (8 ft) overall, including the plug and connector (when provided) but excluding the blades of an attachment plug.
- 3 – Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, SEOWW, SJOW, SJOOW, SJTW, SJTOW, SJTOOW, SJEW, or SJEOW cord that is marked "outdoor" is not acceptable for use in power-supply cords.
- 4 – Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, and SEOWW cord that is marked "For mobile-home use: ____ amperes" is limited to use in power-supply cords for mobile homes. A Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, or SEOWW cord marked "For recreational vehicle use: ____ amperes" is limited to use in power-supply cords for recreational vehicles.
- 5 – Types SP-3, SPT-3, and SPE-3 cords are acceptable for use in power-supply cords for certain appliances that are not frequently moved.
- 6 – In SP-1, NISP-1, SP-2, NISP-2, SP-3, SPT-1, NISPT-1, SPT-2, NISPT-2, SPT-3, SPE-1, NISPE-1, SPE-2, NISPE-2, SPE-3, SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, SVEOO, and HPN type cords, the third conductor is for grounding purposes only.
- 7 – Types SP-2, SPT-2, SPE-2, NISP-2, and NISPE-2 cords employing 30 AWG (0.05 mm²) stranding are limited to use in extension cord sets that are not likely to be subjected to frequent flexing.
- 8 – Types XTW, CXTW, clock cords, and shaver cords are limited to use in power-supply cords marked as required in 30.2.
- 9 – Types SRD, SRDT, and SRDE cables are limited to use where they are not subject to frequent flexing such as with electric ranges and clothes dryers and other appliances rated 30 A or greater that are not frequently moved.

Table 10.1 Continued

Tinsel cords	Heater cords	General-use cords	Specific-purpose cords, cables, and wires
10 – Cord constructions that can be demonstrated to be equivalent to integral Type SPT-2 flexible cord may be used in power-supply cords having a retractile (coiled) cord construction. 11 – Cord types that employ a shield or a shield and drain wire (see 10.1.4.2) are identified by the word “shielded” marked on the outer surface of the cord. 12 – The use of shaver cord is limited to factory-assembled power-supply cords intended for hand-held hair clippers and shaving appliances rated 50 W or less. 13 – Appliance Wiring Material constructed similarly to Type SPT-1 flexible cord, except that the extruded PVC insulation thicknesses are 1.02 mm (40 mils) average minimum, 0.889 mm (35 mils) minimum at any point before separation, 0.483 mm (19 mils) minimum at any point after separation, and 1.52 mm (60 mils) minimum between conductors, is acceptable for use with chain-suspended portable lamps. 14 – A 20 AWG (0.52 mm²) power-supply cord, constructed of Appliance Wiring Material having 36 – 34 AWG (0.013 – 0.020 mm²) stranding and insulation (and jacket, if appropriate), having a thickness equal to the insulation thickness of the flexible cord type it is intended to replace, is acceptable for use as described in 10.1.2.1 and 10.1.2.2. 15 – Conductors sized 20 AWG (0.52 mm²) have been approved only for Types CXTW, XTW, SP-1, NISP-1, SPE-1, NISPE-1, Clock and SPT-1 and NISPT-1. 16 – Conductors sized 22 AWG (0.33 mm²) have been approved only for Type CXTW. 17 – Flexible cord constructions that have been evaluated to the Standard for Flexible Cords and Cables, UL 62 requirements for -R cable and to the end product requirement for the use in fans and heaters and that require extra heavy wall flexible cord shall be identified with the -R designation appearing on the cord jacket.			

10.1.1.2 Power-supply cords shall comply with the applicable requirements of 5.1 – 5.4 and the applicable requirements of 10.1.1 – 10.1.7.

10.1.1.3 There shall be a conductor attached to each blade or pin in the attachment plug and there shall be a blade or pin provided for each conductor in the cord.

10.1.1.4 An outdoor-use power-supply cord is intended for use on outdoor appliances that are to be stored indoors while not in use. It is also acceptable for indoor use.

10.1.1.5 Each outdoor-use power-supply cord may be either the non-grounding type containing 2 circuit conductors or the grounding type containing 2 or 3 circuit conductors and a grounding conductor.

Note: The attachment plug of an outdoor-use power-supply cord need not be polarized.

10.1.2 Attachment to fittings – plugs

10.1.2.1 Except as noted in 10.1.2.2 – 10.1.2.4, 2-wire power-supply cords with polarized or non-polarized parallel-blade attachment plugs or current taps rated 15 A, 125 V and employing the following 2-conductor flexible cord shall employ attachment plugs or current taps that comply with 7.2:

- a) 27 AWG, Types TPT, TST, and shaver cord.
- b) 20 AWG (0.52 mm²), Types SP-1, NISP-1, SPE-1, SPT-1, NISPE-1, and NISPT-1.
- c) 20 AWG (0.52 mm²), Appliance Wiring Material constructed in accordance with note 14 of Table 10.1.
- d) 20 AWG (0.52 mm²), clock cord.
- e) 18, 20, 22, 24 AWG (0.824, 0.052, 0.33, 0.20 mm²), Types XTW and CXTW.
- f) 18 AWG (0.824 mm²), Types CXTW, HPD, HPN, HSJO, SP-1, NISP-1, SP-2, NISP-2, SPT-1, SPT-1W, NISPT-1, SPT-2, SPT-2W, NISPT-2, SPE-1, NISPE-1, SPE-2, NISPE-2, SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, SVEOO, SJ, SJO, SJOO, SJOW, SJOOW, S, SO, SOO, SOOW, SOW, SPT-3, SJT, SJTW, SJTO, SJTOO, STO, STOO, ST, STW, SJTOW, SJTOOW, STOW, and STOOW.
- g) 17 AWG (1.04 mm²), Types HPN, HPD, SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, SVEOO, SJT, SJTO, SJTOO, SJTW, SJTOW, and SJTOOW.
- h) 16 AWG (1.31 mm²), Types CXTW, HPD, HPN, HSJO, SP-2, NISP-2, SPT-2, NISPT-2, SPE-2, NISPE-2, SV, SVO, SVOO, SJ, SJO, SJOO, SJOW, SJOOW, S, SO, SOO, SOOW, SOW, SPT-1, NISPT-1, SPT-3, SJT, SJTW, SJTO, SJTOO, STO, STOO, ST, STW, SVT, SVTO, SVTOO, SJTOW, SJTOOW, STOW, and STOOW.

10.1.2.2 A power-supply cord having 20 AWG (0.52 mm²) conductors and employing either appliance wiring material constructed in accordance with note 14 to Table 10.1, or Type SP-1, NISP-1, SPE-1, NISPE-1, SPT-1, or NISPT-1 flexible cord shall:

- a) Have a 2-pole, 2-wire line plug of the 15-A, 125-V Type that complies with 7.2, and
- b) Be provided with overcurrent protection in accordance with 9.10.

10.1.2.3 A power-supply cord of a toy transformer or electric toy need not comply with 10.1.2 (see 10.2.3).

10.1.2.4 A 2-conductor power-supply cord intended for use with a vacuum cleaner or floor finishing machine that meets the following conditions may have an attachment plug larger than that specified in Figure 7.3:

- a) The flexible cord employed is Type SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, or SVEOO;
- b) The cord employed is at least 4.6 m (15 ft) long; and
- c) The power-supply cord is marked in accordance with 30.4 and 30.5.

10.1.2.5 A current tap may be used for the plug on power-supply cords not intended for outdoor use.

10.1.3 Other components

10.1.3.1 The power-supply cord may include a through-cord switch or other intermediate device connected in the flexible cord.

10.1.3.2 An approved or investigated crimped-on terminal connector (such as a ring, tongue, or quick connect type) may be applied at the load end on one or more of the conductors.

10.1.3.3 A strain relief or antikink device, or both, assembled to the cord may be used.

10.1.3.4 A through-cord switch may be employed on a power-supply cord except for:

- a) Those types covered in 10.10; and
- b) Those intended for replacement use.

10.1.3.5 A through-cord switch employed on a power-supply cord shall comply with the requirements of 9.3.

10.1.4 Flexible cord

10.1.4.1 The flexible cord of a power-supply cord shall be one of the cords in Table 10.1. The maximum circuit-conductor ampacity of cords used in power-supply cords is shown in Tables 10.2 and 10.3.

Table 10.2
Circuit-conductor ampacity and voltage rating for jacketed cords in extension cord sets and power-supply cords

Types of cord	Size of conductors in cord		Number of cord conductors	Number of current carrying conductors ^a	Ampacity of current carrying conductors, (A)		Voltage rating of cord
	AWG	(mm ²)			0 – 15.2 m (0 – 50 ft)	Over 15.2 m (over 50 ft)	
S, SO, SOO, SOOW, SOW, ST, STO, STOO, STW, STOW, STOOO, SE, SEO, or SEOO	18	(0.824)	2, 3 or 4 3 or 4	2 3	10 7	7 5.6	600 600
	16	(1.31)	2, 3 or 4 3 or 4	2 3	13 10	10 7	600 600
	14	(2.08)	2, 3 or 4 3 or 4	2 3	18 15	13 10	600 600
	12	(3.31)	2, 3 or 4 3, 4 or 5	2 3	25 20	18 15	600 600
	10	(5.26)	2, 3 or 4 3, 4 or 5	2 3	30 25	25 20	600 600
	8	(8.37)	2, 3 or 4 3, 4 or 5	2 3	40 35	30 25	600 600
	6	(13.3)	2, 3 or 4 3, 4 or 5	2 3	55 45	40 35	600 600
	4	(21.2)	2, 3 or 4 3 or 4	2 3	70 60	55 45	600 600
	2	(33.6)	2, 3 or 4 3, 4 or 5	2 3	95 80	70 60	600 600

Table 10.2 Continued

Types of cord	Size of conductors in cord		Number of cord conductors	Number of current carrying conductors ^a	Ampacity of current carrying conductors, (A)		Voltage rating of cord
	AWG	(mm ²)			0 – 15.2 m (0 – 50 ft)	Over 15.2 m (over 50 ft)	
SJ, SJO, SJO0, SJT, SJTO, SJTO0, SJE, SJEO, SJEO0, SJTOW, SJTOOW, SJOW, SJOOW, SJTW	18	(0.824)	2, 3 or 4	2	10	7	300
			3 or 4	3	7	5.6	300
	16	(1.31)	2, 3 or 4	2	13	10	300
			3 or 4	3	10	7	300
	14	(2.08)	2, 3 or 4	2	18	13	300
			3 or 4	3	15	10	300
	12	(3.31)	2, 3 or 4	2	25	18	300
			3 or 4	3	20	15	300
	10	(5.26)	2, 3 or 4	2	30	25	300
			3 or 4	3	25	20	300
SV, SVO, SVOO, SVT, SVTO, SVTOO, SVE, SVEO, or SVEOO	18	(0.824)	2 or 3	2	10	7	300
	17	(1.31)	2 or 3	2	12	10	300

^a A conductor that is used to carry an unbalanced current from the other conductors shall not be considered to be a current-carrying conductor.

Table 10.3
Circuit-conductor ampacity and voltage rating for braidless parallel cord in general-use cord sets and power-supply cords

Types of cord	Size of conductors in cord		Number of cord conductors	Number of current carrying conductors ^a	Ampacity of current carrying conductors, A		Voltage rating of cord
	AWG	(mm ²)			0 – 15.2 m (0 – 50 ft)	Over 15.2 m (over 50 ft)	
Appliance Wiring Material ^c	20 ^b	(0.519)	2	2	2 ^d	–	300
HPN	18	(0.824)	2 or 3	2	10	7	300
	17	(1.04)	2 or 3	2	12	10	300
	16	(1.31)	2 or 3	2	15	12	300
	14	(2.08)	2 or 3	2	20	17	300
	12	(3.31)	2 or 3	2	30	20	300
SP-1 ^b , SPT-1 ^b , SPE-1 ^b , NISP-1, NISPT-1, or NISPE-1	20	(0.519)	2	2	2 ^d	–	300
	18	(0.824)	2 or 3	2	10	7	300
SP-2 ^g , SPT-2 ^g , SPE-2 ^g , NISP-2, NISPT-2, or NISPE-2	18	(0.824)	2 or 3	2	10	7	300
	16	(1.31)	2 or 3	2	13	10	300
SP-3 ^g	18	(0.824)	2 or 3	2	10	7	300
	16	(1.31)	2 or 3	2	13	10	300
	14	(2.08)	2 or 3	2	18	13	300
	12	(3.31)	2 or 3	2	25	18	300
SPT-3 ^g or SPE-3 ^g	18	(0.824)	2 or 3	2	10	7	300
	16	(1.31)	2 or 3	2	13	10	300
	14	(2.08)	2 or 3	2	18	13	300
	12	(3.31)	2 or 3	2	25	18	300
	10	(5.26)	2 or 3	2	30	25	300
	18	(0.824)	3	2	10	–	300
TPT, TST	27		2	2	0.5	–	300

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Table 10.3 Continued

Types of cord	Size of conductors in cord		Number of cord conductors	Number of current carrying conductors ^a	Ampacity of current carrying conductors, A		Voltage rating of cord
	AWG	(mm ²)			0 – 15.2 m (0 – 50 ft)	Over 15.2 m (over 50 ft)	
HSJO, HPN	18	(0.824)	2 or 3	—	10	—	300
	16	(1.31)	2 or 3	2	15	—	300
	14	(2.08)	2 or 3	2	20	—	300
	12	(3.31)	2 or 3	2	25	—	300
	10	(5.26)	4	3	30 ^f	—	300
	8	(8.37)	4	3	50 ^f	—	300
	6	(13.3)	4	3	50 ^f	—	300
	4	(21.2)	4	3	60 ^f	—	300
^a A conductor intended for equipment grounding shall not be considered to be a current-carrying conductor. ^b Applicable to power-supply cords only. ^c Constructed in accordance with note 14 of Table 10.1. ^d Limited to a maximum length of 3.6 m (12 ft). ^e 20 AWG (0.52 mm ²) has been approved only for Type SPT-1. ^f These current ratings are for Type DRT dryer and range cables only. ^g Each of these 3-conductor parallel cord types shall not be acceptable for use on cord sets more than 3.0 m (15 ft) in length. Note: It is intended that this table be used in conjunction with applicable end-use product Standards to ensure selection of the proper size and type.							

10.1.4.2 Except as noted in 10.1.4.3, a power-supply cord may employ shielded cord, provided that the shield or drain wire is terminated, along with the grounding conductor, to both the grounding terminal of the attachment plug and, in the case of a cord set, to the grounding terminal of the appliance connector.

10.1.4.3 A power-supply cord or cord set employing shielded cord that does not have the shield or drain wire terminated, along with the grounding connector, to the grounding terminal of the attachment plug, connector, or both, shall be indelibly marked in accordance with 26.1.

10.1.5 Length

10.1.5.1 Maximum allowable lengths shall be in compliance with Table 10.2.

10.1.6 Ratings

10.1.6.1 Ratings shall be determined by the lowest rated component of the assembly and Table 10.4.

Table 10.4
Smallest acceptable conductor size with respect to fittings used on outdoor-use cord sets and outdoor-use power-supply cords^e

Ampere rating of plugs	Number of cord conductors	Number of current-carrying conductors in cord ^a	Grounding required	Maximum number of outlets in cord connector when provided	Smallest acceptable conductor size AWG (mm ²)		Ampacity rating of cord (A)
					1.8 – 15.2 m (6 – 50 ^b ft)	Over 15.2 m to 30.5 m (Over 50 – 100 ft)	
	2	2	No	1	–	18 (0.824)	7
	3 or 4	2	Yes	1	–	18 (0.824)	7
	4	3	Yes	1	–	18 (0.824)	7
	2	2	No	1	18 (0.824)	16 (1.31)	10
	3 or 4	2	Yes	1	18 (0.824)	16 (1.31)	10
	4	3	Yes	1	18 (0.824)	16 (1.31)	7 (10) ^c
15	2	2	No	1	16 (1.31)	14 (2.08)	13
	3 or 4	2	Yes	3	16 (1.31)	14 (2.08)	13
	4	3	Yes	1	16 (1.31)	14 (2.08)	10 (13) ^c
	2	2	No	1	14 (2.08)	12 (3.31)	15
	3 or 4	2	Yes	1	14 (2.08)	12 (3.31)	15
	4	3	Yes	1	14 (2.08)	12 (3.31)	15
	3	2	Yes	3	14 (2.08)	12 (3.31)	15
	3	2	Yes	4 – 6	12	10 ^d	15
	3	2	Yes	4 – 6	14 ^f	12 ^d	15
20	3 or 4	2	Yes	1	12 (3.31)	10 (5.26)	20
	4	3	Yes	1	12 (3.31)	10 (5.26)	20
30	3 or 4	2	Yes	1	10 (5.26)	8	30
	4	2	Yes	1	10 (5.26)	8 (8.36)	30
50	3 or 4	2	Yes	1	6 (13.3)	4 (21.1)	50
	4	3	Yes	1	4 (21.1)	2 (33.6)	50
60	4	2	Yes	1	4 (21.1)	2 (33.6)	60
	4	3	Yes	1	4 (21.1)	2 (33.6)	60

^a For the purpose of this table, a conductor that is used to carry the unbalanced current from the other conductors shall not be counted as a circuit conductor.

^b Lengths specified are for outdoor-use cord sets only.

^c The ampacity rating for over 15.2 m (50 ft).

^d The maximum length of a cord set with 3 – 6 outlets in the cord connector(s) shall be 100 ft (30.5 m). The overall length of a cord set with a joint shall be determined from the sum of the lengths of the main cord (from plug to joint) plus the longest length of flexible cord after the joint to the cord connector.

^e See the applicable Section for the specific requirements for each type of outdoor-use cord set.

^f When a 14 AWG flexible cord is employed, an overcurrent protective device (OCP) device rated 15 Amps is required. See 10.7.1.3.

Note: Constructions over 30.5 m (100 ft) shall be evaluated under special investigations. Evaluation dependent upon end use.

10.1.7 Markings

10.1.7.1 An individually packaged power-supply cord intended for replacement purposes shall be marked in accordance with Section 29, Power-Supply Cords for Replacement Use.

10.2 Special-use power-supply cords

10.2.1 Each power-supply cord intended for special use shall consist of a length of flexible cord that employs a minimum of two circuit conductors assembled or molded without a cord connector or appliance connector but with a plug or current tap of a non-standard configuration, with or without a through-cord switch/overcurrent protective device, for direct connection to an appliance, and that incorporates design features (such as special cords and plugs) for a specific application.

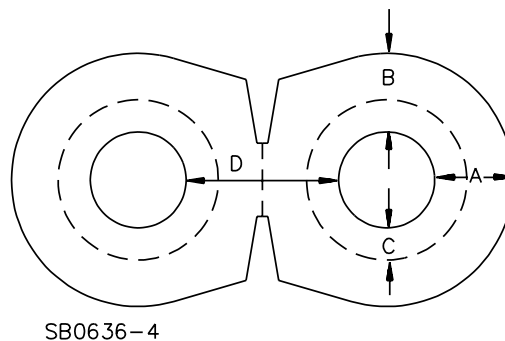
10.2.2 The flexible cord of a power-supply cord shall be one of the cords in Table 10.1. The maximum circuit-conductor ampacity of cords used in power-supply cords is shown in Tables 10.2 and 10.3.

10.2.3 A special-use power-supply cord intended for use with a toy transformer or electric toy shall employ Type SPT-2, NISPT-2, or equivalent or heavier flexible cord with an attachment plug having the distance measured from any point on the blades to the perimeter of the face at least 7.9 mm (5/16 in).

10.2.4 A special-use power-supply cord intended to be woven in the links of a chain-suspended portable lamp shall:

- a) Be at least 4.6 m (15 ft) long;
- b) Have insulation acceptable for use at 105°C (221°F);
- c) Employ a 1-15 polarized attachment plug or a 5-15 grounding-type attachment plug;
- d) Be marked to indicate the intended use (see 30.6); and
- e) Be constructed of:
 - 1) Type SPT-2 or NISPT-2, or heavier flexible cord;
 - 2) Type SPT-1 or NISPT-1 flexible cord provided with a separate jacket of nylon; or
 - 3) Appliance wiring material having 36 – 34 AWG (0.013 – 0.020 mm²) stranding and complying with the insulation requirements specified in Figure 10.1.

Figure 10.1
Minimum insulation thicknesses for appliance wiring material used in a chain-suspended lamp



Legend:

- A – Minimum acceptable average thickness away from tear area and outside point – 1.02 mm (0.040 in)
- B – Minimum acceptable thickness at any point before separation – 0.89 mm (0.035 in)
- C – Minimum acceptable thickness at any point after separation – 0.49 mm (0.019 in)
- D – Minimum acceptable distance between copper conductors – 1.52 mm (0.060 in)

10.3 Recreational vehicle power-supply cords

10.3.1 General

10.3.1.1 The minimum cord-exposed length for power-supply cords for recreational vehicles shall be:

- a) 7.5 m (25 ft) if intended for side entry; or
- b) 9 m (30 ft) if intended for rear entry.

10.3.1.2 Overall length shall be augmented by the difference between the height of the entry point on the recreational vehicle and 0.9 m (3 ft), if the intended entry point is above 0.9 m (3 ft).

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10.3.2 Flexible cord

10.3.2.1 The flexible cord used in power-supply cords for recreational vehicles shall be Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, or SEOOW for recreational-vehicle use. The size and number of conductors shall be in accordance with Table 10.5. The insulation on the grounding conductor shall be green, or green with one or more yellow stripes.

Table 10.5
Sizes and number of conductors in recreational-vehicle power-supply

Power-supply cord rating	Total number of conductors	Number of circuit conductors	Size of circuit conductors		Size of grounding conductor	
			AWG	(mm ²)	AWG	(mm ²)
15 A	3	2	14	(2.08)	14	(2.08)
20 A	3	2	12	(3.31)	12	(3.31)
30 A	3	2	10	(5.26)	10	(5.26)
40 A	4	3	8	(8.36)	8	(8.36)
50 A	4	3	6	(13.3)	8	(8.36)
50 A	4	3	6	(13.3)	6	(13.3)

10.3.3 Plugs

10.3.3.1 The attachment plug shall be in accordance with 10.3.3.2 and 10.3.3.3. The attachment plug shall be molded of butyl rubber, neoprene, or polyvinyl chloride (or other equivalent materials), and shall be so molded to the flexible cord that it adheres tightly to the jacket of the cord at the point where the cord enters the attachment plug (see 11.11). If a right-angle attachment plug is used, the configuration shall be so oriented that the grounding member is the member farthest from the point of cord entry.

10.3.3.2 The attachment plug used with 14 AWG (2.08 mm²), 12 AWG (3.31 mm²), or 10 AWG (5.26 mm²) conductors shall be 5-15P, 5-20P, or TT-30P configuration.

10.3.3.3 The attachment plug used with 8 AWG (8.36 mm²) or 6 AWG (13.3 mm²) conductors shall be a 14-50P configuration.

10.3.3.4 A power-supply cord for recreational-vehicle use having 6 AWG (13.3 mm²) circuit conductors may have the attachment plug marked 50 A. The attachment plug of a power-supply cord having 8 AWG (8.36 mm²) circuit conductors shall not be marked with a current rating.

10.4 Mobile home power-supply cords

10.4.1 General

10.4.1.1 The overall length of each power-supply cord for mobile homes, measured from the end of the cord (including bared leads) to the end of the plug, shall not be less than 6 m (21 ft) nor more than 11.1 m (36.5 ft). The length of the cord from the end of the plug to the point at which the outer jacket of the cord is removed shall be at least 6.2 m (20.5 ft). See Figure 9.1.

10.4.2 Flexible cord

10.4.2.1 The flexible cord used in power-supply cords for mobile homes shall be Type SOW, SOOW, STW, STOW, STOOW, SEW, SEOW, or SEOOW containing four 6 AWG (13.3 mm²) conductors or four 8 AWG (8.36 mm²) conductors or three 6 AWG (13.3 mm²) circuit conductors and one 8 AWG (8.36 mm²) grounding conductor.

10.4.2.2 The insulation on the grounding conductor in the cord mentioned in 10.4.2.1 shall be green, or green with one or more yellow stripes.

10.4.2.3 The outer surface of the cord shall be marked in accordance with the requirements of Section 25, Power-Supply Cords – Shielded.

10.4.3 Plugs

10.4.3.1 The attachment plug shall have a 14-50P grounding configuration. The attachment plug shall be molded butyl rubber, neoprene, or polyvinyl chloride (or other equivalent materials), and shall be so molded to the flexible cord that it adheres tightly to the jacket of the cord at the point where the cord enters the attachment plug (see 11.11.1). If a right-angle attachment plug is used, the configuration shall be so oriented that the grounding member is the member farthest from the point of cord entry.

10.4.3.2 A power-supply cord for mobile-home use having 6 AWG (13.3 mm²) circuit conductors may have the attachment plug marked 50 A.

10.4.4 Rating

10.4.4.1 The current rating is:

- a) 40 A for cord containing four 8 AWG (8.36 mm²) conductors; and
- b) 50 A for cord containing three 6 AWG (13.3 mm²) circuit conductors and a 6 AWG (13.3 mm²) or 8 AWG (8.36 mm²) grounding conductor.

10.5 Range and dryer power-supply cords

10.5.1 General

10.5.1.1 Each power-supply cord for range and dryer application shall be non-detachable and employ Type SRD, SRDT, or SRDE flexible cable and shall be rated in accordance with Table 10.6.

Table 10.6
Circuit-conductor ampacity and voltage rating for range and dryer cables
(Types SRD, SRDT, and SRDE)

Number, size, and use of conductors in cable	Ampacity of circuit conductors of cable (Amperes)	Voltage rating of cable (Volts)
2 10 AWG (5.26 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit	30 ^a	300
2 10 AWG (5.26 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit and 1 10 AWG (5.26 mm ²) grounding	30 ^a	300
3 10 AWG (5.26 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit	25 ^a	300
2 8 AWG (8.36 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit	40 ^a	300
2 8 AWG (8.36 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit and 1 10 AWG (5.26 mm ²) grounding	40 ^a	300
3 8 AWG (8.36 mm ²) unidentified circuit and 1 10 AWG (5.26 mm ²) grounded circuit	36 ^c	300
2 8 AWG (8.36 mm ²) unidentified circuit and 1 8 AWG (8.36 mm ²) grounded circuit	40 ^a	300
3 8 AWG (8.36 mm ²) unidentified circuit and 1 8 AWG (8.36 mm ²) grounded circuit	35 ^c	300
2 6 AWG (13.3 mm ²) unidentified circuit and 1 8 AWG (8.36 mm ²) grounded circuit	55 ^{b,d}	300
2 6 AWG (13.3 mm ²) unidentified circuit and 1 8 AWG (8.36 mm ²) grounded circuit and 1 8 AWG (8.36 mm ²) grounding	55 ^b	300
3 6 AWG (13.3 mm ²) unidentified circuit and 1 8 AWG (8.36 mm ²) grounded circuit	45 ^c	300
2 6 AWG (13.3 mm ²) unidentified circuit and 1 6 AWG (13.3 mm ²) grounded circuit	55 ^{b,d}	300
3 6 AWG (13.3 mm ²) unidentified circuit and 1 6 AWG (13.3 mm ²) grounded circuit	45 ^c	300
2 4 AWG (21.1 mm ²) unidentified circuit and 1 6 AWG (13.3 mm ²) grounded circuit	70 ^{b,d}	300
2 4 AWG (21.1 mm ²) unidentified circuit and 1 6 AWG (13.3 mm ²) grounded circuit and 1 6 AWG (13.3 mm ²) grounded	70 ^{b,e}	300
3 4 AWG (21.1 mm ²) unidentified circuit and 1 6 AWG (13.3 mm ²) grounded circuit	60 ^c	300
2 4 AWG (21.1 mm ²) unidentified circuit and 1 4 AWG (21.1 mm ²) grounded circuit	70 ^{b,d}	300

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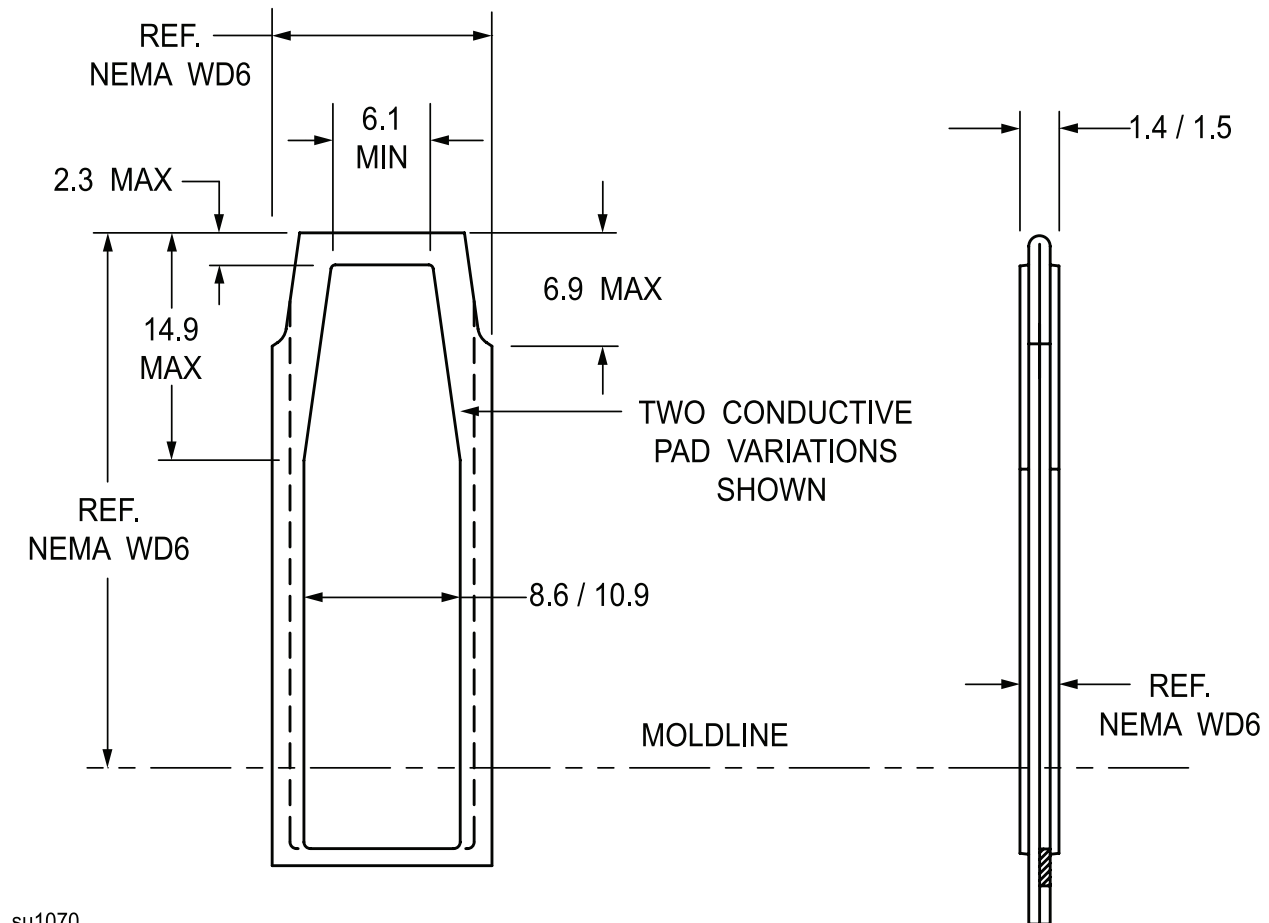
Table 10.6 Continued

Number, size, and use of conductors in cable	Ampacity of circuit conductors of cable (Amperes)	Voltage rating of cable (Volts)
3 4 AWG (21.1 mm ²) unidentified circuit and 1 4 AWG (21.1 mm ²) grounded circuit	60 ^c	300
^a The circuit-conductor ampacity shall be reduced by 5 A if grounded circuit conductor carries current other than unbalanced current. ^b The circuit-conductor ampacity shall be reduced by 10 A if grounded circuit conductor carries current other than unbalanced current. ^c The circuit-conductor ampacity shall be reduced to 80 percent of the value shown if the grounded circuit conductor carries other than unbalanced current. ^d When assembled into power-supply cords, the ampacity shall be limited to 50 A to correlate with rating of the standard 3-pole, 3-wire attachment plug configuration employed. ^e When assembled into power-supply cords, the ampacity shall be limited to 60 A to correlate with the rating of the standard 3-pole, 4-wire attachment plug configuration employed.		

10.5.2 Attachment plug

10.5.2.1 A power-supply cord intended for use with a range or dryer shall be provided with an attachment plug having a 10-30P, 14-30P, 10-50P, or 14-50P configuration. The attachment plug blades shall comply with the dimensional requirements specified either in ANSI/NEMA WD 6, or in Figure 10.2.

Figure 10.2
Padded and folded-over blade construction for 30- and 50-A attachment plugs for use with range and dryer power-supply cords



Notes:

1 – All dimensions in mm.

mm	1.4	1.5	2.3	6.1	6.9	8.6	10.9	14.9
(inch)	(0.054)	(0.058)	(0.090)	(0.240)	(0.270)	(0.340)	(0.430)	(0.585)

2 – Alternate blade profile for NEMA blade configurations 10-30, 10-50, 14-30, and 14-50. All location dimensions shall be as described in the applicable NEMA configurations.

3 – The minimum material thickness for the padded and folded-over blade is 0.7 mm (0.0270 in).

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10.6 Range and dryer power-supply cord kits

10.6.1 General

10.6.1.1 A power-supply cord kit shall consist of a suitable power-supply cord, a strain relief clamp or molded-on strain relief, reducing washers when required for proper installation, and assembly instructions.

10.6.1.2 A power-supply cord kit intended for use with a range or dryer shall be provided with all of the materials necessary to comply with the requirements in 10.5. A stranded lead shall be treated so that no loose strands result – for example, by tinning of the conductor ends, or the use of crimped-on connector terminals or banding strips.

10.6.1.3 When assembled properly, the completed kit shall comply with the requirements of the appropriate end-product standard, and meet the requirements of Section 13, Tests for Range and Dryer Power-Supply Cord Kits.

10.6.2 Flexible cord

10.6.2.1 Power-supply cord kits intended to be used with range and dryers shall be provided with flexible cords as defined in 10.5.1.

10.6.3 Length

10.6.3.1 The length of a power-supply cord for use with a range or dryer shall not be less than 1.22 m (4 ft), and not exceed 1.83 m (6 ft) when measured from the end of the plug to the point at which the outer covering of the cord is removed.

10.6.4 Strain relief

10.6.4.1 Strain relief means shall be provided so that a mechanical stress applied to the flexible cord is not transmitted to terminals, splices, or internal wiring when tested in accordance with Section 13, Tests for Range and Dryer Power-Supply Cord Kits.

10.6.4.2 The strain relief shall be constructed so as to prevent the power-supply cord from contacting the edges of the opening in the sheet metal plate when tested as described in Section 13, Tests for Range and Dryer Power-Supply Cord Kits, with the cord installed in the most adverse position.

10.6.4.3 For strain relief consisting of a threaded bushing secured by a threaded locknut, the locknut shall:

- a) Be provided with notches or the equivalent for easy tightening; and
- b) Have a maximum outside diameter as specified in Table 10.7.