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SUBJECT 2682

OUTLINE OF INVESTIGATION
FOR
SWITCH-RATED PLUGS AND RECEPTACLES

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Summary of Topics

This first issue of the Subject 2682 Outline of Investigation for Switch-Rated Plugs and Receptacles covers non-interlocking plugs, receptacles, power inlets and connectors for use in switching applications.

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

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INTRODUCTION

1 Scope

1.1 This standard applies to non-interlocking plugs, receptacles, power inlets, and connectors for use in switching applications, rated up to 800 amperes and up to 600 volts ac or dc, and which may include pilot contacts. These devices are intended to provide power from branch circuits, or are for direct connection to the branch and motor circuit in accordance with the National Electrical Code ANSI/NFPA 70, using copper conductors, for use in either indoor or outdoor nonhazardous locations.

1.2 This standard does not apply to:

- a) Single conductor pin and sleeve devices.
- b) Devices molded integrally with flexible cord or cable that are covered by the Standard for Cord Sets and Power Supply Cords, UL 817.
- c) General and special use devices, such as attachment plugs, receptacles, cord connectors, inlets, current taps, flatiron and appliance plugs, that are covered by the Standard for Attachment Plugs and Receptacles, UL 498.
- d) Single and multi-pole connectors intended for connection to copper conductors, for use in data, signal, control and power applications within and between electrical equipment, where exposed, that are covered by the Standard for Component Connectors for Use in Data, Signal, Control and Power Applications, UL 1977.
- e) Products such as branch circuit switches that are covered by the Standard for Enclosed and Dead-Front Switches, UL 98.
- f) Products such as pin and sleeve devices that are not intended for switching applications and are otherwise covered by the Standard for Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type, UL 1682.
- g) Devices intended for use in hazardous (Classified) locations that are covered by the Standard for Receptacle-Plug Combinations For Use in Hazardous (Classified) Locations, UL 1010.

2 Glossary

2.1 For the purposes of this standard, the following definitions apply:

2.2 CONNECTOR (CABLE CONNECTOR) – A portable receptacle that is intended to provide power, with means for attachment of flexible cord or cable and not intended for permanent mounting.

2.3 CONTACT – A conductive element in a component that mates with a corresponding element to provide an electrical path.

2.4 CONTACT, PILOT – A conductive element intended to carry an indicating or controlling signal.

2.5 DEAD FRONT – A mechanism or design that prevents unintentional exposure or accessibility to live contacts on the line side of the connector.

2.6 DELAYED ACTION – An arrangement that delays the separation of device housings, which is intended to reduce the likelihood of exposure of arcing contacts during the breaking of the circuit when the plug is withdrawn.

2.7 ENCLOSURE – The case or housing into which the insulator and contacts are assembled. The enclosure system may be composed of elements such as outlet boxes, mounting panels, receptacles, plugs, and connectors.

2.8 GROUNDING (BONDING) PATH – A path between the grounding contact and the grounding terminal or, if the device has no grounding terminal, the point at which the path makes contact with a part of the metal raceway system, such as a box, box cover, or the raceway itself.

2.9 GROUNDING TYPE DEVICE – A device having a grounding (bonding) path.

2.10 INSULATION, ELECTRICAL – The insulation necessary for the proper functioning of the product and for basic protection against electrical shock.

2.11 INSULATOR – That portion of a device that provides for separation and support of contacts.

2.12 LOCKING RETAINING MEANS – A mechanical arrangement that holds a plug or connector in position when it is in proper engagement and is intended to reduce the likelihood of its unintentional withdrawal. It may also facilitate environmental sealing.

2.13 MOTOR RATING – A rating expressed in horsepower (hp) and/or full load and locked rotor current, and voltage assigned to a device that is intended to control a motor load.

2.14 PLUG (ATTACHMENT PLUG) – A device intended to receive power when inserted in a receptacle or connector, which establishes connection between conductors of the attached flexible cord or cable and the conductors connected to the receptacle or cable connector.

2.15 POWER INLET – A permanently mounted plug intended to receive power from a cable connector.

2.16 RECEPTACLE (OUTLET) – A device that is intended to provide power to an inserted plug, and that is installed as a fixed outlet or on equipment.

2.17 SWITCH RATED PLUGS AND RECEPTACLES – Plugs and receptacles that may be used in either branch circuit or motor circuit switching applications.

2.18 TERMINAL – A conductive part provided on a contact for connecting a conductor.

2.19 TERMINAL, CRIMP TYPE – A terminal in which an electro-mechanical connection is made between the terminal lug and a conductor by compressing the lug onto the conductors.

2.20 TERMINAL, FIELD WIRING – A terminal to which power supply, load, control, or equipment grounding connections will be made in the field when the device is installed.

2.21 TERMINAL, PRESSURE-WIRE – A terminal in which the conductor is clamped under a pressure plate or saddle by one or more screws or nuts.

2.22 TERMINAL, SET SCREW – A terminal in which the clamping pressure is applied by the end of the screw bearing directly on the conductor.

2.23 TERMINAL, WIRE-BINDING SCREW – A terminal in which the conductor is bent around the screw and is clamped directly under the head of the screw when it is tightened.

3 General

3.1 Components

3.1.1 Except as indicated in Clause 3.1.2, a component of a product covered by this outline 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 outline. A component shall comply with standards as appropriate for the country where the product is to be used.

3.1.2 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 outline, or
- b) Is superseded by a requirement in this outline.

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

3.1.4 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.

3.2 Units of Measurement

3.2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

CONSTRUCTION

4 General

4.1 The ratings mentioned throughout this outline, including those mentioned in Clause 46.2, represent the maximum ampacity and voltage for a device. A device is considered to be for use with either alternating or direct current unless the rating includes a marking to restrict the use to alternating current. See Clause 47.5.1.

5 Configurations

5.1 Combinations of attachment plugs and receptacles are covered by this outline and standardized configurations of these attachment plugs and receptacle combinations are located in the Standard for Pin and Sleeve Configurations, UL 1686.

6 Insulating Material

6.1 A base or body in or on which live parts are mounted shall be of ceramic or other insulating material meeting the requirements of this outline.

6.2 Vulcanized fiber or rubber may be used for insulating washers, separators, and barriers, but not as the sole support for live parts. The material shall be moisture resistant in accordance with Section 24.

6.3 A polymeric material used for electrical insulation, an internal barrier necessary to maintain electrical clearances and creepage distances, or enclosure of live parts shall have a flame class rating of HB, V-2, V-1, V-0, VTM-2, VTM-1, VTM-0, 5VA or 5VB in accordance with the requirements of the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. The flammability classification shall be judged at the actual minimum thickness employed within 0.8 mm (1/32 inch) of live parts within the device.

6.4 The internal insulating systems of components for which component requirements exist need not have a flame class rating.

6.5 A small part meeting all the following criteria need not have a flame class rating:

- a) Its volume does not exceed 2 cm³ (0.122 cubic inch);
- b) Its maximum dimension does not exceed 3 cm (1.18 inches); and
- c) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

6.6 Fiber and similar material that is equal to or less than 0.25 mm (0.010 inch) thick need not have a flame class rating.

6.7 A polymeric material used for electrical insulation, an internal barrier necessary to maintain electrical clearances and creepage distances, or enclosure of live parts shall comply with the requirements in Section 20 – 27.

6.8 A polymeric material having a maximum comparative tracking index (CTI) performance level class of 3 or a minimum CTI value of 175 need not comply with Comparative Tracking Index, Section 20.

6.9 A polymeric material having hot wire ignition (HWI) corresponding to the values shown in Table 6.1 for the applicable flammability classification need not comply with Glow Wire, Section 21.

6.10 A polymeric material having high-current arc resistance to ignition (HAI) corresponding to the values shown in Table 6.1 for the applicable flammability classification need not comply with High-Current Arc Resistance to Ignition, Section 22.

Table 6.1
Hot wire ignition (HWI) and high-current arc resistance to ignition (HAI) ratings of insulating materials
(See Clause 6.9)

Flammability classification ^b	HWI ^{c,e}		HAI ^d	
	Maximum PLC ^a	Minimum value	Maximum PLC ^a	Minimum value
V-0, VTM-0	4	7	3	15
V-1, VTM-1, 5VA, 5VB	3	15	3	15
V-2, VTM-2	3	15	3	15
HB	2	30	1	60

^a For materials with other than VTM flammability classifications, the performance level class (PLC) for material shall be evaluated using the specimen thickness employed in the end product or nominal 3.2 mm (1/8 inch) thickness, whichever thickness is greater.

^b Flammability classification- Described in Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. The flammability classification shall be judged at the actual minimum thickness employed within 0.8 mm (1/32 inch) of live parts within the device.

^c Hot Wire Resistance to Ignition – Described in Polymeric Materials – Short Term Property Evaluations, UL 746A.

^d High-current arc resistance to ignition – Described in Polymeric Materials – Short Term Property Evaluations, UL 746A.

^e The requirements for hot wire ignition (HWI) performance level class values do not apply to a polymeric material used as an enclosure of a portable device, that does not enclose live parts or insulated live parts where the insulation thickness is greater than 0.7 mm (0.028 inch).

6.11 The internal insulating systems of components for which component requirements exist need not comply with the requirements in Sections 20 – 22.

6.12 A small part meeting all the following criteria need not comply with the requirements in Sections 20 – 22:

- a) Its volume does not exceed 2 cm³ (0.122 cubic inch);
- b) Its maximum dimension does not exceed 3 cm (1.18 inches); and
- c) Its location is such that it cannot propagate flame from one area to another or act as a bridge between a possible source of ignition and other ignitable parts.

6.13 Fiber and similar material that is equal to or less than 0.25 mm (0.010 inch) thick need not comply with the requirements in Sections 20 – 22.

6.14 A polymeric material used for electrical insulation, an internal barrier necessary to maintain electrical clearances and creepage distances, or enclosure of live parts shall have the temperature index ratings shown in Table 6.2 for the specific application of the insulating material.

Table 6.2
Minimum relative thermal indices of insulating materials
(See Clause 6.14)

Application	Minimum relative thermal index ^a , Degrees C		
	Electrical	Mechanical ^b	
		With impact	Without impact
ELECTRICAL INSULATION All devices	80	60	80
ENCLOSURE or parts of an ENCLOSURE A. All permanently wired devices and other devices containing fuses B. All other devices	80 60	60 60	80 60
^a Relative thermal index – Described in UL 746B. For materials with other than VTM flammability classifications, the material shall be evaluated using specimen thickness of no more than the thickness employed in the end product or nominal 3.2 mm (1/8 inch) thickness, whichever is greater. ^b For filament wound tubing, industrial laminates, vulcanized fiber and similar polymeric materials, the minimum RTI for mechanical shall be the values specified for Electrical.			

7 Resistance to Corrosion

7.1 Parts of iron or steel other than stainless steel parts shall be protected against corrosion, in accordance with Moisture Resistance, Section 44.

8 Enclosures

8.1 General

8.1.1 An enclosure shall be constructed to reduce the risk of unintentional contact with uninsulated live parts, as indicated in Clause 11.1, and to provide internal parts with protection from specified external conditions. Additional items used to form an enclosure, such as adapters, hoods, covers, and the like, shall be permitted to be permanently secured to the device.

8.2 Mechanical Strength

8.2.1 An enclosure shall have adequate strength and rigidity in accordance with Impact (Plugs and Connectors), Section 30 and Crush, Section 31.

8.3 Nonmetallic enclosures

8.3.1 A nonmetallic enclosure or a nonmetallic part of an enclosure shall comply with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.

8.3.2 If a nonmetallic enclosure is identified as being intended to be exposed to specific chemicals, oils, acids, solvents, cleaning agents, and the like, the performance of the enclosure material shall not be adversely affected by such substances as determined by applicable tests as described in the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A.

8.3.3 Pliable, molded natural or synthetic rubber, or a combination thereof, or a pliable composition, the basic constituent of which is vinyl chloride or a copolymer of vinyl chloride and vinyl acetate, in the finished device that complies with Accelerated Aging, Section 19, may be employed as an insulating material for the enclosure of an attachment plug or a cord connector.

8.4 Metallic enclosures

8.4.1 An enclosure may be constructed of iron, steel, copper, brass, zinc, aluminum, or their alloys. Aluminum alloys containing less than 80% aluminum shall not be used. Magnesium and its alloys shall not be used.

8.4.2 Zinc or a zinc-based alloy shall not be used for an enclosure or parts of an enclosure which are in the primary grounding path.

8.5 Attachment plugs

8.5.1 An attachment plug shall not be provided with more than one multiconductor cord-outlet hole.

8.6 Specific enclosures

8.6.1 An enclosure marked with one or more environmental enclosure type designations shall comply with the applicable requirements in Environmental Enclosure Type Designators, Section 45 and Environmental Enclosures, Section 47.13.

9 Current-Carrying Parts

9.1 A current-carrying part shall be of silver, copper, a copper alloy, or other material acceptable for the application. Plated iron or steel shall not be used for parts that are depended upon to carry current.

9.2 Stainless steel may be employed for a part not subject to arcing.

9.3 Pressure wire terminal screws and wire binding screws shall be permitted to be made of plated iron or steel

9.4 Iron or steel, if protected against corrosion by zinc, tin, or equivalent plating, may be used for screws, plates, yokes, or other parts that are employed as a means of clamping the conductor, providing such parts are not the primary current-carrying members.

9.5 Suitable means shall be provided for retaining live parts within such limits of alignment as to ensure that plugs will enter receptacles, connectors, and the like in the intended manner.

9.6 Uninsulated live parts shall be secured in place to ensure the clearances and creepage distances required in Clauses 10.1 and 10.3 are maintained.

9.7 A current-carrying part shall be prevented from turning relative to the surface on which it is mounted if such turning would result in a reduction of spacings below the minimum acceptable values.

10 Clearances and Creepage Distances

10.1 The clearances and creepage distances shall be not less than 6.4 mm (1/4 inch) between:

- a) Field wiring terminals of opposite polarity; and
- b) A field wiring terminal and any other uninsulated metal part of a different polarity.

10.2 For field wiring terminals intended for solder connections using solid or tin dipped stranded wire only, the minimum clearances and creepage distances between the terminals shall be as specified in UL 840.

10.3 In all circuits other than at field wiring terminals, the acceptability of the clearances and creepage distances between an uninsulated live part and any other uninsulated metal part, not of the same polarity shall be as specified in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840.

10.4 The dead metal mentioned in Clause 10.3 includes a metal surface on which the device is mounted in the intended manner. A dead-metal screw head, rivet, or the like is not considered to be exposed to contact by persons after the device is installed in the intended manner, if it cannot be contacted by the probe illustrated in Figure 10.1.

10.5 Clearances and creepage distances shall be measured in accordance with the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840. In determining the pollution degree and overvoltage category, the end-use application may be considered for a higher pollution degree and may modify those characteristics given in Clauses 10.8 and 10.9.

10.6 Clearances and creepage distances shall be measured in all conditions of use, both with and without mating devices of the intended configuration installed and any movable parts displaced to the position of a minimum spacing.

10.7 The clearances and creepage distances required in Clause 10.1 shall be measured through air and over insulating and conductive surfaces with the device wired as intended with the maximum anticipated conductor size. They shall be measured from any point on the terminal that may contact the clamped conductor as in the case of a wire-binding-screw terminal, or from any point on the perimeter of an opening to receive a conductor in the case of an enclosed terminal.

10.8 Indoor use equipment shall comply with the requirements for pollution degree 3. Outdoor use equipment shall comply with the requirements for pollution degree 4, unless protection is afforded by a suitable enclosure appropriate for the installation in which case a lower pollution degree can be achieved. The interior of equipment with enclosure Types 3, 3S, 4, 4X, 6 and 6P or Marine Type shall comply with the requirements for pollution degree 3. Hermetically sealed or encapsulated enclosures shall comply with the requirements for pollution degree 1.

10.9 Plugs, connectors, inlets, and other cord connected devices shall be rated overvoltage Category II and receptacles and other devices connected to fixed wiring shall be rated overvoltage Category III as defined in the Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment, UL 840.

11 Accessibility of Live Parts

11.1 To reduce the likelihood of unintentional contact that may involve a risk of electric shock from uninsulated live parts, a live part shall not be contacted by the probe illustrated in Figure 10.1. See Clause 11.6.

11.2 The contacts of an outlet device must be protected from unintentional contact by means of a dead front with a means of indicating if the device is in the on or off position.

11.3 The probe illustrated in Figure 10.1 shall be applied to any depth that the recessing will permit, and shall be rotated, changed in configuration or angled before, during, and after application to any position that is necessary to examine the device.

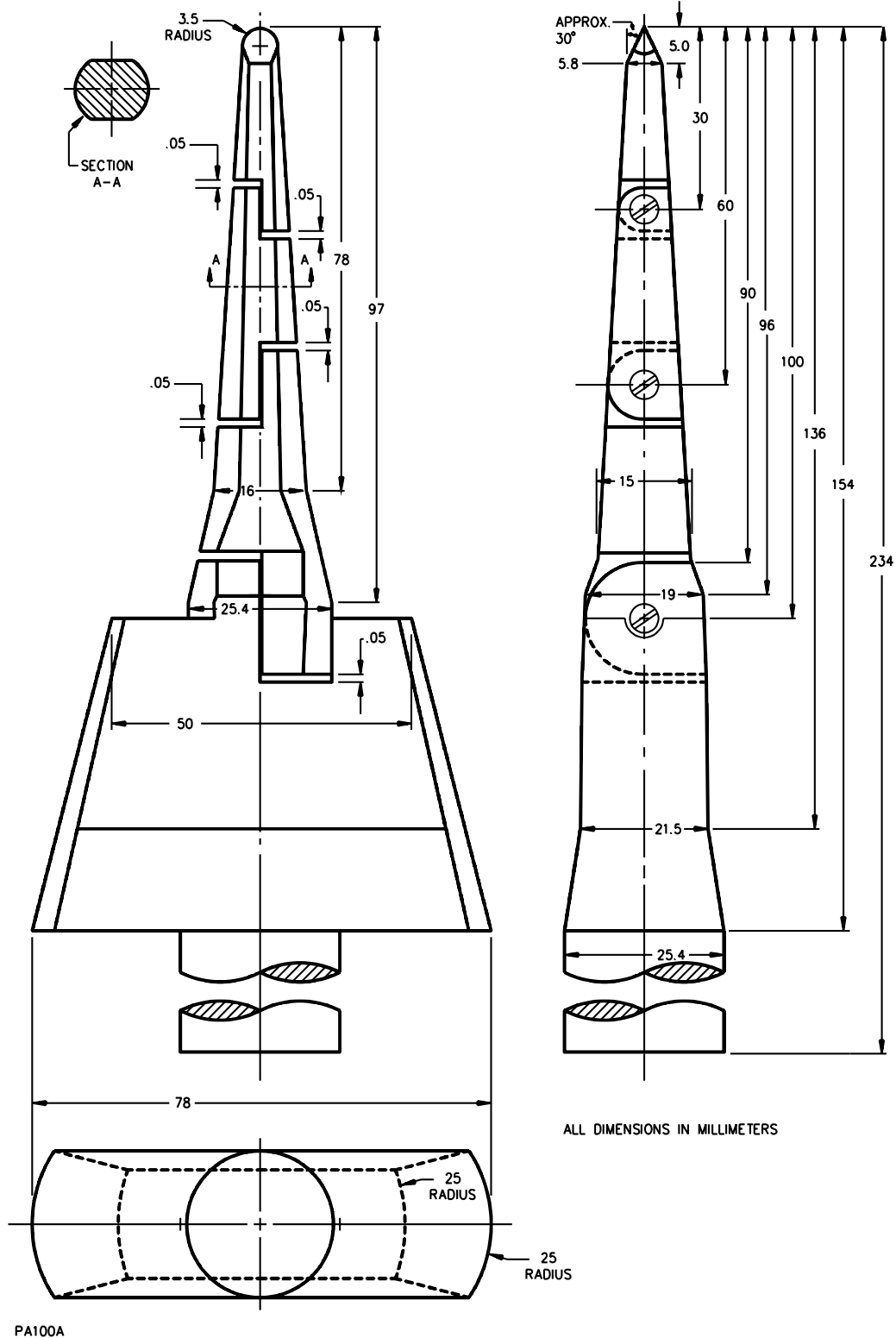
11.4 The probe mentioned in Clause 11.1 shall be used as a measuring instrument to judge the accessibility provided by the recessing and not as an instrument to judge the strength of a material. The probe shall be applied with a force of 13 N (3 lbf) to determine accessibility.

11.5 During the examination of a product to determine whether it complies with the requirements in Clause 11.1, the device shall be wired and assembled in accordance with the manufacturer's instructions. Any other part that may be opened or removed by the user without using a tool shall be opened or removed.

11.6 Mating devices shall not have exposed live contacts when fully mated or during engagement or withdrawal.

Figure 10.1
Articulate probe with web stop

[See Clauses 10.4, 11.1, 11.3, 11.7, 23.1(a), 30.5(a), and 31.4(a)]



11.7 Compliance with Clause 11.6 shall be determined with the use of the probe shown in Figure 10.1 in every possible position. See Clause 11.3.

11.8 The probe shall not be applied to holes in the shroud provided for locking if they do not exceed 10.2 mm (0.400 inch) diameter.

12 Grounding (Bonding) and Dead Metal Parts

12.1 A grounding type device shall have a separate contact for interconnection of the equipment grounding conductor.

12.2 The equipment grounding terminal or lead and its corresponding contact of a male inlet or equipment outlet intended for permanent installation shall be conductively connected to the mounting means, housing, hood, shell or other dead-metal parts of a device that may come into contact with the equipment enclosure.

12.3 The conductive connection need not be provided if the mounting means, housing, hood, or shell is constructed of an insulating material and the lack of ground continuity to the equipment enclosure is readily apparent.

12.4 The conductive connection need not be provided if the device is marked in accordance with Clause 47.3.1.

12.5 A device that has a metal shell used as the grounding contact member shall be as follows:

- a) The surface of the shell that is depended upon for grounding continuity shall not have a nonconductive coating or otherwise be subjected to conditions that may result in loss of grounding continuity;
- b) One or more separate spring type components shall be incorporated to provide grounding path continuity;
- c) The grounding components shall be protected against damage; and

12.6 The grounding contact shall be located and formed so the path of electrical continuity to the grounding contact of the mating plug is completed before continuity is established between any other contact and its respective contact on the plug.

12.7 The grounding contact path, except for the metal housing or mounting, shall be of copper or a copper alloy or equivalent material. If a metal housing is a part of the primary equipment grounding path, it shall not be of zinc or a zinc-based alloy.

12.8 A copper-base alloy rivet, which is used to hold parts together in the grounding-contact path or forms a part of the grounding path, shall not contain less than 80% copper.

12.9 A connection in the grounding-contact path shall be secured by riveting, bolting, clamping, or welding or by an equivalent mechanical means of securement, capable of complying with the requirements of Grounding (Bonding) Path Current, Section 33.

12.10 In mating devices provided with an equipment-grounding contact, the grounding contact shall not be capable of touching a line-side phase contact, independent of any polarization feature of the enclosure. The above requirement is applicable only to devices rated 100 A and less, with four or fewer power contacts, excluding grounding contacts. Such devices shall comply with the requirements of Resistance to Arcing, Section 38.

12.11 All exposed non-current-carrying metal parts of a device that are likely to become energized, shall be conductively connected to the equipment ground.

12.12 Grounding and other dead-metal parts shall be secured in place so the spacing required in Section 10 are maintained.

13 Grounding (Bonding) Connections

13.1 The grounding (or bonding) conductors of a device shall not be smaller in size than indicated in Table 13.1.

13.2 An integral grounding or bonding pigtail lead for field connection shall not be shorter than 150 mm (6 inches).

13.3 A terminal provided for the field connection of a grounding (or bonding) conductor shall:

- a) Employ a mechanical clamping means that does not depend upon solder for the connection of the wire; and
- b) Be capable of securing a conductor of the minimum size indicated in Table 13.1.

Table 13.1
Minimum acceptable sizes of grounding (bonding) conductors
(See Clauses 13.1 and 13.3)

Device rating, amperes	Copper grounding conductors ^a	
	AWG	mm ²
Not exceeding		
15	14	(2.1)
20	12	(3.3)
30	10	(5.3)
40	10	(5.3)
60	10	(5.3)
100	8	(8.4)
200	6	(13.3)
300	4	(21.2)
400	3	(26.7)
500	2	(33.6)
600	1	(42.4)
800	1/0	(53.5)

^a Equivalent metric cross-sectional area provided for reference only.

14 Terminal Parts

14.1 Devices shall be provided with suitable terminals or leads for the connection of conductors having an ampacity not less than the current rating for which they are intended in accordance with the NFPA 70. See Clauses 47.1.2 – 47.1.4.

14.2 Pressure wire and set screw terminals used with single or multiple copper conductors for fixed wiring shall comply with the applicable requirements in the Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors, UL 486E.

14.3 The tightening torque for the field wiring terminals of the devices mentioned in Clause 14.2 shall be specified by the device manufacturer and shall be marked as described in Clause 47.11.1.

14.4 A terminal plate that has a tapped hole for a soldering lug or pressure-wire connector shall be at least 1.27 mm (0.050 inch) thick and shall have no fewer than two full threads in the metal for a terminal screw.

14.5 Wiring terminals of a receptacle or power inlet shall be located or protected so they cannot be forced against the wiring in the terminal box or compartment during installation.

14.6 Crimp type terminals may be provided with an inspection hole at the end of the crimp well to assure the full insertion of the conductor. Devices with crimp terminals shall be provided with manufacturer's installation instructions and be used with stranded conductors only and marked in accordance with Clause 47.11.3.

14.7 Wire binding screws used in making electrical connections shall not be smaller than indicated in Table 14.1. Wiring terminal screws shall have no fewer than two threads of engagement into metal.

14.8 A No. 8 or larger binding screw that has more than the number of threads per inch indicated in Table 14.1, with a terminal plate formed from stock 0.76 mm (0.030 inch) thick, is not prohibited from having the metal extruded at the tapped hole to provide the two full threads of minimum engagement for the binding screw. To determine compliance with note b of Table 14.1, six devices shall be used. Solid No. 14 AWG (2.1 mm²) copper wire shall be placed under the screw head and wrapped 2/3 – 3/4 turn around the screw. The screw shall then be tightened with a clutch-type torque screwdriver that has been calibrated and preset to release at 1.8 N·m (16 lbf in).

Table 14.1
Minimum sizes of wire binding screws
(See Clauses 14.7 and 14.8)

Contact rating, Amperes	Minimum size of screw	Minimum head diameter	Maximum number of threads per inch
20 or less	#6 ^a	0.275 in	36
up to 35	#8 ^b	0.315 in	32
^a An No. 6 terminal screw, minimum head diameter 6.3 mm (1/4 inch), may be used on devices not intended for permanent installation and rated at 15 A. ^b A No. 8 or larger screw having more than the number of threads per inch indicated may be used for terminals if the assembly is capable of withstanding a tightening torque of 1.8 N·m (16 lbf in) applied to the wire-binding screw without stripping either the screw threads or the terminal plate threads, or damaging the slot in the head of the screw. See Clause 14.8.			

14.9 A wiring terminal that involves a wire-binding screw shall have upturned lugs, or the equivalent, to hold a wire under the head of the screw.

14.10 Terminal parts that are depended upon to carry current and that come into contact with branch circuit conductors other than the grounding conductor, shall not have a coating of zinc or cadmium.

14.11 For a receptacle or an inlet, the integral supply leads shall not be shorter than 10 cm (4 inches).

15 Assembly

15.1 General

15.1.1 A device incorporating two or more pieces shall be of such design that any intended grounding contact polarization will not be defeated by improper assembly during installation.

15.1.2 Means shall be provided for securely attaching the body of an inlet to the supporting base. When assembled, the body shall be prevented from turning with respect to the base.

15.1.3 Screws upon which the permanent assembly of a device depends shall not loosen under normal use.

15.1.4 A device shall be capable of being readily wired as intended and shall be capable of accepting a flexible cord or cable having an ampacity at least equal to the rating of the device and of the type and size specified by the manufacturer.

15.1.5 Electrical contact shall be reliably maintained at any point at which a connection is made between current-carrying parts.

15.1.6 A sealing compound, if used, and in contact with live parts, shall be of an insulating, waterproof material that will not melt or flow at a temperature lower than the temperature rating of the conductors.

15.1.7 A determination of the softening point of a sealing compound shall be made in accordance with ASTM E28-1967 (1982).